Innovative modularity and networking for truly customised Pulmonary Function Testing solutions

“Respiratory care, when breath does matter”
Quark PFT is the modular Pulmonary Function Testing laboratory from COSMED, designed to meet the needs of the modern physicians who invest before spending. Whether you need a complete PFT system or a basic configuration to start your own practice, Quark PFT can be tailored to any requirement and application. Instantly upgrade your Quark PFT without having to send it to the manufacturer, thanks to an innovative “plug and play” design. Low maintenance costs, no need for technical expertise and user-friendly software, make Quark PFT the perfect tool for accurate and reliable data in any hospital department or physician’s office.

Quark PFT modules fully comply with the latest published ATS/ERS statements.

**Design**

- **True modular design architecture** allows to configure Quark PFT selecting only the required test features. This cost-effective solution gives the opportunity to scale at any time to a more complex configuration. “Plug and play” circuitry allows instant upgrades without the need of technical support.

- **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.

- **Latest technology** in flowmeters, gas analysers and other hardware components (ie COSMED patented smart shutter valve), allows accurate measurements and fast test procedures.

- **Simplified workflow** For improved pulmonary function tests workaround. Quark PFT with the new OMNIA software is an easy and straightforward solution for save and efficient transmission, interpretation and billing of tests performed inside an organisation, contributing to improved efficiency and reduction of errors.

- **Quick and advanced calibration procedures** for high accuracy measurements either for flowmeters (calibration and linearity check), gas sensors (zero, gain and delay) and body box (box leakage and the polytrophic factor).

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<table>
<thead>
<tr>
<th>X9 PNT</th>
<th>Digital Turbine</th>
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<tbody>
<tr>
<td>Lilly type pneumotach</td>
<td>Bi-directional turbine</td>
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<tr>
<td>Accurate through a wide ventilation range</td>
<td>Good linearity at any ventilatory range</td>
</tr>
<tr>
<td>Easily maintainable and reliable through many tests</td>
<td>Durable, virtually maintenance-free</td>
</tr>
<tr>
<td>3 litres syringe calibration (required every day)</td>
<td>3 litres syringe calibration (required once a week)</td>
</tr>
<tr>
<td>Linearize the flowmeter at any time with OMNIA software</td>
<td>No need for linearization</td>
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Fluometers available with Quark PFT and their main features.
- **Powered by OMNIA software** with innovative user interface, touch screen, easy-to-use and self-explanatory. Compatible with Win 8 PRO (32/64), Win 7 (32/64), Win Vista (32/64).
- **Comprehensive interpretation tool** with a powerful algorithm automatically elaborating results and providing interpretation text strings including numerical results. Graphical data presentation both at screen and on printouts with gauges (pictograms).

**Spirometry**

The basic configuration of Quark PFT includes all features and hardware for spirometry testing (FVC, SVC, MMV and Pre/Post Bronchial Provocation).

- Choice of different flowmeter configurations (PNT or turbine)
- New Trial Selection and Quality Control functions (in compliance with ERS/ATS guidelines)
- Innovative pediatric incentivization with selectable effort grade
- Full compliance with “2005 ATS/ERS consensus” (Interpretation, QC, etc.)
- GOLD COPD Interpretation on FVC PostBD
- Latest Global Lung Initiative (GLI) predicteds (including Z-score)
- Possibility to download Six Minute Walk Test data from any Spiropalm 6MWT

**Body Plethysmography (TGV/RAW)**

“Gold Standard” lung volume measurement can be performed as a Quark PFT module with the addition of a variable-pressure plethysmographic body-box with extremely fast times of stabilisation and calibration. The large cabin provides comfort and ease-to-access both for adults and special populations.

- Large constant-volume cabin (873 litres)
- Ultimate pressure sensor transducers ensure maximum sensitivity with severe patient’s response
- User-defined testing sequence (TGV, sRAW, SVC, IC)
- Real time review of all previously performed captures
- Advanced Edit function for tests/trials/captures
- Automatic interpretation statements according to measured TLC (restriction confirmed)
- Possibility to capture multiple RAWs with one single click (up to 7)
TLC can now be calculated with an Inspiratory Capacity (IC) manoeuvre other than a complete SVC manoeuvre (TLC=TGV+IC).

Different RAW algorithms available (sRawTOT, sRawins, sRawexp, sRaw0.5, sRaw0.2, sRawFmax).

Latest Predicteds: ERS93/ECCS, Roca/ECCS, Koch 2012, Garcia-Rio

Simulated test with optional Erlenmeyer Flask

**Lung Diffusing Capacity (DLCO)**

The DLCO module allows the diffusing capacity of Carbon Monoxide (CO) in the lungs with different test options: single-breath, intrabreath and membrane diffusion. The measurement is made possible through the continuous analysis of CO fractions and methane (CH4 the tracer) with two extremely fast infrared analyzers.

- CO analyzer independent from CO2 presence in gas sample (therefore additional CO2 analyzer not required)
- “0 wet” correction to compensate CO back pressure and humidity interference
- DLCO advanced edit feature (automatic and custom selection of washout and alveolar gas volume)
- Mouth pressure signal during DLCO (Single breath only)
- Clinically relevant parameters (DLCO corr, DLCO/VA) reported as pictograms
- Estimated TLC during DLCO corrected for obstructive patients

Membrane Diffusion automatically enabled whenever multiple DLCO9 or DLCO14 manoeuvres are performed.

Test simulation (without using gas mixture) to coach subjects before testing.

DLCO Quality Control grading

Specific X9 linearization table for improving accuracy of inspiratory volume during DLCO.

Breath hold time settings according to different standards (Jones, Ogilvie and ESP).

Latest Predicteds: ECCS, Crapo and Morris, Paoletti, Roca, Knudson

**Lung Volumes (FRC - Nitrogen Washout)**

The lung volumes module adds the possibility to test Functional Residual Capacity (FRC) via multi-breath Nitrogen Wash-out or single-breath 100% O2 techniques. More affordable alternative to body plethysmography for lung volume measurement (ATS/ERS guidelines).

- Use of fast and accurate O2 and CO2 analyzers (instead of the conventional N2 analyzer) simplifies significantly ordinary maintenance and calibration procedures.

- Possibility to detect automatically or manually the 4 phases composing the wash-out curve, including the slope of the alveolar plateau.
Real time N2 Wash-Out plot together with several indicators for the control of the respiratory pattern
Quality control messages during test manoeuvre (wash-out pattern)
User defined Multi axis graphs during and after test execution
Visual leak detection by real-time FêtN₂ plot.
Possibility to perform SVC separately

Respiratory Mechanics
The respiratory mechanics module enables the execution of tests for the evaluation of respiratory muscles strength and their severity.
Also included with the Body-Box module
Minimal Inspiratory Pressure (MIP) and Maximal Expiratory Pressure (MEP)
Respiratory drive (P0.1) performed either with or without elevated inspiratory CO₂

Forced Oscillation Technique (FOT)
For the assessment of mechanical properties of total respiratory input impedance (Zrs) under tidal breathing conditions
Great accuracy and reproducibility
Fast (8 seconds only) and easy
Ideal for uncooperative subjects or patients unable to perform forced expiratory manoeuvres
Pseudo random noise signal (frequency range from 4 to 48Hz)
Adjustable arm for maximum comfort during testing

Interrupter Technique (Rocc/Rint)
Measurement of respiratory resistance through the interrupter technique. Tidal breathing through a mouthpiece while an occlusion valve interrupts the airflow.
Rocc, RoccEX, RoccIN, Gav, etc.
Low patient collaboration required (ideal for testing children)
Limited patient collaboration required (ideal for testing children)
Easy to mount and to disinfect

Integrated Dosimeter
Controlled and more accurate management of bronchial challenge tests with an integrated DeVilbiss 646 Nebulizer, powered by dry compressed air.
ATS (“Five breaths”), Metacholine-dose, Mannitol and user defined Bronchochallenged protocols
Multi-step protocol with a single drug concentration
Easy cleaning and disinfecting

Forced Oscillations Technique (FOT) the best way to lung function assessment in children

Integrated Pulse Oximeter (SpO₂)
Digital pulse oximetry capabilities can be easily integrated with Quark PFT system for the measurement of oxygen saturation during rest or during exercise.
High quality integrated monitors (Nonin® technology)
Broad range of accurate and dependable sensors (finger, earlobe or forehead/reflectance)
Low power draw (60 mW) and intelligent pulse-by-pulse filtering

Airway resistance by the Interrupter Technique (Rocc/Rint)

DeVilbiss 646 Nebulizer for integrated dosimetry tests

Integrated pulse oximetry (SpO₂) for measurements at rest or during exercise.
Metabolic (CPET/REE)
Quark PFT can be easily transformed in a compact metabolic cart for the assessment of pulmonary gas exchange and ventilatory responses during clinical exercise test. High quality components and super-fast analysers assure unsurpassed accuracy, reliability and real breath-by-breath analysis.

- Latest technology in gas analyzers: paramagnetic, stable and durable for the O₂, rapid infrared for the CO₂. Both analysers are reliable and do not need maintenance for long periods.
- Breath by Breath (BxB) 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
- Independently validated technology on a wide range of test modes and exercise intensities

OMNIA Metabolic 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

- O₂ Kinetics feature automatically provides O₂ debt, O₂ deficit and tau values during any constant stage
- Indirect Cardiac Output by “Wasserman Algorithm”

Metabolic Accessories and Options
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, cycle-ergometers, arm-ergometers and recumbent bikes, suitable for any clinical and research application.
Networking

- Compatible with Windows Server 2008 (SP2, R2 SP1), Server 2012
- Database running on Microsoft SQL database, Express edition for small networks, Enterprise edition for complex hospital networks
- Optional networking module includes 5 clients (with simultaneous access to server). Licenses are not permanently linked to a device. Additional single licenses can be purchased when required.
- Multi-users access rights management (Physician, Technician, Administrator…) with event logging
- GDT data interface included
**Technical Specifications**

**Product** | **Description** | **REF**
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Quark PFT | Pulmonary Function Testing Laboratory | C09072-02-99

**Standard packaging**
- Unit, Smart Valve, Nose clips (2 pcs), USB cable, PC Software (CD-Rom), Calibration Syringe 
- 3L, User Manual

**Standard Tests**

- **Spiremetry**
  - ATS/ERS 2005: Standardisation of the measurement of spirometry
  - "Multi-ethnic reference values for spirometry for the 3-95-yr age range: the global lung function 2012 equations"

- **Body Plethysmography**
  - ATS/ERS 2005: Standardisation of the measurement of lung volumes
  - V. Brusasco, R.Crapo et al - Eur Respir J 2005; 26: 511-522

- **Lung Diffusing Capacity**
  - ATS/ERS 2005: Standardisation of the single breath determination of carbon monoxide uptake in the lung
  - V. Brusasco, R.Crapo et al - Eur Respir J 2005; 26: 729-735

- **Nitrogen Washout (FRC)**
  - ATS-ERS Consensus statement for inert gas washout measurement using multiple and single breath tests.
  - ATS/ERS 2005: Standardisation of the measurement of lung volumes
  - V. Brusasco, R.Crapo et al - Eur Respir J 2005; 26: 511-522

- **Forced Oscillations Technique (FOT)**

- **Respiratory Mechanics**
  - ATS/ERS 2002: Statement on Respiratory Muscle Testing
  - Integrated Dosimeter

- **Metabolic**

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**To know more:**

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