



Ergospirometer exercise test PRE-101

Cardiopulmonary
exercise testing provides a global assessment of the integrative exercise responses involving the pulmonary and cardiovascular system.

Ergospirometry is increasingly being used in a wide spectrum of clinical applications for the evaluation of undiagnosed exercise intolerance and exercise-related symptoms.

International guidelines and requirements

- Statement on Cardiopulmonary Exercise Testing American Thoracic Society and American College of Chest Physicians, November 1, 2001
- Standardization of Lung Function Testing ATS/ERS Task force, European Respiratory Journal 2005

Exercise modes

- Bicycle and treadmill
- Selectable exercise testing protocols
- Progressive incremental exercise protocol
- Constant work rate protocol
- Multistage exercise protocol with a pseudo steady state at each level
- Discontinuous protocol

Measured and calculated parameters

| | |
|------------------|----------------------------|
| WR | Work rate |
| VO ₂ | Oxygen uptake |
| VCO ₂ | Carbon dioxide output |
| HR | Heart rate |
| ECG | 12 leads |
| BP | Blood pressure |
| VE | Minute ventilation |
| VT | Tidal volume |
| IR | Respiratory frequency |
| RER | Respiratory exchange ratio |

- Graphic representation
 - Wassermann's 9 basic graphs
 - 17 types of VO₂ graphs
 - Determination of Anaerobic Threshold
 - V-slope method
 - RQ=1 method
 - Lactate determination method

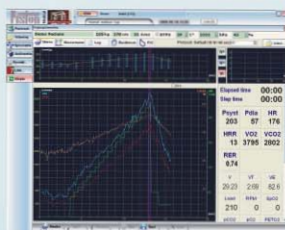


| PinkFlow® flow-meter | | |
|----------------------|-----------------|----------------|
| Gas analyzers | CO ₂ | O ₂ |
| Principle | NDIR | Micro membrane |
| Range | 0-100% | 0-100% |
| Accuracy | 0.05% | 0.05% |
| Response T90 | 130 ms | 130 ms |
| ECG | | |
| Leads | 12 Standard | + 3 Frank |
| Resolution | 2.5 uV/bit | 12 bit A/D |

Mobile ergospirometer PRE-101/m

The mobile ergospirometer provides data acquisition of breathing, metabolism and ECG outside of PFT laboratories as well. It is useful especially at sport medicine and rehabilitation program.

| | |
|--------------------------|-------------------------|
| PinkFlow® flow-meter | |
| CO ₂ analyzer | O ₂ analyzer |
| EKG | 3 leads |
| Service time | 40 minutes |
| Lithium-ion | 2000 mAh |
| Accumulator | |
| Size | 160 * 100 * 60 mm |
| Weight | 680 g |
| PC interface | USB 2.0 |
| Accessories | Waterproof side bag |



Accessories

The accuracy and reliability of Piston devices are guaranteed only with the usage of original Piston accessories and consumable parts

Calibration syringe

PCS-3000

Calibration syringe for daily calibration and validation of lung diagnostic devices.

Our precision calibration syringe is extremely well sealed and its traction is very low.

| | |
|------------|------------------------------|
| Volume | 3 litre ±1.5 ml |
| Connection | ISO-30 medical taper, Female |
| Size | 520 * 120 * 110 mm |
| Weight | 2,1 kg |



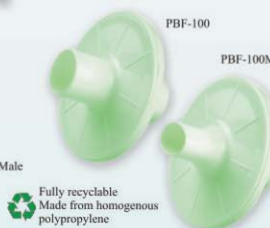
Bacterial and viral filter

PBF-100 and PBF-100M

Using bacterial and viral filter prevents cross-contamination during pulmonary function tests

| | |
|---------------------------------|---|
| Size | D 100 mm * L 75 mm |
| Filtrating media | Filtrete by 3M |
| Resistance | 60 Pa/l/s @ 12 l/s |
| Additional dead space | 75 ml |
| Device side connection | ISO-30 medical taper, Female |
| Patient side connection | PBF-100: ISO-30 medical taper, Male PBF-100M: Elliptic, form of lips |
| Bacterium filtration efficiency | 99,999 %* |
| Virus filtration efficiency | 99,999 %* |

* Tested by Nelson Laboratories, Salt Lake City, USA



Mouthpiece

MPA-30
Anatomically shaped mouth piece for the basic pulmonary function tests



PMP-28
Mouthpiece with bite-on grip guarantees perfect sealing for plethysmograph, diffusion capacity test and oscillometry

Nasal probe

PNP-12, -14, -16



Nasal probes for rhinomanometer
• Soft silicon rubber plug with smooth surface
• Series of sizes: D12, D14, D16 mm

Facial mask

PFM-115, -120, -130, -140, -150



- For ergospirometer
- For rhinomanometer
- Soft transparent silicon rubber
- Headgear with fast release strip
- Series of sizes: 115, 120, 130, 140, 150 mm



Nasal clip PNC-65

It is advisable to use at all pulmonary function tests

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* PinkFlow: Patent Pending
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Piston



PULMONARY
FUNCTION TEST
POWERED BY PINKFLOW

PINKFLOW

The PinkFlow® flow-meter is the ideal flow-meter for the most demanding pulmonary function tests.

- Hygienic single-use application
- No moving parts
- Insensitive against condensation and vapour
- Integrated gas sampling port
- Fully interchangeable flow-meters
- No need for recalibration after changing
- Quick pneumatic coupling
- Fully recyclable made from homogenous polystyrene

The PinkFlow® flow-meter fully complies with the specifications and requirements of the Standardization of Lung Function Testing ATS/ERS Task force (European Respiratory Journal 2005)

| Type | PPF-18 |
|------------|------------------------------------|
| Principle | Symmetric Pitot tube |
| Flow range | ±18 l/s |
| Accuracy | ±2% or 50 ml, whichever is greater |
| Dead space | 36 ml |
| Resistance | 60 Pa/l/s @ 15 l/s |

System overview

Selectable and enhanceable reference value algorithms

- ECCS
- Cotton & Dust
- Crapo HSU
- Knudsen
- Austrian, Finnish, Swedish

System integration into information networks

- Application of standard protocols
- Health Level 7 (USA)
- Geräte Daten Träger (Germany)

Further features

- Eight identical measurements can be performed simultaneously
- Database management
- Pre-Post examination, Trend analysis
- User definable printed report
- Multiple communication languages



Spirometer

PDD-301/s

The spirometer is the basic device of the functional lung diagnostics. It is inevitable in detecting the early malfunction of the respiratory system:

- COPD
- Asthma
- Chronic bronchitis
- Obstructive ventilation disorder
- Emphysema

Measurement modes

- Forced ex- and inspiration
- Static vital capacity
- Maximal voluntary ventilation

Connecting to a laptop PC provides full portability



Rhinomanometer and spirometer

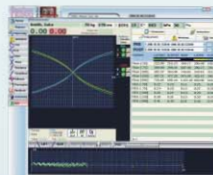
PDD-301/r



The device ensures the measurement of nasal resistance and the basic pulmonary function testing. It is inevitable in objective diagnose of rhinitis and in the ENT practice.

Measurement modes

- Active anterior nasal resistance
- Active posterior nasal resistance
- Forced ex- and inspiration
- Static vital capacity
- Maximal voluntary ventilation

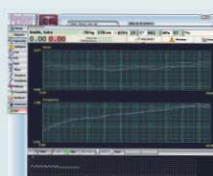


Breath carbon monoxide monitor

PDD-301/sco and PDD-301/rco

The device ensures the measurement of breath carbon monoxide concentration. It is inevitable in the smoking cessation program.

- Monitoring and follow up of breath carbon monoxide concentration
- Combination with a full feature spirometer and rhinomanometer
- Side stream gas analysis for higher accuracy and shorter response time
- Full flow and volume monitoring during CO analysis
- CO concentration range: 0 - 100 ppm
- Automatic zero setting and calibration



Impulse oscillometry

PDD-301/o

The Impulse Oscillometry or with other name Forced Oscillometry offers an economical alternative for measuring impedance of airways. During the test the patient has to breath quietly. The test can be performed successfully without any special co-operation of the patient.



- Fast Fourier Transformation
- Average calculation of Reproductive Spectrums
- Model matching for Reproductive Spectrums
- Separation of Resistance / Elastance / Inertia
- Random induced frequencies
- Sequential induced frequencies
- Induced frequency range: 2-35 Hz
- Induced pressure wave: max. 0,2 kPa
- Induced power: max. 50W

Whole body plethysmograph

PDT-111/p

The device ensures the measurement of mechanical parameters of the pulmonary system

- Accessible for patients sitting in a wheelchair (optional)
- Double time constant of the cabin provides tests at normal breathing frequency and with panting as well
- Diffusion capacity test (optional)
- Spacious cabin with four transparent walls and roof from hardened glass
- From inside the door of the cabin can be only opened
- Programmable audiovisual metronome
- Automatic BTPS correction based on the temperature, humidity and pressure measured in the cabin
- Full automatic calibration and leakage test
- Communication system with built in speaker and microphone



Measurement modes

- Thoracic gas volume
- All components of airway resistance
- Work of breathing
- Dynamic and static compliance (optional)
- Diffusion capacity test (optional)
- Maximal occlusion pressure
- Forced ex- and inspiration
- Static vital capacity
- Maximal voluntary ventilation
- Nasal resistance (optional)



Diffusion capacity test

PDT-111/d

The device can be used to measure the lung's transfer factor, the oxygen bounding ability and the functional residual capacity

Measurement modes

- "Single breath" method with breath holding
- "Intra breath" method without breath holding
- Cardiac output (optional)
- Forced ex- and inspiration
- Static vital capacity
- Maximal voluntary ventilation

- Non Dispersive Infra Red (NDIR) multi gas analyser
- 130 ms response time
- CO, CH4, CO2 simultaneous measurement
- Direct gas analysis without gas sampling balloon

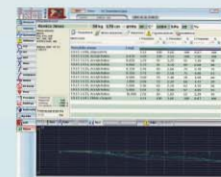


Dose controlled drug nebulizer

PDD-301/p

The nebulizer can be integrated into a system with all Piston made lung diagnostic devices

- Exact deposition of the medicine thanks to mechanical nebulizer with narrow range of particle sizes (1,2 µ or 3,5 µ)
- Full support of provocation test and bronchospasms
- Constant concentration multi step protocol
- Increasing concentration, dilution row, multi step protocol
- Breath phase controlled, nebulizer runs only during inspiration
- Supervision of total inhaled dosage and automatic limitation
- Exhalation of medicine thru bacterial and viral filter or into a collecting sack to prevent environment



Modifications of pulmonary function parameters as a function of inhaled dosage are traceable on histograms

| | PDD-301/spf | PDD-301/rpf | PDD-301/sco | PDD-301/o | PDT-111/p | PDT-111/d | PRE-101 |
|-------------------------------|------------------|------------------|-------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Spirometer | + | + | + | + | + | + | + |
| Rhino manometer | + | + | + | + | + | + | + |
| Breath CO monitor | + | + | + | + | + | + | + |
| Oscillometer | + | + | + | + | + | + | + |
| Whole body plethysmograph | + | + | + | + | + | + | + |
| Diffusion capacity test | + | + | + | + | + | + | + |
| Ergospirometry | + | + | + | + | + | + | + |
| Static vital capacity | + | + | + | + | + | + | + |
| Maximal voluntary ventilation | + | + | + | + | + | + | + |
| Nasal resistance | + | + | + | + | + | + | + |
| Breath CO monitor | + | + | + | + | + | + | + |
| Impulse oscillometry | + | + | + | + | + | + | + |
| Thoracic gas volume | + | + | + | + | + | + | + |
| Airway resistance | + | + | + | + | + | + | + |
| Work of breathing | + | + | + | + | + | + | + |
| Compliance | + | + | + | + | + | + | + |
| Diffusion capacity | + | + | + | + | + | + | + |
| Ergospirometry | + | + | + | + | + | + | + |
| ECG 12 leads | + | + | + | + | + | + | + |
| Size | 150 * 82 * 45 mm | 150 * 82 * 45 mm | 190 * 138 * 68 mm | 260 * 155 * 160 mm | 1680 * 925 * 790 mm | 320 * 200 * 240 mm | 320 * 200 * 140 mm |
| Weight | 220 g | 220 g | 420 g | 2,5 kg | 200 kg | 5,5 kg | 4,5 kg |
| Power supply | USB port | USB port | USB port | 90 - 260 VAC 50/60 Hz | 90 - 260 VAC 50/60 Hz | 90 - 260 VAC 50/60 Hz | 90 - 260 VAC 50/60 Hz |