Quark PFT

Pulmonary Function Testing

Extreme Modularity for the most innovative diagnostic equipment for Pulmonary Function Testing

- Spirometry
- Lung Volumes
- Lung Diffusing Capacity
- Respiratory Mechanics (P0.1, MIP-MEP)
- Airway Resistance (Rocc/Rint)
- Forced Oscillation Technique
- Integrated Dosimeter
- Cardio Pulmonary Exercise Testing & Nutritional Assessment

COSMED

Pulmonary Function Equipment

Application fields

Quark PFT is the ideal equipment for applications in Pulmonary Departments, Sport Science, Cardiology and any field where the study of the Cardio-respiratory system is necessary.

Unsurpassed accuracy

Quark PFT uses COSMED's innovative technology to ensure great accuracy exceeding ATS and ERS criteria. Automated calibration, warnings and messages are prompted to avoid errors and simplify testing procedures.

Rapid Response CO-CH_4 Analyzers

The new "diamond-like carbon" infrared technology allows for performing accurate and reliable DL_{CO} tests on Patients with reduced Vital Capacity.

Paramagnetic O_2 Sensor

Quark PFT is provided with the most accurate and fast-response Paramagnetic O2 sensor. This technology does not require periodical maintenance and prevents user from unexpected down-time due to sudden failures.

Choose Your Ideal Flowmeter

Quark PFT is the only PFT lab offering three different flowmeter configurations:

The bi-directional digital **Turbine** flowmeter ensures utmost accuracy within a wide flow range (up to 20 l/sec) requiring virtually no maintenance.

The new **disposable Pneumotach Flowsafe** prevents patients from the risk of cross contamination and provides superior accuracy at very low flow rates. It can be used even during Lung Volumes and DL_{CO} tests.

The **multi-use Pneumotach Flowsafe X9** provides high accuracy at very low flow rates and extremely low thermal capacity (so avoiding condensation during expiration). Easily maintainable, it guarantees high reliability through many tests.

New Breathing Valve

The newly-designed breathing valve (patent pending) offers incomparable ease-of-disinfection and reliability over the time. An extra number of valves helps user simplifying the operating procedures.

Ultimate Software

The operating software designed for Windows XP and compatible with VISTA, provides ease operations through the intuitively designed Windows ™ software. User-friendly interface, intuitive commands and icons are the perfect tools for fast and reliable data collection in any hospital department or doctor office.

- Complete management of patient archive, diagnosis database and clinical reports
- Fully custom design and user defined plots, parameters and printout reports
- Integrated patient database between all PFT modules and products.
- Instant test data export in different file formats (Excel, ASCII files)
- User-defined parameter and predicted equations
- Database of diagnosis

The new breathing valve can be easily disinfected and exchanged between tests.

Single use Pneumotach "Flowsafe" provides extreme accuracy at very low flows.

Multi-use Pneumotach "Flowsafe X9" guarantees high reliability through many tests.

Breeze through the innovative software of Quark PFT.

- Automatic generation of PDF files according to consistent user-defined file names
- Printout batch of multiple tests
- Compatible with any LAN running under MS Windows.

True Modularity !!

Quark PFT has been designed to meet the needs of the modern physician who invests before spending. The system incorporates "plug and play" circuitry for instant upgrades. Save your money and choose your best product configuration at the most competitive price in the market. Quark PFT available modules are:

Spirometry Module (standard)

The basic PFT module includes all features and hardware for spirometry testing (FVC, SVC, MMV and bronchial-challenge tests).

Lung Volumes Module

Adds Functional Residual Capacity testing via Nitrogen Washout and Closing Volume techniques.

DL_{CO} Module

Brings Lung Diffusing Capacity testing (single-breath, intrabreath, membrane diffusion and 3eq DL_{CO}).

Dosimeter Module

The integrated dosimeter for automatic broncho-challenge tests delivers aerosols solution according to either predefined or user protocols.

- Multi-step protocol with a single drug concentration
- Pressure control during drug delivery to ensure maximal accuracy
- Inspired air filtration for both user and environment's safety
- Requires compressed air gas

Respiratory Mechanics Module

Upgrade your PFT right on the field with all features you need for Respiratory Mechanics including P0.1, MIP-MEP and optionally Airway Resistance by occlusion technique (Rocc/Rint).

Quark i2m Forced Oscillations

Add Forced Oscillations to your PFT lab by integrating Quark i2m unit. Featuring new Input Impedance measurements by Pseudo-Random-Noise signal a noninvasive method for recording and monitoring the lung mechanics of the total respiratory system.

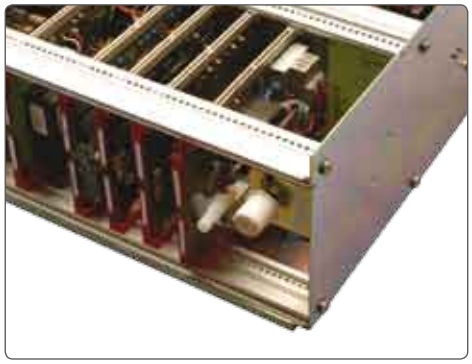
CPET Module

Expand your Pulmonary Function Testing with a fully integrated Cardio Pulmonary Exercise Testing using "breath by breath" Pulmonary Gas Exchange (VO_2, VOC_2 etc.)

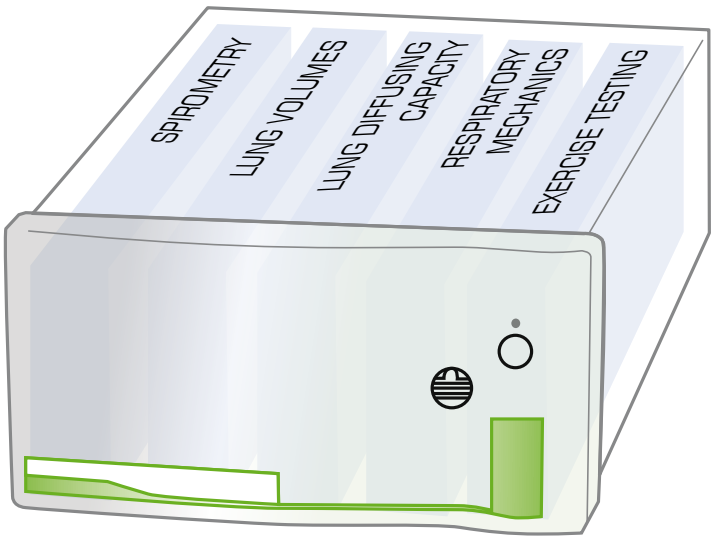
Nutritional Assessment

Labs interested in Nutritional Assessments and Resting Energy Expenditure Measurements of confined-to-bed patients or for weight loss programs, may benefit the complete integrated Nutritional Module for indirect calorimetry. The module includes necessary hardware for both canopy and face mask assessment.

Medical grade cart allows easy move of Quark PFT and accessories anywhere in your lab.



The modular design of Quark PFT minimizes technical assistance by means of boards replacement.



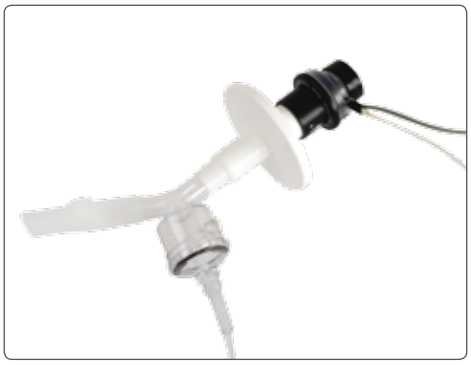
"TRUE MODULARITY"

Service and Maintenance

COSMED has done everything to protect customer's investment by keeping the running costs as low as possible. 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.

Spirometry

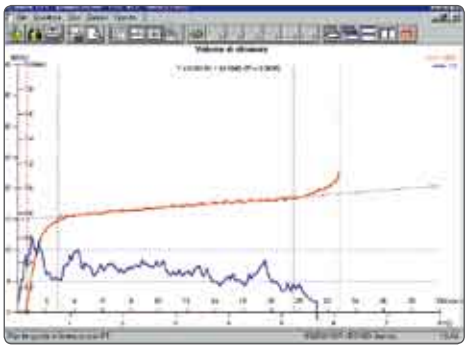
- Forced Vital Capacity
- Slow Vital Capacity (In-Ex)
- Forced Vital Capacity post BD
- Quality Control messages according to the latest ATS and ERS recommendation
- Best Test selection and reproducibility criteria according to the ATS standards
- Automatic test interpretation according to the latest ERS/ATS criteria
- Simplified management of bronchial challenge test with user defined protocols
- Auto-calculation of key interpretive indices (ERS '93) for bronchial dilator and metacholine tests
- Calculation of PD10, PD15 and PD20
- Lung age
- Fall FEV1 plot
- Trend analysis on multiple parameters
- Software encouragement tool for paediatric or non-cooperative patients
- 11 free selectable sets of predicted and unlimited number of user defined sets
- New NHANES III predicted equations included
- FEV6, FEV6/FVC
- Printouts complying ERS/ATS standard
- Automatic BTPS correction
- New GDT format for data export



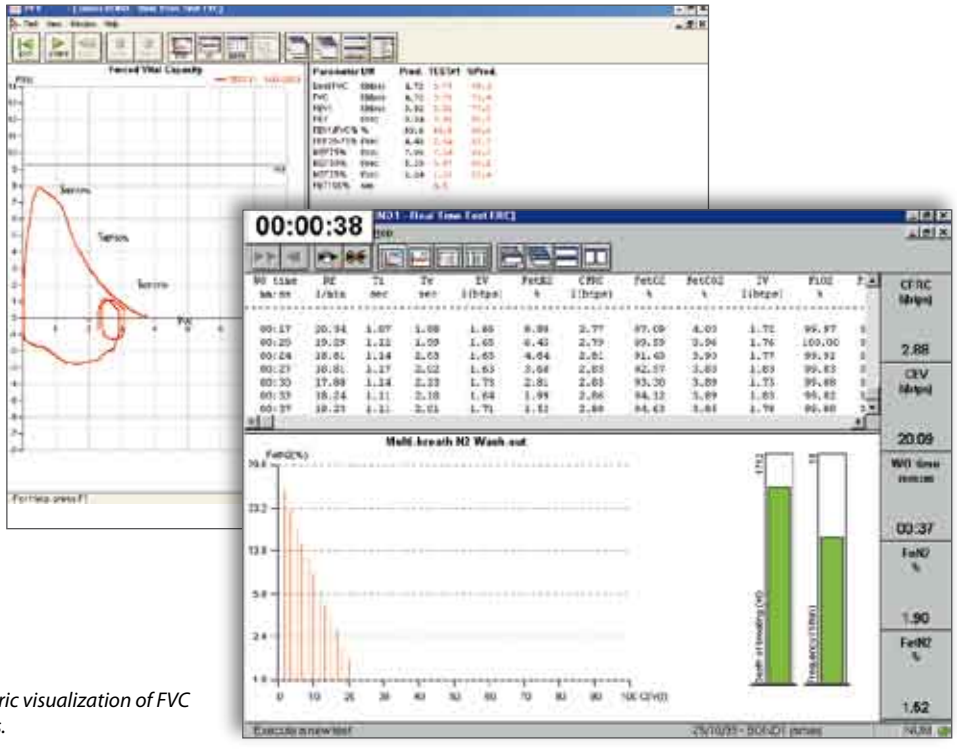
Integrated dosimeter for automatic broncho-challenge tests

Lung Volumes

- FRC, RV, TLC
- Real time N2 Wash-Out plot together with several indicators for the control of the respiratory pattern
- Quality control messages during test maneuver (Wash-out pattern)
- User defined Multi axis graphs during and after test execution
- Visual leak detection by real-time FetN2 plot.
- Possibility to perform SVC separately.



Real time display of the Closing Volume test.



Real time graphic and numeric visualization of FVC and Nitrogen Wash Out tests.

Lung Distribution

- Closing Volume with pure O2 Single Breath technique
- Automatic/manual detection of the 4 phases composing the washout curve
- Automatic/manual detection of the Dead Space according to the Fowler method
- Automatic calculation and display of the linear fitting on the alveolar plateau
- Data elaboration tools for Lung Distribution Analysis
- Calculation of LCI (Lung Clearance Index) and AMDN (Alveolar based Mean Dilution Number).

Lung Diffusing Capacity

- DL_{CO} Single-Breath with Apnea
- Visual inspection of CO and CH4 traces
- DL_{CO} intrabreath, without breath hold
- Dm, Vc, DL_{CO} 3 equations and DL_{CO} steady state
- Continuous measurement and display of CO and CH4%
- Ability to change the rejection and sampling volume for accurate measurement of patients with reduced vital capacity
- Possibility to split the membrane diffusion capacity and capillary volume
- Breath hold time settings according to different standards (Jones, Ogilvie and ESP)
- DL_{CO} compensation for hemoglobin, carboxy-hemoglobin and environmental pressure
- Graphical leak detection during breath hold time
- View and change dead space detection by the Fowler method.

DL_{CO} by 3 Equation Method

The method of calculating DL_{CO} developed by Graham, Cotton and coll. based on separate equations that analytically account for the differences of CO uptake during the three phases of the test (inhalation, breath holding, exhalation). This makes the measurement of the single breath DL_{CO} independent from the maneuver and increases the accuracy of the test.

Respiratory Mechanics

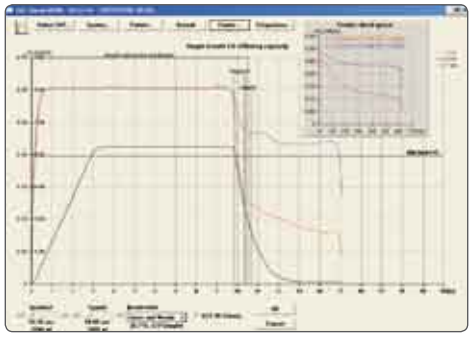
- Measurement of respiratory muscle strength (MIP/MEP)
- Respiratory drive (P0.1).

Airway Resistance (Option)

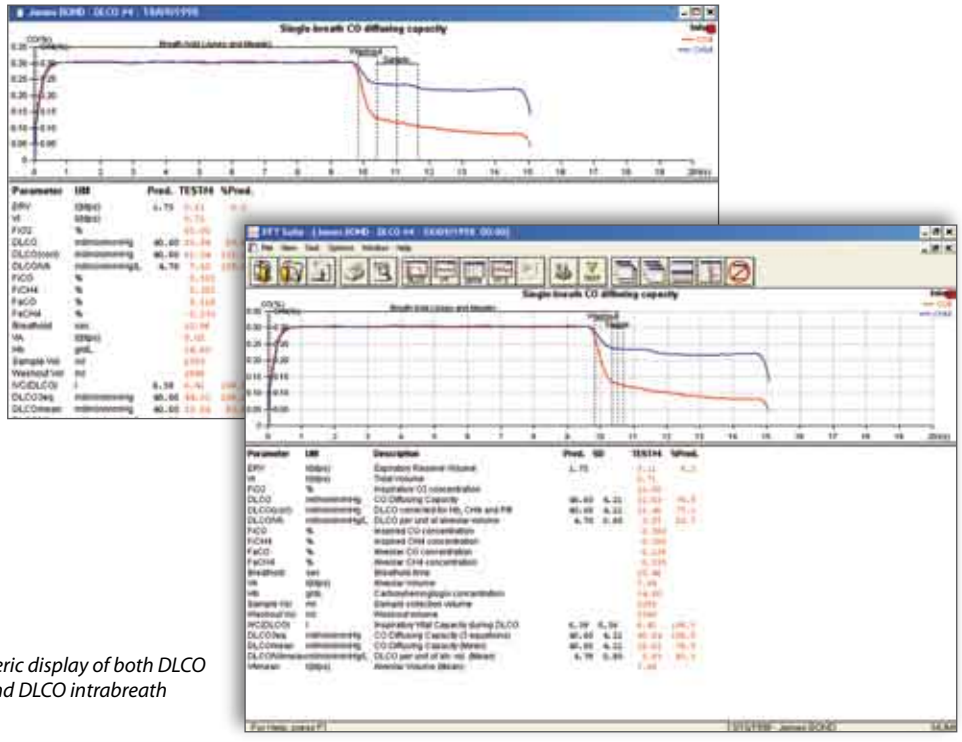
- Rint, Rocc, RoccEX, RoccIN, Gav etc.
- Dedicated low-flows Pneumotach
- Respiratory resistance with interrupter technique.

The Rocc kit for airway resistance is highly indicated for pediatric applications.

PFT use a unique breathing valve to perform different testing manoeuvres.



Editing tool for the selection of alveolar volumes and dead space according to user-defined criteria.



Real time graphic and numeric display of both DLCO Single breath with apnea and DLCO intrabreath (without breath hold).

Forced Oscillations

Quark PFT can be fully integrated with **Quark i2m** the forced oscillation system for measuring total respiratory system impedance

- Pseudo random noise signal
- Tidal Breathing analysis
- Fast and easy testing procedure (8 seconds tidal breathing only)
- No patient collaboration required ideal for pediatric applications
- Frequency range between 4 and 48Hz
- Adjustable arm for maximum comfort during testing
- Great accuracy and reproducibility.

Exercise testing

- Breath by breath or Mixing Chamber pulmonary gas exchange (VO2, VCO2)
- Real time visualization of O2 and CO2 waveforms
- Automatic and manual detection of anaerobic threshold (modified V-slope)
- Advanced data elaboration (filtering, smoothing, spread-sheet features)
- O2 Kinetics (O2 deficit, O2 debt and time constant)
- Estimation of Cardiac Output from VO2 max measured
- Extrapolation of VO2 max during a sub-maximal test
- Custom fittings (linear and exponential)
- Exercise Flow-Volume loops
- Ergometer control by RS232 interface
- Instant test data export to Excel, TXT, ASCII and in XPO (COSMED proprietary) formats
- User defined parameters
- Customized graphical and numerical data presentation (display, report and printout)
- Test data and predicted values editing
- Compatible with any LAN running under MS Windows.
- Suitable for mechanically ventilated patients (ICU) (option)
- Long lasting measurements while sleeping
- Canopy blower flow rate directly measured with digital turbine flowmeter
- Automatic re-calibration procedure during test
- The ethanol kit for the respiratory quotient control.

12-lead Stress Testing ECG

Only COSMED gives you the power to integrate a 12-lead ECG with the breath by breath metabolic data. Developed in conjunction with a world leader in ECG technology, the PC card based QuarkT12 and C12 offer the following features:

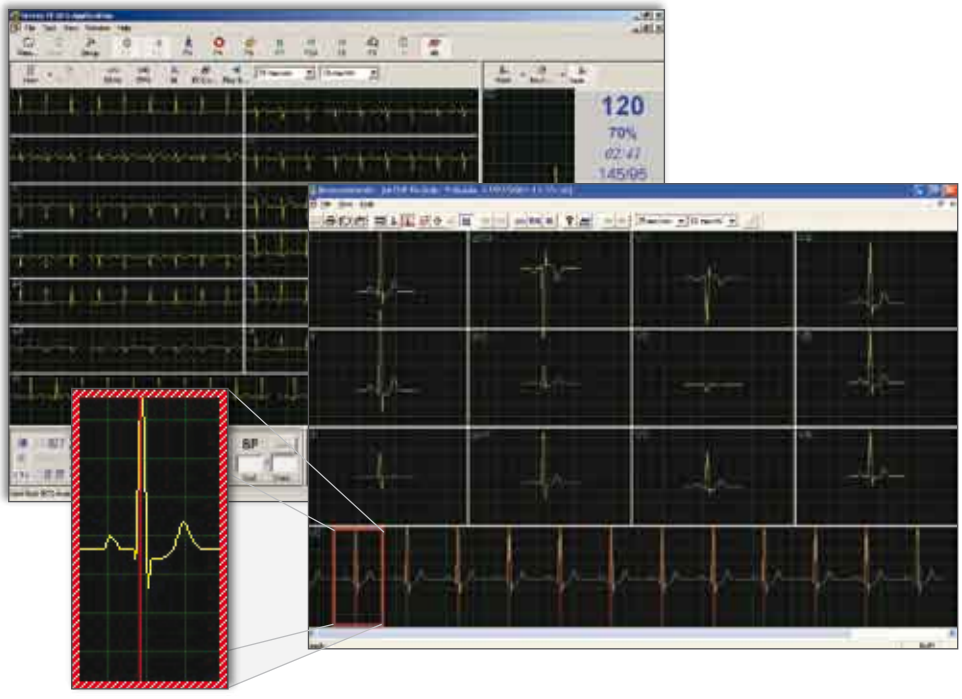
- Continuous display of all 12 leads
- True diagnostic quality waveforms
- Single or multiple leads view including zoom and freeze features
- Current and reference ST analysis profiled for 12 leads
- ST depression and slope trends displayed during test
- Averaged QRS complexes overlapped on a reference ECG complex.

The CPET module add the possibility of performing pulmonary gas exchange analysis during exercise.

Measurement of resting energy expenditure with a Canopy.

Nutritional Assessment

- Indirect calorimetry VO_2, VCO_2, RQ, REE and related parameters
- Available with Canopy or facial mask
- Individuation of energy substrate utilization (%FAT, %CHO, %PRO)
- Available with High FiO2 kit for enriched O2 mixture use



Real time graphic and numeric display of a Cardiopulmonary exercise test (Gas exchange and ECG).

Accessories & Options

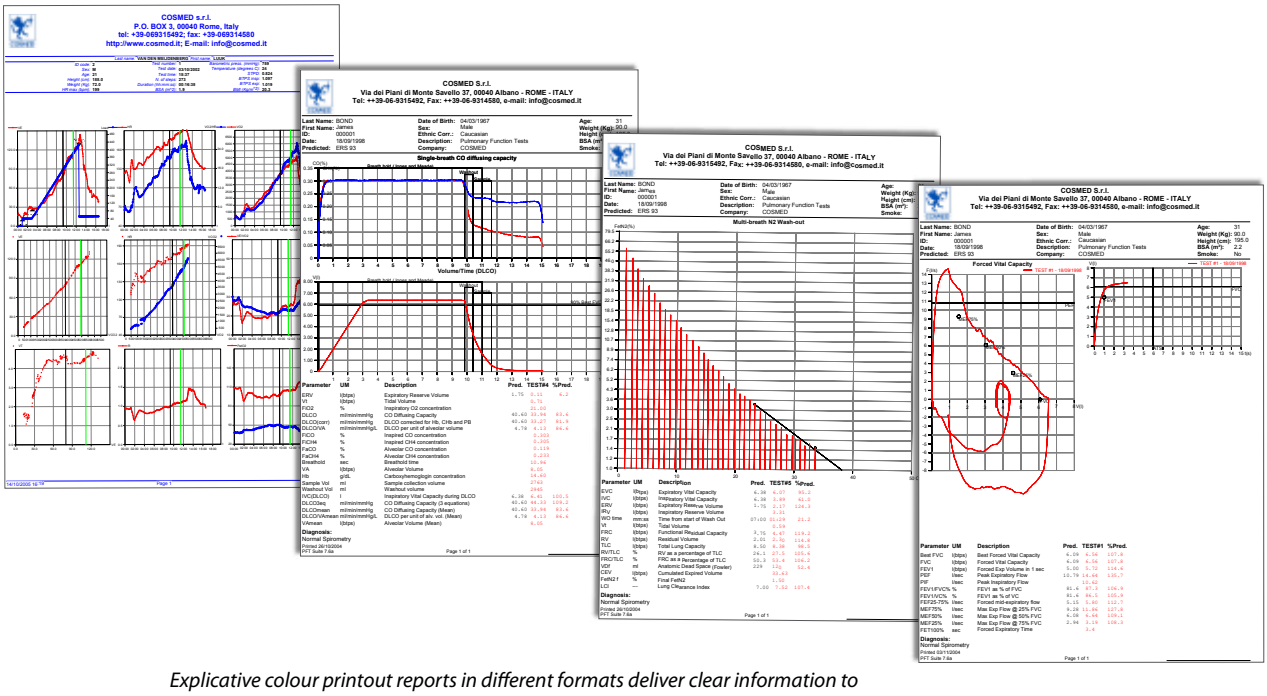
Flowmeters	Disposable pneumotach “flowsafe” Digital Turbine (28 mm) Digital turbine (18 mm)
Pulse Oximeter	A monitor of oxygen saturation (SpO2) at rest and during exercise available with finger, reflectance or ear sensors
Mixing Chamber	Special technology that allows for gas exchange analysis with a dynamic mixing chamber
12-lead stress test ECG	Available in both wireless and direct-patient-cable connect configurations.
Ergometers	Wide selection of treadmills and bikes for any applications
Anti-Bacterial Filters	High filtration efficiency filter barrier to avoid cross contamination
Dosimeter	Integrated dosimeter for bronchial challenge tests select from commonly

The SpO2 module is available with different sensor probes: Finger, Ear and reflectance.

True diagnostic quality 12-lead stress test ECG available in both wireless and Patient-cable configurations .

Miscellaneous Accessories

Medical Cart	Medical graded Cart with isolation patient transformer required for medical environments
Arm support	An adjustable arm holding the breathing valve
Gas cylinder & regulator	Specific Medical Gas mixtures and pressure regulators for calibrations and testing
PC & Peripherals	Proven PCs & peripherals fully compatible w/ COSMED equipment, factory-installed to avoid any possible compatibility issue.



Explicative colour printout reports in different formats deliver clear information to user including: graphical test display, numerical data compared to predicted values and automatic interpretation of test results.

What's new

- Available now with Flowsafe. Disposable pneumotach for Lung function testing
- Introducing Smart Valve. Revolutionary breathing valve. The smallest, less expensive and easiest to be disinfected
- New single piece waterproof turbine flowmeter for both PFT and CPET
- Fully integrated with COSMED body Box
- Integrated dosimeter for metacholine challenge
- Enhanced respiratory mechanics (P0.1, MIP/MEP) using the same breathing valve
- Enhanced Airway Resistance Module (Rocc)
- Integrated Wireless or cable 12 lead Stress Testing Ecg
- CPET using both Breath by Breath & Mixing chamber
- Nutritional Assessment & Substrate Metabolism with multiple techniques (breath by breath, canopy)
- New hardware, software and pneumatic design for maximum reliability and easy support
- Opto-isolated auxiliary USB port for interfacing external devices
- Opto-isolated USB interface with PC
- New Medical Cart.

Technical Specification

Tests	PFT Basic Module	Lung Volumes	Diffusing Capacity	Metabolic/Calorimetry	Respiratory Mechanics
Forced/Slow Vital Capacity (SVC-FVC)	●				
Maximum Voluntary Ventilation (MVV)	●				
Bronchial Challenge Test	●				
Integrated Dosimeter	○				
Multi-Breath Nitrogen Wash-out		○			
Single-Breath 100 % O_2 (Closing Volume)		○			
Lung Volumes by DLCO Single Breath dilution		○			
DLCO Single Breath (w/ Breath Hold & Intrabreath)			○		
DLCO 3eq (3 equations method)			○		
Membrane Diffusing Capacity			○		
Indirect Calorimetry w/ Mask				○	
Indirect Calorimetry w/ Canopy Hood				○	
Indirect Calorimetry w/ Ventilator				○	
VO_2max, Anaerobic Threshold				○	
Integrated Pulse Oximeter (SPO2)				○	
Integrated 12-lead ECG (GAS/ECG)				○	
HR Interface w/ external ECG (TTL)				○	
Mip-Mep / Respiratory Drive (PO.1)					○
Airway Resistance (Rocc/Rint)					○

Analyzers	O_2	CO_2	CO	CH_4
Type	*Paramagnetic*	*Infrared digital*	*Infrared*	*Infrared*
Range	*0-100 %*	*0-10%*	*0-0.35%*	*0-0.35%*
Accuracy	*± 0.03 %*	*± 0.03 %*	*± 0.003 %*	*± 0.003 %*
Response time	*< 120 ms*	*< 120 ms*	*< 200 ms*	*< 200 ms*
Warm-up time	*0 min*	*5 min*	*15 min*	*15 min*

Flowmeter	Digital turbine (Ø 18mm)	Digital turbine (Ø 28 mm)	Flowsafe PNT	Flowsafe PNT X9
Type	*Bi-directional*	*Bi-directional*	*Lilly Pneumotach*	*Lilly Pneumotach*
Flow range	----------	*0.03-20 l/s*	*0-16 l/s*	*0-16 l/s*
Ventilation range	*0-50 l/min*	*5-300 l/min*	----------	----------
Accuracy	*±2%*	*±2%*	*±2%*	*±2%*
Resistance l/s	*<0.7 cmH2O/l/s @ 3 l/s*	*<0.6 cmH2O/l/s @ 14l/s*	*<1 cmH2O/l/s @ 14 l/s*	*<1 cmH2O/l/s@14*

Hardware

Temperature	*0-50°C (32 - 122 F°)*
Barometer	*400-800 mmHg*
Humidity	*0-100%*
Dimensions (Main unit)	*33 cm x 41 cm h 16 cm (12,9 x 16 in h 6.2 in)*
Weight (Main unit)	*6 kg (13,2 lb)*

Available languages

Italian, English, German, Spanish, French, Portuguese.

Electrical requirements

Power supply	*100-240V ± 10% 50/60 Hz*
Power consumption	*100 W*
Class	*I type BF (EN60601-1)*

PC configuration required

Pentium or faster, Windows XP, VISTA 32, 128 Mb RAM or more, USB or RS 232, CD-Rom reader, 80 Mb on HD space available.

Safety & Quality Standards

Equipment complies with MDD (93/42 EEC) and FDA 510(k) cleared, EN 60601-1 (safety) and EN 60601-1-2 (EMC)

CE 0476

CERMET Reg.n. 387- M UNI EN ISO 13485:2003
CERMET Reg.n. 387- A UNI EN ISO 9001:2008

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