



Cardiopulmonary Exercise Testing

One examination for heart, lung and metabolism



Diagnosis with Foresight

Cardiopulmonary Exercise Testing from CORTEX

«Man is as healthy as his veins» – that is only part of the truth. Impairments of any part of the cardiopulmonary system often affect performance and require precise differential diagnosis.

This is where Cardiopulmonary Exercise Testing as a noninvasive test procedure assumes an important role. Meaningful parameters for cardiac and respiratory function and metabolism can be determined simply and rapidly in a single test. In many patients dyspnea impaired performance and other early-stage diseases only occur on physical exertion and in this case exercise tests demonstrate clear diagnostic benefits over examinations performed at rest.

In your expert hands Cardiopulmonary Exercise Testing with ECG recording is an excellent instrument for diagnosis, treatment monitoring and prevention. With the all-round expertise of a world market leader, CORTEX is your partner.



Cardiopulmonary Exercise Testing as Gold Standard

Simple, accurate and reliable

Looking for a simple procedure for assessing cardiovascular and respiratory function? Want to offer your patients meaningful individualized health services and extend your diagnostic spectrum? Performance assessment under realistic conditions is particularly important for your work?

Adopt the gold standard for Cardiopulmonary Exercise Testing, risk assessment and performance testing:

Cardiopulmonary Exercise Testing The diagnostic benefit of Cardiopulmonary Exercise Testing in medicine is now recognized worldwide. Cutting-edge technology makes it possible to construct small, mobile and portable systems that are highly efficient and reliable.

This makes Cardiopulmonary Exercise Testing the gold standard in performance testing:

- Determine important cardiopulmonary parameters in just one noninvasive test
- Distinguish immediately between cardiovascular and pulmonary function deficits and institute the correct treatment
- Diagnose in detail functional deficits that are only detectable on exercise
- Use a procedure that provides feedback on performance and exercise tolerance in real-life situations
- Receive medical results and conclusions that are relevant to your patient's everyday life

Cardiopulmonary Exercise Testing Pays its Way

Economic, multifunctional and flexible

We have given Cardiopulmonary Exercise Testing a new status: first, CORTEX systems are small, light and robust; secondly, our software concept provides very flexible and customizable features. Ease of maintenance and well-designed accessories make not only acquisition, but also operation of our systems particularly efficient. Selected applications include:

- Differential diagnosis of cardiopulmonary conditions in cardiology, pulmonology and occupational and sports medicine
- Cardiac risk assessment, treatment evaluation and rehabilitation monitoring in heart patients
- Performance testing for training management in leisure and elite athletes
- Assessment of physical constitution and surgical risk in transplantation medicine and prosthetic surgery

By means of practice-oriented software modules, our systems can be adapted to fulfill almost any differential diagnosis or performance testing requirement: you choose the specific module that meets your application spectrum.

Convince your patients with your specialist skills. Exact diagnosis and an innovative, evaluated procedure – our Cardiopulmonary Exercise Testing systems are a stepping stone to success.



Competence in Cardiopulmonary Exercise Testing

Our solutions

Just a few years ago Cardiopulmonary Exercise Testing was the domain of university diagnostics – large, stationary systems prevented simple and practice-oriented use. CORTEX mobile systems have changed all that. We are now the world market leader in mobile Cardiopulmonary Exercise Testing and have set new global quality standards. With modern know-how and as a result of an intensive exchange of experience with our customers, we are continuing to enhance our systems successfully. However, despite or perhaps even because of the increasing complexity, our self-imposed obligation is to ensure that Cardiopulmonary Exercise Testing is simple and cost-effective.

For indoors or outdoors, portable or mobile – at CORTEX you will find the right solution for your needs. Our product lines:

METALYZER®

Practical, portable Cardiopulmonary Exercise Testing systems for practices and hospitals for complete medical functional analysis of the heart, lungs and metabolism at rest and during exercise. By virtue of the ECG connection and a variety of hardware and software options, these systems can be used for a particularly wide variety of applications.

METAMAX®

Mobile wireless “indoor” and “outdoor” Cardiopulmonary Exercise Testing system for sport and training sciences and for occupational medicine under real exercise conditions. The mains-independent operation and wireless transmission ensure a particularly wide radius of operation, while numerous hardware extensions and coordinated software options provide a high degree of flexibility.

METALYZER®

Cardiopulmonary Exercise Testing redefined

Cardiopulmonary Exercise Testing for diagnosis, therapy and prevention – that is the focal point of our research and development. The METALYZER® systems in conjunction with our MetaSoft® Studio software are the key to our innovation. Whether as a single unit for Cardiopulmonary Exercise Testing or as a complete system for cardiopulmonary differential diagnosis – CORTEX measurement technologies and powerful, practice-oriented software solutions will convince you:

- Incomparable measurement precision as a result of cutting-edge sensor technology and simple, rapid calibration
- Individual and reusable masks available in different sizes
- Respiratory gas analysis using the breath-by-breath or mixing chamber methodology
- Measurement and monitoring of heart function via a heart rate chest strap or 12-channel ECG*
- Small, light, portable: 24 x 17 x 9 cm weighing 1.3 kg, in a robust carrying case
- Additional diagnostic systems of other essential parameters and peripheral components*
- Interfacing to practice IT systems *
- Numerous software options*

METALYZER® 3B (Breath-by-Breath-System): Part No. 220-01-008

METALYZER® II (Mixing Chamber System): Part No. 210-01-995



METAMAX® 3B (Breath-by-Breath-System): Part No. 130-01-992

METAMAX® 3X (Mixing Chamber System): Part No. 140-01-993

METAMAX®

Mobile Cardiopulmonary Exercise Testing

The METAMAX® is a mobile, mains independent indoor and outdoor Cardiopulmonary Exercise Testing system for sports and exercise science as well as for occupational medicine. Complete performance testing directly under actual performed activity. Thanks to the bidirectional wireless transmission and battery operation you can obtain previously unachievable freedom for your application. This means: put it on, connect it and measure. A variety of hardware expansions and complementary software options increase flexibility. The «International Forum Design» awarded the METAMAX® with the famous iF Product Design Award.

- Maximum measurement precision as a result of cutting-edge sensor technology and rapid calibration
- Extremely compact design, carefully designed body attachment and light weight (570 g including battery)
- Mains-independent operation for up to 15 hours
- Wireless range up to 1.0 km
- Respiratory gas analysis using the breath-by-breath or mixing chamber methodology
- Patented bidirectional transfer of test data and audio feedback for efficient management of the test subject
- Measuring the heart rate with a chest strap and recording the heart function with a 3-channel or 12-channel ECG*
- Cutting-edge GPS technology to determine speed and altitude*
- Integration of blood pressure devices and pulse oximetry systems*

* Options and add-ons

Cardiopulmonary Exercise Testing in Practice

Multifunctionality – the key advantage of CORTEX

For the cardiologist

The situation: A 58-year-old woman is referred to you with dyspnea of unknown origin. You must decide whether she is suffering cardiac-induced dyspnea or whether this is a case of respiratory insufficiency.

The solution: Knowing the value of Cardiopulmonary Exercise Testing, you immediately decide on this testing method. You use your CORTEX METALYZER® 3B for the test, combined with the 12-channel ECG, blood pressure module, pulse oximeter and PC. This system incl. all accessories are integrated on the compact CORTEX mobile PLUS system cart and can therefore be used anywhere in your practice. Patient data can be transmitted directly from your practice IT system to the computer via the network. Using this testing method you can detect significantly reduced values in maximum oxygen uptake, heart rate reserve and oxygen pulse even at a low exercise load of 90 Watts.

Your success: A single test gives you the treatment-relevant differential diagnosis of cardiac-induced dyspnea. You do a risk assessment using the MetaSoft® Studio software and make treatment outcomes measurable. Your referring colleague has long appreciated your precise, clearly structured Cardiopulmonary Exercise Testing documentation.



For the pulmonologist

The situation: As a pulmonologist you are examining a 52-year-old teacher at a vocational school. He has been referred to you by his general practitioner with unremarkable findings. The patient is a heavy smoker and complains of rapid tiredness, irritability and impaired concentration at work. Previous medical examinations failed to produce a definitive diagnosis.

The solution: You suspect occupational causes as well as excessive smoking and after taking a detailed history you perform a cardiopulmonary exercise test. For this you use your CORTEX METALYZER® 3B system with the MetaSoft® Studio software, 12-channel ECG and blood pressure module. What you value about this combination is the simplicity and reliability of use and the variety of different analysis options. You diagnose exercise-induced asthma, which manifests as impaired ventilation, an increased heart rate reserve and a reduced respiratory reserve. The patient is also exhibiting the impaired lung function typical of smokers.

Your success: As a result of the outstanding facilities offered by the METALYZER® for a complex diagnosis, you spare the patient additional, stressful examinations. You can institute promising treatments straight away. The positive effects of the recommended smoking cessation can be demonstrated objectively in subsequent cardiopulmonary exercise tests. Cardiopulmonary Exercise Testing extends your range of services and your circle of patients.







For the occupational physician

The situation: As an occupational physician you assess the fitness for deployment of professional groups exposed to particularly demanding or risky situations. The breathing apparatus crew and the municipal fire brigade regularly come to you for their statutory medical check-ups. In these professional groups the assessment of physical performance is vital if they are to be assigned to the appropriate category of crew or to remain a member of the breathing apparatus crew.

The solution: You use your portable METAMAX® 3B system from CORTEX with blood pressure module and notebook PC for the examination. Cardiopulmonary Exercise Testing and analysis are performed directly under real conditions in the breathing apparatus test chamber. Because it is an easy to use noninvasive procedure, you can also examine larger groups of subjects within a minimal period of time. In your practice you combine METAMAX® 3B with the 12-channel ECG, the CORTEX mobile PLUS system cart and your treadmill. As a result you do not require a further Cardiopulmonary Exercise Testing system.

Your success: With our MetaSoft® Studio software you receive all the relevant data to your assessment in real time. The examination is documented accurately, reliably and in detail by the system.

This is how it works:

-  Prepare system
-  Enter or call up test
-  Prepare and connect
-  Perform measurement
-  Evaluate and interpret results
-  Print out and discuss results

For the sports physician

The situation: As a sports physician you often serve athletes from clubs in your home town. The wide variety of sports and the very different performance levels mean that you require a procedure for performance testing that meets all the requirements of mass and elite sport. Simple-to-perform measurements and practical implementation of your individual training recommendations are important for your work.

The solution: You know about the multifunctional and sport-specific options of Cardiopulmonary Exercise Testing and use your CORTEX complete system with METAMAX® 3B, MetaSoft® Studio software, 12-channel ECG, blood pressure module and system cart. You use METAMAX® 3B both in your practice and also directly during sporting activity. The CORTEX MSS Training Guidance and CORTEX MSS Exercise Scheduler software modules assist you in individual counseling. In mass-sport testing you use the CORTEX MSS Energy Metabolism module to determine the workload-dependent substrate utilization rate. For obese individuals you can use the results to establish appropriate dietary recommendations.

Your success: With the results of your performance testing you motivate athletes at all performance levels, particularly in endurance sports. Their targets can be translated into specific, individualized activities and the sporting achievements of your patients become objectively measurable. From performance enhancement through correction of training errors to explanation of health risks, you cover a broad spectrum of sports medicine through your individualized support.

Intelligent Programmes

The CORTEX centrepiece: MetaSoft® Studio

One Software for all Processes. The core of all CORTEX systems is the application software called MetaSoft® Studio. It manages and monitors all processes of Cardiopulmonary Exercise Testing and controls all peripheral systems such as heart rate and blood pressure meters well as other measuring instruments.

Tailored Cardiopulmonary Exercise Testing. Intuitive workflows allow users to easily run all applications. Step by step, users are guided through the individual phases of Cardiopulmonary Exercise Testing. Based on a modular system, MetaSoft® Studio enables you to compile individual test and analysis processes. Each user can set up typical test processes and standardize them.

Easy Handling. Useful graphical displays make it easy to evaluate the measurements. The user can select from different display options or configure the display of test data according to his or her preferences. Reporting functions allow you to display the test results in a clearly structured form. The user can either use a mouse, a touch screen or a keyboard to run the programme.



Perfect ECG Integration. The product also offers integration of ECGs. The software supports numerous 12-channel ECG systems available on the market. The product meta control 3000 from CORTEX combines a spirometry and a proven 12-channel ECG from the company custo med. MetaSoft® Studio combines both systems bidirectionally forming an easy-to-use cardiopulmonary diagnostics system.

Complete Pulmonary Function Diagnostics. Together with Medical Equipment Europe, CORTEX offers a complete pulmonary function diagnostics. MetaSoft® Studio controls all pulmonary function tests and stores the test results. A patient administration programme included in MetaSoft® Studio and equally used for all examination tools simplifies the user's work.

CORTEX MetaSoft® Studio: Part No. 721-09-010

Determine Heart Diseases

Cardiac Output Module Reveals Heart Disease

A number of heart diseases cause changes in heart rate and in left and right ventricular stroke volume. These changes become particularly marked on exercise. Our Cardiopulmonary Exercise Testing systems allow the continuous, noninvasive recording of cardiac output based on the maximum and real-time oxygen uptake (K. Wasserman's method). Therefore, even during Cardiopulmonary Exercise Testing you are obtaining indicators of cardiac changes.

Our CORTEX Cardiac Output software option supplements MetaSoft® Studio with the continuous determination and display of cardiac output and offers a safe and permanent indicator of heart function for both healthy subjects and cardiac patients.

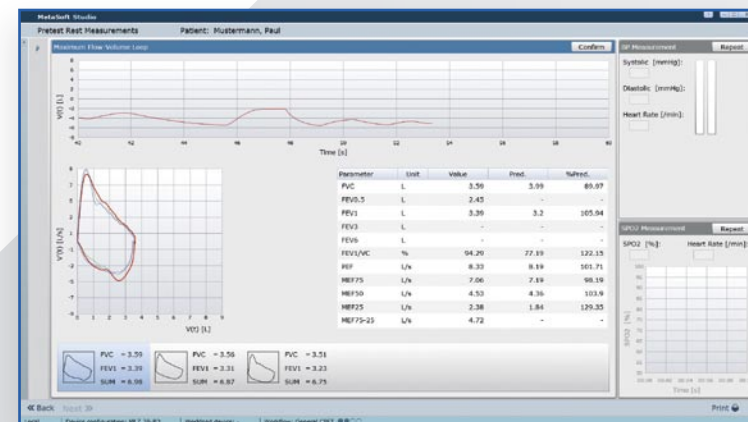
CORTEX Cardiac Output: Part No. 720-09-017

Conventional Spirometry

Our solutions for Cardiopulmonary Exercise Testing naturally offer the option of conventional spirometry. Our CORTEX MSS Spirometry software option operates within the MetaSoft® Studio functional environment and offers you a number of other measurement, calculation and comparison options in addition to VC, FVC and MVV tests.

With minimal additional effort you can offer your patients a lung function test at any time under laboratory conditions with the CORTEX Spirometry option.

CORTEX MSS Spirometry: Part No. 721-09-028



Effective Training

Precise Determination of VT1 and VT2

The software feature CORTEX MSS Training Guidance determines the optimal training zones. It calculates individualised heart rate training zones for different stress phases and individual training goals and motivates users by precisely showing the progress gained.

Effective Training. CORTEX is the only company offering a training guidance which determines training zones based on two physiological thresholds: the anaerobic threshold (1. respiratory threshold) and the respiratory compensation point (2. respiratory threshold). As a result the heart rate training zones can be strictly delimited from each other at both thresholds. The athlete thus knows at any time in which training he or she is. Only this makes his or her training really effective.

Manual Adjustment. Main novelty in MetaSoft® Studio: The determined thresholds and training zones can not only be adjusted automatically, but also manually and easily.

Various Reference Values. To assess the individual fitness of an athlete or patient, the values determined in Cardiopulmonary Exercise Testing are compared with standardized scientifically proven values and displayed in an overview. MetaSoft® Studio also allows you to compare several test results of one or various individuals and groups with each other.

CORTEX MSS Training Guidance: Part No. 721-09-020



Planned Success

Effective Training with CORTEX MSS Exercise Scheduler

The CORTEX MSS Exercise Scheduler transmits the results of the Training Guidance to a clearly structured training plan that is structured like a calendar.

Clear Training Cycles. Based on the previously determined fitness level and defined parameters such as training goal, load increase, frequency and type of sport, the system generates training plans in a micro-, meso- and macro-cycle.

Variety for Sport, Prevention and Rehabilitation. The Exercise Scheduler has a comprehensive collection of reference training plans for various types of sports, prevention and rehabilitation measures. The planer also allows you to easily set up individual training plans.

Motivation based on Overview. Looking at the training plan, you always see the goals set. This motivates the athlete and progress is made quicker. This way, sport physicians and therapists can easily accompany the performance steps of their athletes and patients.

CORTEX MSS Exercise Scheduler: Part No. 721-09-021



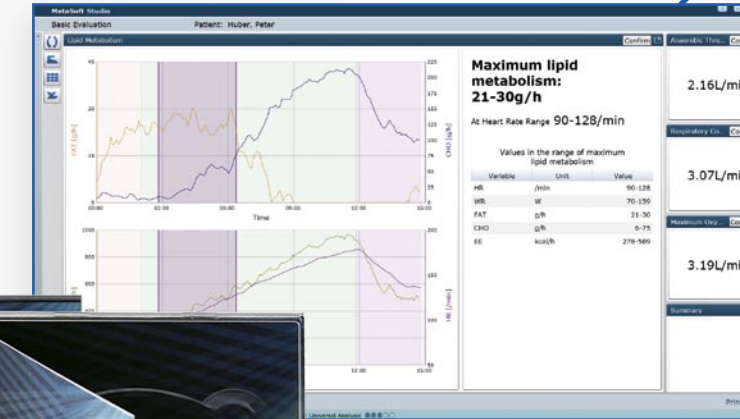
Check of the Energy Balance

CORTEX MSS Basal Resting Metabolic Rate

The resting metabolic rate informs you of the individual energy balance of a test person. This rate is measured at rest and compared to expected values.

It is used and seen as a reliable basis for controlled calorie intake, for example in the context of a recommendation for individual nutrition or training.

CORTEX MSS Basal Resting Metabolic Rate: Part No. 721-09-023



CORTEX MSS Energy Metabolism for CPET

A well functioning energy metabolism is an important prerequisite for proactive and sustainable health care. It can be improved if doing the right training. For this purpose, you must measure a person's energy balance and the fat and carbohydrate burning at increasing stress levels. MetaSoft® Studio then determines the ideal heart rate zones for a more economic metabolism.

CORTEX MSS Energy Metabolism for CPET: Part No. 721-09-022



Integral Service

Optimally integrated hardware options



Complete measurement set

This will provide you with everything. METALYZER® 3B Cardiopulmonary Exercise Testing system including breathing mask and volume sensor, 12-channel PC-ECG with electrode suction system, bicycle ergometer, PC system with two monitors and printer, CORTEX mobile PLUS system cart, MetaSoft® Studio software and operating system.



Workload devices

CORTEX will provide you with all the current available workload devices from reputed manufacturers in their current, well-established design. We would be happy to provide you with further details personally.



CORTEX mobile PLUS system cart

You remain mobile with everything to hand. CORTEX mobile PLUS system cart can carry the METALYZER®, PC, printer, two monitors, ECG and ECG electrode suction system, and blood pressure device. Move your complete Cardiopulmonary Exercise Testing system effortlessly to wherever you need it.



Ipod® und Xpod®

Simple and flexible pulse oximetry

Ipod: External digital pulse oximeter system with sensor and oximeter mounted directly in the finger clip.

Xpod: Like the Ipod, but with applicationspecific sensors. With its compact size, Xpod is particularly suitable for mobile use with METAMAX®.



Cardiopulmonary Exercise Testing and ECG

Besides the optional integrated 3-channel ECG for performance monitoring; most 12-channel ECG systems can be interfaced to the CORTEX systems. Moreover, CORTEX offers 12-channel ECG systems from well known manufacturers.



Tango+

Motion-tolerant noninvasive blood pressure measurement. Automated, artifact-tolerant blood pressure and HR measurement with upper arm cuff specifically for treadmill application. External system with a wide range of applications.



GPS module for METAMAX®

Even out in the field you can be kept informed about the current speed and altitude. Additional spatial data are recorded alongside the cardiopulmonary exercise test data and make it possible to specify the workload even without a bicycle ergometer.



PC, Notebook, second monitor and color printer

Our MetaSoft® Studio software works with Microsoft® Windows® XP, Windows® Vista™ and Windows®7. On request we can supply you directly with the complete, customized hardware such as a PC or Notebook with operating system, second monitor and color printer.

Cardiopulmonary Exercise Testing – an Integral Service

Innovation and competence from CORTEX

We offer:

- Extensive on-site product training
- On-site installation
- Regular software updates
- On-site and hotline support
- A variety of seminars

All our products are CE certified and meet European standards for Quality and Safety*.

In your area – our sales and service partners are competent and authorized. For us, competence in Cardiopulmonary Exercise Testing means constant technical innovation and close partnership – aspects you can rely on with CORTEX.

* Quality – EN ISO 9001 / EN ISO 13485 / Directive 93/42/EEC; Safety – DIN EN 60601-1 / DIN EN 60601-1-1 / 60601-1-2 / 60601-1-4 ; DIN EN 14971

Innovative Solutions for Cardiopulmonary Exercise Testing

That's what CORTEX stands for



With our two main product lines, METALYZER® and METAMAX®, we are pioneers in the field of medicine, sport and fitness. We achieve maximum performance in Cardiopulmonary Exercise Testing with innovative hardware and software.

Our solutions for Cardiopulmonary Exercise Testing are applied worldwide, ranging from basic research to routine cardiac diagnosis, from competitive sport to fitness centers. Physicians, therapists and coaches successfully use our systems in the fields of sports medicine, cardiology, pulmonology and occupati-

onal and rehabilitation medicine, as well as in exercise and sports science.

CORTEX also stands for competence in extreme situations and high-level requirements - this has been demonstrated by our participation in the largest Everest medical expedition to date, the »Xtreme Everest« project (2007), and our involvement in many Olympic Training Centers.

Development, production and administration are located at our head office in Leipzig, Germany. From there we distribute our solutions for cardiopulmonary diagnostics to all continents via a worldwide network of local sales and service partners.

Please feel free to contact us.

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Your local CORTEX partner



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