Resmon™ PRO FULL

Forced Oscillation Technique

THE RESMON PRO, A UNIQUE FOT SYSTEM, FINALLY MADE EASY

The Resmon Pro Full is a professional, uniquely designed device, engineered for non-invasive evaluation of pulmonary airway mechanics.. Laboratories love the Resmon Pro Full because it is accurate, versatile and efficient. Patients love it because it is fast and easy to use.

The Resmon Pro uses the forced oscillation technique (FOT) to measure the mechanical properties of the lung and airways. FOT assesses the respiratory system's response to small-pressure stimuli applied to the opening of the airway during normal breathing.

With just normal breathing from the patient, the Resmon Pro Full can measure the mechanical properties of the respiratory system and provide a simple, effort-independent assessment of airways obstruction, characterizing peripheral, central or heterogeneous patterns. During the test, the Resmon Pro Full will assess expiratory flow limitation (EFL) while evaluating bronchial reversibility. The Resmon Pro Full is an important tool for the measurment and diagnosis of respiratory function in individuals who cannot perform spirometry—including elderly or pediatric patients and patients with neuromuscular disease. It also has published clinical uses in asthma, COPD and airways clearance evaluation.

With such versatility, the Resmon Pro Full is ideal for virtually any testing environment—including pulmonary laboratories, private offices, on-site school or workplace settings and sites for clinical trials or research studies.

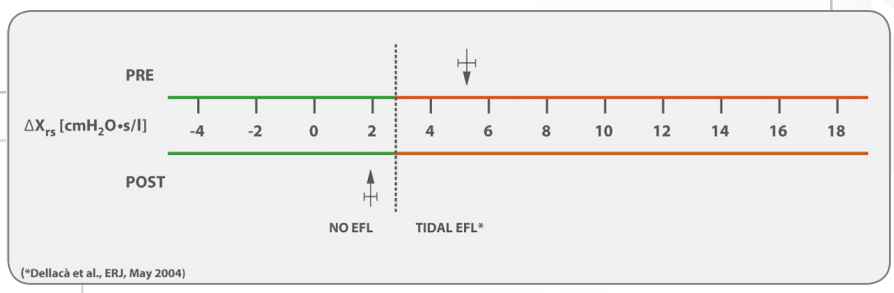
RESMON PRO FOT SYSTEM

DESIGNED, DEVELOPED, PRODUCED AND SUPPORTED BY EXPERTS

The Resmon Pro Full is the result of more than 15 years of research conducted by the medical bio-engineering team at the Politecnico di Milano University (Milan, Italy), in cooperation with key scientific, clinical and research centers in Europe, US and Australia.

UNIQUE FEATURES FOR CLINICAL AND RESEARCH USE

- "WITHIN-BREATH" ANALYSIS OF BREATHING PATTERNS AT FAST SAMPLING FREQUENCY
  - Real-time display of resistance (R), reactance (X) and tidal volume
  - Accurate calculation of inspiratory, expiratory and total parameters
  - Full respiratory pattern parameters measurement and reporting
- THREE MEASUREMENT MODES:
  - Single frequency mode options of 5, 6, 8, 10 Hz *(for children, severely obstructed patients and special research purposes)*
  - Innovative "enhanced optimized" multiple frequency mode of 5-11-19 Hz
  - "Enhanced optimized" Pseudo Random Noise (PSN) of 5-37 Hz
- EXCLUSIVE "10 BREATHS" MODE
  - Comfortable testing for the patient with an automatic discard of non-physiological and non-coherent breaths
- AUTOMATIC ADJUSTMENT AND DETECTION
  - Automatic adjustment based on patient impedance, auto adjustment of stimulus amplitude during the first three breaths for optimal patient comfort
  - Patented, automatic detection and quantification of Expiratory Flow Limitation with ΔXrs index graph and % of Flow Limited breaths (FL%), also used for pre-post bronchodilator or pre-post treatment testing
  - Complies to ERS guideline of peak-to-peak mouth pressure
- MINIMAL DEAD SPACE
  - Only 35cc of dead space



A unique feature of the Resmon Pro Full FOT system is detection and quantification of the degree of Expiratory Flow Limitation

CONVENIENT SIZE AND FUNCTIONS

- Easily transportable allowing for testing in the lab and off-site (school, office, etc.)
- Self-contained and compact unit
- Quiet operation with an automatic "active-wash" silent fan for expired CO_2 removal from the system
- Suitable for children
- Unique ERJ referenced verification tool is included to verify the accuracy of both resistance (Rrs) and reactance (Xrs) recordings at any time
    - Verification date/time printed on final report for quality assurance.

The Resmon Pro requires no personal computer and is a completely stand-alone system for evaluating pulmonary function with the ability to download tests to PC software after testing. It includes:

- A wide touchscreen for fast, easy and intuitive test management
- Large internal memory
- Built-in database to store and retrieve patient data
- Multi-user access with data security
- Detailed report of results for further trending, analysis and statistics
    - Data available in RAW, XSL/CSV and PDF output
- Connectivity options

CLINICAL ISSUES AND FOT SOLUTIONS

- *"Spirometry is not an easy test to perform because the forceful expiratory and inspiratory manoeuvres require good patient co-operation. Children aged <5 years, elderly people and those with physical and cognitive limitations cannot perform spirometry easily."* *Ref: Brashier et al, 2015*
- Pre-Post bronchodilator testing with forced flow-volume loops maneuvers and body plethysmography are very difficult to perform by most patients especially in Acute Exacerbations COPD *(AECOPD)*
- DEEP INHALATION EFFECT: It has been demonstrated and referenced over the last years that the Deep Inhalation can alter the bronchial tone in COPD and Asthma patient, adults and pediatrics. *"The deep inspiration that precedes forced expiration may modify airway smooth muscle tone, and, therefore, may influence the result of the BHR test."* *Ref: Osteveen et al 2013*
- EFL (EXPIRATORY FLOW LIMITATION) often difficult measurement: *"EFL promotes dynamic pulmonary hyperinflation and intrinsic positive end-expiratory pressure (PEEPi) with concurrent dyspnea"* *Ref: Kouloris et al, 2011*
- Airways Clearance Therapy Effects: *"In spite of the widespread application of airways clearance techniques in respiratory rehabilitation, we could not identify, at this time, objective outcome measurements for these treatments"* *Ref : Gigliotti et al, 2015*

SPECIFICATIONS

FLOW MEASUREMENT	Mesh type
RANGE	±1.5 L/s
LINEARITY	±2%
MOUTH PRESSURE	Range: ±2.5 cm H_2O
MOUTH PRESSURE LINEARITY	0.05% full scale
RESOLUTION	0.015 cm H_2O

PHYSICAL DIMENSIONS	Height: 55 cm (21 in) Width: 89 cm (35 in) Depth: 26 cm (10 in)
WEIGHT	7 kg (16 lbs)

TESTING "WITHIN BREATH" SIGNALS MODE	SINGLE FREQUENCY	MULTIPLE FREQUENCY	PSEUDO RANDOM NOISE (PSRN)
	5, 6, 8, 10 Hz	5 + 11 + 19 Hz	5-37 Hz

MEASUREMENT ACCURACY	±0.1 cm H_2O/L/s or 10% *(6% for US models)* of the measured value
CALIBRATION	Factory calibration according to international guidelines + auto-zeroing of the sensors before each test + calibration check with a test object (provided)
PATIENT LOAD	0.46-0.54 cm H_2O/L/s in the frequencies of normal breathing (0.1-1 Hz)
DEAD SPACE	35 cc

CONNECTIVITY	2 USB ports Ethernet
PROCESSOR AND MEMORY	Dual core architecture, 64 MB RAM, 4 GB flash memory
DISPLAY	5.7" LCD backlit touchscreen display
ELECTRICAL SPECIFICATIONS	Medical grade 100/240 V, 50/60 Hz 60 W input AC/15 VDC output power supply (included)
STAND-BY CURRENT	250 mA
AVERAGE CURRENT	1500 mA
MATERIALS EXTERNAL CASE	ABS
SUPPORT ARM	Aluminum
LOUDSPEAKER MEMBRANE	Silicone rubber
CERTIFICATION	MDD 93/42 EEC, FDA 510 K152585

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