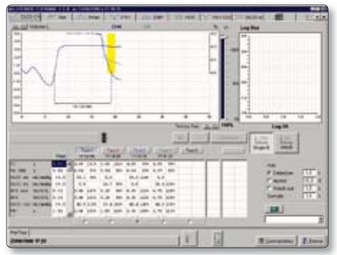
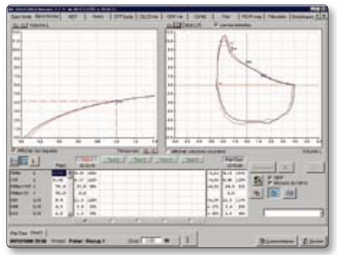
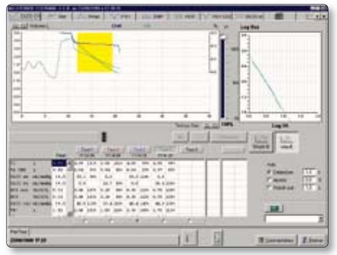
DLCO CH4 measurement by the apnea technique



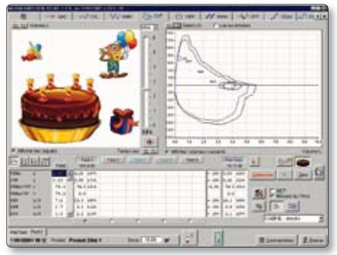
Forced spirometry measurement



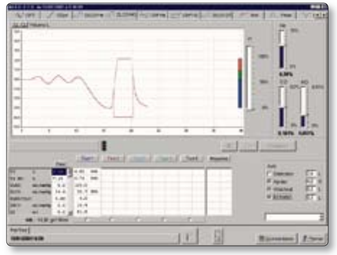
DLCO CH4 measurement by the simple expiration technique



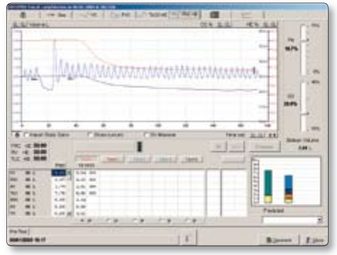
Forced spirometry measurement with incentive



DLCO-NO measurement

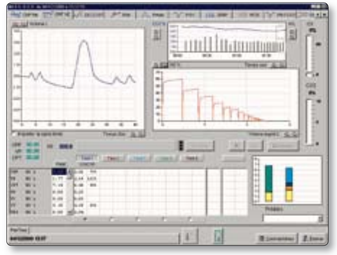


FRC measurement by the helium dilution technique



DLCO measurement by the Steady State technique

FRC measurement by nitrogen washout



EXPAIR software

The most intuitive, userfriendly and complete software in basic version.

- A sophisticated and powerful data-base function and electronic storage function
- Trend Report (Historic function)
- Interpretation function
- Comment function
- Off Line input and on line data transfer
- Report designer
- Predicted value maker
- Language maker
- User calculated parameters
- Bronchial test generation
- Bronchial test generation
- Blood gases with blood chemistry analysis from manual entry
- Users Units capability
- Measure sequency 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

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

HYPAIR COMPACT+

GENERAL SPECIFICATIONS

Dimensions	Module	Trolley
(H x W x D) cm	14 X 40 X 33	89 x 65 x 67
Weight	+/- 12 Kg	+/- 35 Kg
Power requirements	230/115 VAC	50/60 Hz
Power Consumption	+/- 100 VA (module)	
Warm up Time	20 min. minimum	

Conform to electrical req. IEC60601/1 and CE certified

AMBIENT CONDITIONS

Temperature	10 to 40°C
Relative humidity	25 to 95% (non condensed)

PATIENT VALVE

Pneumotachograph	Lilly type
Range	+/- 0,03 à 15 L/sec
Resistance	0,4 cmH2O/L/sec
Relative Accuracy	Error < 3%
Desinfection	Simple Dismantling for cold cleaning

Volume conv. to BTPS included thermometer (optional barometer)
Automatic zero shift correction of measuring elements

Patient valve	Pneumatic (T. of O/C: 30 mSec)
Dead Space	< 60ml / 30ml (paediatric)
Valve Support Arm	Movable arm with 3 joints

PRESSURE TRANSDUCERS

Piezo resistive sensors protected from overload

Sensitivity		Resolution	Calibration
$P_{0.1}$, NEP, Rint,	+/-12,5 cmH_2O	Ocl. P. & flow.	0,01 cmH_2O	Mouth P	Water column
MIP, MEP, SNIP	+/-200,0 cmH_2O	Linearity	Error < 0,1%	Pneumotachograph	Semi - auto with serynge
Flow.	+/-5,0 cmH_2O	Relative accuracy	Error < 0,01%	of 1 to 3L with quality control	

GAS ANALYSERS

Helium	Thermal conductivity
Range	0 to 15% He
Relative Accuracy	+/- 0,1%
Response time	10 sec (10-90 % Fs)
Carbone Monoxyde	Chemical Fuel Cell
Range	0 to 0,350% CO
Relative Accuracy	+/- 0,1%
Response time	+/- 20 sec. (10-90 % Fs)
Oxygen	Chemical Fuel Cell
Range	0 to 100% O2
Relative Accuracy	+/- 0,1%
Response time	<10 sec (10-90% FS)
Oxygen	Paramagnetic (FRC paediatric option)
Range	0-100% O2
Relative Accuracy	+/- 0,01%
Response time	+/-2 sec(10-90% FS)

OPTIONAL ANALYSER

Multigas analyser	IR spectrometer (CO, CH_4, CO_2)
Range	0 to 0,350%
Relative Accuracy	+/-0,1%
Response time	< 0,1 sec (10 - 90% FS)
Nitric oxyde	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

CALIBRATION GAS BOTTLE MIXTURE

FRC He	14% He, 25% O_2, Qs N_2
FRC N_2	O_2 100%
DLCO He	0,28% CO, 21% O_2, 14% He, Qs N_2
DLCO CH_4	CO and CH_4 0,3%, O_2 21%, Qs N_2
DLNO	NO 225 or 450 ppm, Qs N_2

OPTIONS

- FRC He paediatric, CRF He without O2 compensation
- FRC N2, Closing volume
- DLCO He or CH4, DLCO steady state
- MIP/MEP, SNIP, P0-1, NEP, Rint, Ros,
- Static et dynamic Compliance
- Integrated automatic bronchial provocation system
- Heating pneumotachograph (STD on CRF He / O2 Comp.)
- Computer integration trolley with electrical insulation transfo.
- TFT monitor
- Integrated barometer
- Automatic data backup
- Medisoft Network
- Data transfert & reception (HL7, . . .)

COMPUTER Interface

Type	serial RS 232 or USB compatible
Conversion	12 & 16 bit.
Acq. frequency	100 Hz /channel (multigas 3500 Hz)
Transmission speed	115,200 baud
Isolation	System fully isolated by optical infrared
Computer	Pc Pentium, 17" monitor, Hp printer Deskjet A4 colour.
Operating Syst	Windows® 2000 professionnal

ANALYSER CIRCUIT

80 ml analyser circuit included linear motorized pump (no wear) sampling system with flow regulation.
Gas sample dried to room conditions by the Nafion tubing.

MEASURED AND CALCULATED PARAMETERS

- Slow Spirometry : CV, VC, ERV, IRV, IC, EC, . . .
- Forced Spirometry : FEV1, FIV1, FVC, FEV1/FVC, FEV1/VC,
- PEF, F25, F50, F75, MEF, MVV, . . .
- Bronchodilation and challenge test, dose-response curves, reactivity threshold, . . .
- FRC, RV, TLC, RV/TLC, . . . (option)
- DLCO: AV, DLCO / AV, DLCO - NO : Dm, Vc, DLCO ss (option)
- Compliance stat./dyn., RL stat./dyn., CL stat./dyn., (option)
- EL dyn., W vis.. (option)
- MIP/MEP, SNIP, P0-1, . . . (option)
- NEP, RNep , Exp. Flow Lim, ... (option)
- R_{int}, R_{os}, ... (option)

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ISO 13485 : 2000

HYPAIR COMPACT+ ®

PULMONARY FUNCTION TESTING STATION

The device unequalled :

- **More than 20 different combinations to adapt itself to the most diverse applications in daily pulmonary function testing or in research.**

medisoft
CARDIO-RESPIRATORY INSTRUMENTATION

HYPAIR COMPACT +

Pulmonary Function Testing Station

- **Hyp'Air Compact and Exp'Air combination offer :**
  - **"Gold Standard" measuremen**
  - **A fast, accurate "One-stop" test cent**
  - **Software guided clinical excellenc**
  - **Expansive capability (DLCO, MIP/MEP, ...)**
  - **Precision engineering of the highest quality**
  - **Low cost of operation and maintenanc**
  - **No high-cost proprietary disposable**

From basic to Full version,
8 optional versions &

STANDARD SPIROMETRY (SLOW AND FORCED)

The Hyp'air Compact® has all the functions and performances needed to measure slow and forced vital capacity.
The flow is measured by the pneumotachograph and the volume is calculated by numerical integration.

tests under bronchodilator or bronchoconstrictor are simplified by the specifically adapted software functions (comparison table, effect-doses curves, test protocols, ...).

The post visualisation and the post treatment give a convinience of use particularly appreciated (choice of the graphical representation, control of the calculation points, centering of the flow / volume curves regarding the RV, evolution of the measured values in function of time by numerical tables and graphs, ...).
Fun screen (extinction of candles on a cake), ideal method for little children.

FRC HE OR N_2 (option)

The Hyp'air Compact® can be equipped with the functions necessary to the FRC measurement by the helium dilution technique in closed circuit or by the nitrogen washout method by pure O2 inspiration, in open circuit (single and multi breath method).

These two techniques are completely automated and necessitate only a minimal user intervention.
The recording of the ventilation and of the gas concentration variations (He or N2) is visualised in real time, during the test, to make theses measures very understandable.

• Measurement of TLC by Nitrogen washout.
The Nitrogen washout uses the accumulated volume of oxygen to wash nitrogen from the lungs as the 'true' FRC value.
On screen visualisation guides the user through the full test procedure, making the understanding and quality control of the test a key feature. The possibility to import a VC from a separate effort is possible when the subject maybe unable to perform the best effort within the test. The measuring circuit utilises an O2 and CO2 analysers by subtraction to measure the nitrogen; the patient circuit consists of an automatic two-channel valve with automatic delivery of 100% O2 with a low resistance demand valve.
The closing volume measure is calculated from N2 slope during on a maximal expiration

Asx in siromemtry, all the software functions needed for the realisation of measures in the best conditions are inegrated in this option. Special combined version (paediatrics and adult).

MEASUREMENT OF DIFFUSION CAPACITY DLCO (option)

UNIQUE the only spirometer offering the range of 5 diffusion methods :

Single Breath using the helium trace gas He
The most well known technique as 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

Single 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.

Intra Breath diffusion
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 phase it is of great benefit with some subject groups.

Steady State diffusion TIco ss New
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.

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 favorite studies undertaken in routine practice. 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.

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 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 permits the comparison of the flow volume loop with the tidal efforts when reviewed as a flow volume loop display.
This method allows in addition to measure indirectly the resistance (RNep) and provide a good alternate at the standard method for a first screening.

RINT -ROS (option)

Rint
Measurement of the total pulmonary resistance by the method of airflow interruption (during 80 to 120 ms) at each respiratory cycle.
• Visualisation of the mouth pressure in real time with calculation point for each cycle.
• Choice between 3 mouth pressure calculation methods.
• Averaging of the value with rejection by "Gauss's curve" method.
• Automatic functions indentical to the spirometry ones for test with bronchodilator and bronchoconstrictor.
• these measurements are taken in passive mode.

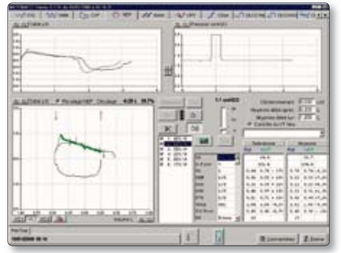
Ros
Measurement of airway resistances by forced oscillation method, generated by a sinusoidal pump turning at approximately 6 to 30 Hz. This method measures the impedance (Z) and the phase (j) to calculate the resistance.

VENTILATION MECHANICS (OPTION)

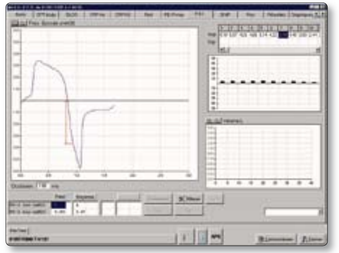
• MIP –MEP : Maximum Inspiratory and Expiratory Pressure.
• SNIP : measurement of the maximal nasal inspiratory pressure.
• $P_{0.1}$: inspiratory occlusion pressure at 0.1 second.
• Static and dynamic Compliance and Resistance : measured by intra-oesophageal ballon catheter.

HYPAIR Compact + desktop version

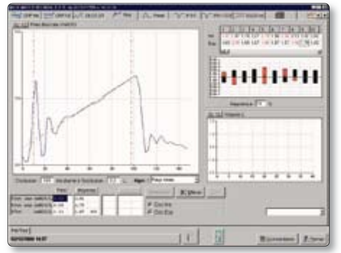
Expiratory flow limitation measurement by N.E.P.



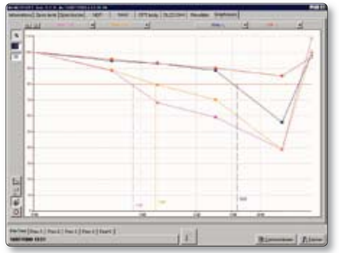
Occlusion pressure after 0.1 sec



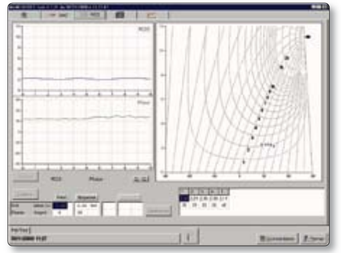
Resistance measurement by the airflow interruption method



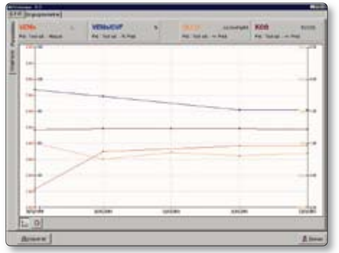
Effect / dose curve function (challenge test)



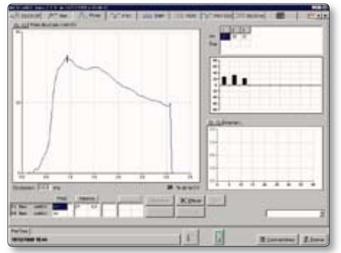
Resistance measurement by the forced oscillation method



Historic graphic function



Maximum Expiratory and Inspiratory Pressures



Examples of printing protocols configured by the user