

BODYBOX 5500®

Barometric and volumetric total bodyplethysmograph

BODYBOX 5500 :

- ▶ "Gold-standard" measurement
- ▶ A fast, accurate "One-stop" test center
- ▶ Software guided clinical excellence
- ▶ Expansive capability 8 options
- ▶ Precision engineering of the highest quality
- ▶ Low cost of operation and maintenance
- ▶ No high-cost proprietary disposables

AND NEW COMBINATION
::: HYPAIR ARTS :::



BODYBOX 5500

► The perfect unit for :

- Pulmonary function analysis with both children and adults
- Ventilatory mechanics
- Bronchodilatation studies and
- Hypersensitivity research (challenge tests)

From basic to Full version, 8 optional versions & combinations

ABILITY TO BUILD CUSTOM SIZES FOR SMALL ADDITIONAL COSTS

For those centers unfamiliar with plethysmography, the technique is often misunderstood and considered to be difficult to use. Quite the contrary! The Body Box 5000 series is incredibly easy to operate and patient comfort is given by :

- An ergonomic chair
- Comfortable box volume
- The largest window area, all around vision
- A double door version for wheelchair access
- A simple Quality control procedure is provided with each equipment.



NEW

DISABLED HANDRAIL SUPPORT

To assist disabled or infirm subjects, the option of a hand rail can be added to assist entry and exit of the cabin.

DUAL DISPLAY MODULE OPTION

This innovation allows separate screen layout for the physiologist or operator and the subject. The subject can view test instructions or incentive displays whilst the operator can review and report on the actual test results.

This improves the reproducibility of testing, enhancing the quality of testing and adding a new dimension.

HYPAIR ARTS

The respiratory gas analyser with a wide spectrum of components for measuring.

- Lung volumes by :
 - Helium washin
 - Nitrogen washout
- Diffusion by :
 - Standard sample collect method
 - Collect during exhalation methods
 - Steady state real time method
- Dm and VC options
- Cardiac output :
 - Acetylene dissolution
- Exercise Testing
- Nitrogen or He Slope



Trolley for a perfect computer integration with isolation transformer for electrical safety.





AIRWAYS RESISTANCE and CONDUCTANCE (RAW & GAW)

The airways resistance can be measured easily and quickly. The subject establishes a resting FRC level of tidal breathing and the operator can then select to collect flow against box data for analysis. The test can be performed at both resting ventilation and with the panting method. The correlation between methods is excellent.

When the operator is satisfied with the quality of the captured data the occlusion valve can be operated to set the actual thoracic gas volume at which the measurements are made. This is essential for a meaningful measurement of Sgaw.

The software control allows manual fitting of the slope to the data, selection and de-selection of efforts for the mean, manual selection of Tidal volume and Vital capacity minimum and maximum points as well as adjustment of the FRC level.



Additionally this measurement can be performed in conjunction with NEP, this then allows the evaluation of pulmonary blood flow and its ability to recruit from the capillary reserve.

Single Breath & Intra Breath using Methane trace gas (CH4)

Using fast gas analysis, this method collects the exhaled breath directly as a high resolution data array. This has the advantage that post test analysis can be performed aligning the start of sample onto the alveolar plateau after the clearances of all the dead spaces. A sample as low as 50 ml can be used to calculate the diffusion. This can overcome the volume limitation of other systems and methods.



Single Breath & Intra Breath using trace gas (He)

The most significant improvement to diffusion measurements is the last 10 years. Previously only possible with a mass spectrometer and rapid IR carbon monoxide analyzer. The new Medisoft rapid gas analyzer technology allows the measurements in 'real time' of exhaled diffusion gases. This is both in traditional single breath and intra breath modes. With typical responses in the range of 100-200 ms for two discrete analyzers the system is perfectly matched.

As this method is faithful to the standard by which the Predicted Values were collected, the data yields the most reproducible data for subjects related to normal data.

The method extends easily to 'steady state' diffusion in 'real time' and so has no volume limitation for the measurements of diffusion.

The properties of Helium as the traces gas is better presented for gas mixing than alternative, leading to more accurate estimates of total surface area represented by single breath total lung Capacity (TLC) the alveolar Volume (Va)

Intra Breath diffusion He & CH4

The sample is taken during a slow and constant exhalation in the range of 200 – 500 ml/sec. Applying linear regressions to the data array of the expiratory gas, the alveolar concentrations are calculated. As this method requires no breath holding, it will greatly benefit some subject groups.



THORACIC GAS VOLUME, TOTAL LUNG CAPACITY AND LUNG SUB-DIVISIONS

The test calls for the subject to achieve a stable FRC level, the operator can then select occlusion mode. The powerful software then closes the valve at an end tidal point and the resulting tangent of the mouth pressure versus the box pressure is the thoracic gas volume (TGV,FRC). As subjects change their FRC level during the effort, the software monitors the baseline shift and then adds or subtracts the volume difference from the measured thoracic gas volume to show the 'True FRC' as the TGV. A full vital capacity effort then provides the calculations of the lung sub-divisions relating to the TGV measurement. Complete control over reported parameters and information. Selection of data, movement of the tidal volume, vital capacity and FRC levels as well as deletion of poor efforts.

Five sets of measurements can be recorded at the same or different times to identify improvements in patient measurements.

Three different occlusion modes can be selected:

1. Insp. cycle - 2. Complete cycle - 3. Multiple cycles



Steady State diffusion Tlco ss NEW & EXCLUSIVE

Medi-soft has taken a new look at this method, using fast gas technology and replacing the older bulky instrumentation. This is a "NEW" method for a new age of diffusion measurement. Requiring minimal subject effort, this method is especially helpful for obtaining measurements with children and reluctant subjects. Performed at a steady state breathing condition, the measurement is valid as soon as the subjects ventilation is uniform and stabilized.



PERITHORACIC AND THORACIC COMPRESSION (OPTION)

This test demonstrates the degree of thoracic compression, the method simultaneously measures the flow volume characteristic measured at the lips with the subject breathing from inside the cabin through the wall and the corresponding flow volume characteristic measured by the thoracic displacement through the cabin wall.

The Thorax is normally free moving provided the respiratory muscles are performing correctly, whilst the loop presented at the lips is characteristic of all the resistance and compliance characteristics of the lung and bronchial tree. This is a clear indicator of flow limitation and also muscular force (alveolar pressure) throughout a forced manoeuvre.



NEP (OPTION) EXCLUSIVE

A new and very sensitive test that is specific and reproducible for determining the degree of expiratory flow limitation both at rest and during exercise, particularly with subject's known to have obstructive lung disease. The test applies a negative pressure to the mouthpiece during the expiratory phase, this allows the comparison of the flow volume loop with the tidal efforts when reviewed as a flow volume loop display. This method also allows the indirect measurement of the resistance (RNep) which provides a good alternative to the standard screening method.



SLOW AND FORCED SPIROMETRY

The Body Box 5500 allows full measurement of spirometry with facilities for multiple level spirometry as well as bronchial challenge testing. Additionally, incentive spirometry assists the measurements of children. Post visualization and post treatment provide a convenience of use particularly appreciated: Choice of graphical representation, selection of calculation points, alignment of flow curves on RV, time evolution of measured parameters by numerical and graphical representation, deletion of poor effort, trend graphing and dose response curves.



VENTILATION MECHANICS (OPTION)

- MIP – MEP : Maximal Inspiratory and Expiratory Pressures as an assessment of respiratory muscle strength, also useful for weaning subjects from ventilators, ...
- SNIP : measurement of the maximal nasal inspiratory pressure using a nasal canular. A non-invasive estimate of muscle fatigue.
- STATIC AND DYNAMIC COMPLIANCE AND RESISTANCE : The use of an oesophageal balloon catheter inserted into the subject allows the measurements of both static and dynamic compliance. The components of compliance and resistance are fundamental to the mechanics of the lung



MEASUREMENT OF DIFFUSION CAPACITY DLCO (OPTION)

UNIQUE - the only body plethysmograph offering the range of 5 diffusion methods.

Single Breath using the helium trace gas He

The well known technique described by J.E. Cotes based on the Jones Meade method. Using a bag collection system the subject can be controlled for inspiratory volume, washout (discard) volume and Sample volume. This method has proven repeatability and the method was the same as that used to collect the predicted values we use today.

DLCO-NO (trace gas He) NEW & EXCLUSIVE

Membrane diffusion and capillary blood volume (Dm & Qc) measurement.

Regarded as the 'True' diffusion characteristic and the most useful indicator of membrane thickening, this measurement takes on a new lease of life. The powerful Exp'Air software makes the calculations painless, the combination of NO and CO follows the work of Prof. Guenard of Bordeaux. Simple to perform and rapid results add this test to the list of favourite studies undertaken in routine practice.



PROVO 4 (OPTION)

Equipment for fully automated bronchochallenge test with automatic nebulizer. This option provides full control of products and doses used and of test performing criteria for bronchochallenge testing



FENO (OPTION)

External module for the measurement of exhaled endogenous NO by the off-line method



EXPAIR software

The most Intuitive, userfriendly and complete software basic version

- A sophisticated and powerful data-base function and electronic storage
- Trends Report (Historic function)
- Interpretation function
- Comment function
- Off Line input and on line data transfer
- Report designer
- Predicted value editor
- Choice of languages
- Choice of units for the measured parameters
- Bronchial test generation
- Blood gases with blood chemistry analysis from manual entry
- Users Units capability
- Measurement sequencing configuration
- Full calculation function : display of calculation points with manual correction capability
- Technical toolbox to enable diagnostic function and full program control
- Inbuilt quality control with calibration markers for performance
- Teleassistance or VPN assist

The MediSoft factory is a state of the art modern facility with clinical research, precision engineering and computer design departments.



BODYBOX 5500

GENERAL SPECIFICATIONS

	Dim.	Standard	Double Door or XL Model
(H x W x D) cm	176x87x71	179x120x83	
Weight	± 130 kg	± 150 Kg	
Internal Volume	960 Liters	± 1250 Liters	
Patient chair	Pneumatic adjustment		
BodyBox closing door	Sturdy closing and internal handle		
Power requirements	230/115 VAC 50/60 Hz		
Power Consumption	100 VA (module)		
Warm up Time	20 min (minimum)		

Conform to electrical safety req. IEC60601/1 and CE 0029

PATIENT VALVE

Pneumotachograph	Lilly cone
Range	0,03 to 15 L/sec or 20L/sec
Résistance	0,4 cmH ₂ O/L/sec
Relative accuracy	Error < 3%
Volume conv. to BTPS	integrated thermometer (optional barometer)
Automatic zero shift	correction of measuring elements
Software	computerised linearization
Patient valve	Pneumatic (Time O/C : 30 mS)
Dead Space	< 60 ml / 30 ml (paediatric).
Disinfection	Simple Dismantling for cold cleaning
Valve Support Arm	Moveable arm with 3 joints

PRESSURE TRANSDUCERS

Piezo resistive sensors protected from overload

Sensitivity	Resolution	Calibration
Box pres ± 0,5 cm H ₂ O	Box Pres 0,05 cm H ₂ O	Box Pres Integrated 30ml pump
Mouth pres ± 50,0 cm H ₂ O	Mouth Pres. & Flow 0,01 cm H ₂ O	Mouth Pres. Water column
Pres. MIP/MEP SNIP ± 280,0 cm H ₂ O	Linearity Error < 0,1%	Pneumotachograph semi. auto. with 1 to 3L
Mouth flow ± 5,0 cm H ₂ O	Relative Accuracy Error < 0,01%	syringe with ERS/ATS quality control indicator

GAS ANALYZERS

Helium	Thermal conductivity
Range	0 to 15% He
Relative accuracy	± 0,1%
Response time	± 200 msec Fast He ± 10 sec He STD
Carbon monoxide	Chemical infra red/Fast Co or Fuel Cell
Range	0 to 0,350 % CO
Relative accuracy	± 0,1 %
Response time	± 150 msec Fast CO ± 20 sec CO STD

OPTIONAL GAS ANALYZERS

Multigas analyser	Infrared spectrometer (CO, CH ₄ , CO ₂ , C ₂ H ₂)
Range	0 to 0,350%, CO ₂ : 0 -10%
Relative accuracy	± 0,1 %
Response time	< 20 sec (10 - 90% FS)
Nitric oxide	Chemical fuel cell
Range	0 - 450 ppm
Relative accuracy	± 0,1 %
Response time	< 10 sec (10 - 90 % Fs)

ANALYSER CIRCUIT

Automatic, rapid and accurate calibration with quality control

COMPUTER INTERFACE

Type	Serial RS232 or USB
Conversion	12 & 16 bit.
Acq. frequency	100 Hz /channels (Multigas 3500 Hz)
Transmission speed	115,200 baud
Isolation	System fully isolated by optocoupling
Computer	Pc Pentium, 19" monitor, A4 colour
Operating system	Windows® XP Pro or version 7™ 32bit

MEASURED AND CALCULATED PARAMETERS

- RAW (Insp. exp. tot.), SRAW, GAW, SGAW, ...
- TGV, VC, IRV, ERV, RV, TLC, ...
- Slow Spirometry : VC, ERV, IRV, IC, EC
- Foced Spirometry : FEV1, FIV1, FVC, FEV1/FVC, FEV1/VC, FEV6, PEF, F25, F50, F75, MEF, MVV, ...
- Bronchodilation and challenge test, dose-response curves, reactivity threshold, ...
- V Comp., P. Alv. (option)
- DLCO : AV, DLCO / AV, DLCO - NO : Dm, Vc; DLCO ss (option)
- Compliance stat./dyn., RL stat./dyn., CL stat./dyn., EL dyn., W vis. (option)
- MIP/MEP, SNIP, ... (option)
- NEP, R_{Nep}, Exp. Flow Lim, ... (option)

GAS SUPPLY SPECIFICATIONS

Body Box	Compressed air
DLCO He option	0,3% CO, 14% He, 21% O ₂ , rem N ₂
DLNO option	± 450 ppm No, rem N ₂
DLCO CH ₄ option	0,3% CO, 0,3% CH ₄ , 21% O ₂ , rem N ₂
Pressure regulator	0 - 8 Bars / 15 m ² / h
DLCO ss	0,08 CO, 21% O ₂ , rem N ₂

VOLUMETRIC BODYBOX (OPTION)

Pneumotachograph	double Grid Lilly cone
Range	0,01 to 15 L/sec
Resistance	0,1cm H ₂ O/L/sec
Relative accuracy	Error < 3%

AMBIENT CONDITIONS

Temp. 10 - 40°C	Relative humidity 25 to 80 % non condensed
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OPTIONS

- Mixed (Volumetric and Barometric bodyplethysmograph)
- DLCO He, DLCO NO, DLCO CH₄, DLCO steady state
- MIP/MEP, SNIP, NEP, Rint
- Static and dynamic Compliance
- Integrated automatic nebulizer, PROVO 4.
- External compensation Box
- Computer integration trolley with electrical isolation transformer
- Double Door for wheelchair access
- Medisoft network
- Data transfer & reception (HL7, ...)
- Automatic data backup
- Disabled handrail support



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