Poly-Spectrum-Velo

series of digital ECG stress test systems for exercise testing on cycle ergometer

Main Features of Digital ECG Stress Test System Poly-Spectrum-Velo:

- Stress-test with the continuous ECG control on cycle ergometer
- Continuous recording from 1 to 12 ECG leads
- Possibility of ECG recording in Frank or Nehb lead system
- Displaying the user-defined number of ECG leads during the whole test
- Displaying dynamically averaged cardiocomplex as superimposed with displacement on the averaged rest ECG
- Displaying large number of objective indices during the test which are received from the patient on-the-fly
- Displaying the graphs of heart rate (HR), workload, blood pressure (BP) and ST amplitude changing during the whole test
- Automatic control of cycle ergometer
- Storing of the whole ECG record during the test on hard disk
- Possibility of automatic measurement of any chosen ECG fragment
- Calculation of large quantity of ergometric parameters and indices after test termination
- Automatic checkup report generation

Medical Diagnostic Equipment Development and Manufacture
Poly-Spectrum-Ergo Software Features

Poly-Spectrum-Ergo Software Capacities

The large quantity of exercise tests protocols gives you the possibility to solve the wide range of tasks such as CAD diagnostics and prognosis (expert questions solving), evaluation of exercise tolerance, study of abnormal heart rhythm dynamics during exercise, assessment of maximal work capacity in normal individuals (also in sports medicine) and asymptomatic individuals.

Protocols:
- Multistage test (on cycle ergometer or treadmill)
- One-stage test based on BEE value (on cycle ergometer)
- Astrand-Test (on cycle ergometer)
- PWC 170 (on cycle ergometer)
- Three-stage Swedish protocol by Sjostrand (on cycle ergometer)
- R. Bruce protocol (on treadmill)
- J. Naughton protocol (on treadmill)
- Any protocol constructed by the user (on cycle ergometer or treadmill)

The possibility of gaining of objective recommendations concerning quality and quantity of exercise needed for a beneficial effect (recommended training parameters: running and walking speed, cycle ergometer training schedule, training pulse, energy loss per day, etc.) make the program attractive for doctors in sports medicine and for specialists in physical rehabilitation and also for individuals willing to keep them in shape.

Certainly, your work with program can be facilitated by function of automatic report generation containing objective assessment of exercise testing results and interpretation based on our algorithms.

The program has a convenient structured database of patients. The volume of this database can be limited only by the capacity of your PC hard disk.

If the stress test system includes Poly-Spectrum-8/EX digital ECG unit which transfers full electrocardiogram to PC by radio (using Bluetooth interface), the most part of problems associated with noises caused by intensive movements of patient cable will disappear. Besides, in case Poly-Spectrum-8/EX application, you can put the cycle ergometer or treadmill in any place within 7-10 meters from computer without paying attention to ECG wires positioning.
Wide Possibilities of Setting up

A big list of exercise testing protocol is available. It is possible to set up many testing parameters and also create testing protocols according to your own requirements. You can also adjust the color for ECG, figures and graphs drawing and also size and visibility of different screen areas.

Test Performing

During the test performing the main part of the screen is occupied by the curves area. The patient ECG recorded in the real-time operation mode is represented here. The lead system (standard, Frank or Nehb system), number of displayed leads, ECG sweep speed and sensitivity are software switchable. The averaged cardiocomplex field is to the right of the curves area. Averaging is done by several last complexes on-line. The averaged complex is represented as superimposed with displacement on the complex, which is averaged through the rest ECG recordings. HR (or R-R duration), workload and BP time variation curves are given under the curves area. Besides, time variation curves of ST displacement through all leads may also be shown under the curves area. To the right of the curves the numerical information is shown, these are test elapsed time, current stage elapsed time, current HR, current workload, cycling speed for cycle ergometer or speed and grade for treadmill. A switch to the next stage can be done manually (by keystroke) or automatically (by the software preset interval). At any time you can “freeze” ECG by keystroke. Then you can send it in ECG measurement and interpretation window or print it. The number of blood pressure measurements and their savings is unlimited. If BP measurement module is available, the program can download measured values automatically. Monitoring and saving of whole ECG record to PC memory is done during recovery period as well as during exercise period.
Record Analysis
At the end of the test, any ECG fragment can be analyzed in ECG measurement and interpretation window. The analysis can be done by selected or averaged for any interval complex. Besides, every 30 seconds the program makes automatic averaging of small ECG fragment. The averaged fragment is stored in PC memory. After finishing of testing all the averaged fragments are displayed in the separate window and they also can be analyzed. ECG measurement and interpretation window contains the table of amplitude-time parameters of cardiocomplex in all the leads.

In addition to ECG analysis a number of ergometric parameters can be analyzed after exercise testing. Some of them are represented in “Ergometry” or “Treadmill” window. Moreover, combined graph of HR, BP, workload changing and combined graph of ST displacement changing before and during the testing and also in the recovery period are shown here.

Automatic Report Generation
At the end of the test the program automatically generates the checkup report. It consists of interpretation text, per minute exercise and recovery protocols with HR, BP and double product values, ergometric parameters table, automatically defined functional class and exercise tolerance values (physical working capacity), quality and quantity of exercise needed for a beneficial effect.

You may choose the elements you would like to include in the report. The most representative ECG fragments (at user’s option) with QRS complex amplitude-time parameters tables can be included in the report. Besides, you may also print the whole ECG record.

Checkup Storing
The checkups are stored in the database providing the advanced capabilities of search. The records can be stored not only on the computer connected to digital ECG stress test system but also on any remote computer (file server).

ECG stress test system but also on any remote computer (file server).

Table of cardiocomplex amplitude-time parameters by all leads in ECG measurement and interpretation window.

Combined graph of HR, BP, workload changing and combined graph of ST displacement changing before and during the testing and also in the recovery period.

“Ergometry” or “Treadmill” window with ergometric parameters table
Selection of elements which will be included in the report.
Poly-Spectrum-TM

series of digital ECG stress test systems for exercise testing on treadmill

Main Features of Digital ECG Stress Test System Poly-Spectrum-TM:

- Stress-test with the continuous ECG control on treadmill
- Continuous recording from 1 to 12 ECG leads
- Possibility of ECG recording in Frank or Nehb lead system
- Displaying the user-defined number of ECG leads during the whole test
- Displaying dynamically averaged cardiocomplex as superimposed with displacement on the averaged rest ECG
- Displaying large number of objective indices during the test which are received from the patient on-the-fly
- Displaying the graphs of heart rate (HR), workload, blood pressure (BP) and ST amplitude changing during the whole test
- Automatic control of treadmill
- Storing of the whole ECG record during the test on hard disk
- Possibility of automatic measurement of any chosen ECG fragment
- Calculation of large quantity of ergometric parameters and indices after test termination
- Automatic checkup report generation
Delivery Set

- Digital ECG system Poly-Spectrum8/E (digital ECG system Poly-Spectrum8/E for Poly-Spectrum-Velo/X)
- Exercise testing software Poly-Spectrum-Ergo
- Exercise testing device:
  - Cycle ergometer:
    - Kettler ERGOMETER X5 for Poly-Spectrum-Velo/L
    - e-Bike Ergometer without BP measurement module for Poly-Spectrum-Velo and Poly-Spectrum-Velo/X
    - e-Bike Ergometer with BP measurement module for Poly-Spectrum-Velo/E
  - Lode Valiant for Poly-Spectrum-TM
- Stand for ECG cable top fixation (except Poly-Spectrum-Velo/X)
- Desktop PC-based system with laser printer

Specifications

### Digital ECG Systems

<table>
<thead>
<tr>
<th></th>
<th>Poly-Spectrum-8/E</th>
<th>Poly-Spectrum-8/EX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of ECG channels</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>ECG leads</td>
<td>I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6, X, Y, Z (by Frank)</td>
<td>12</td>
</tr>
<tr>
<td>A/D converter</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td>Sampling rate</td>
<td>2000 Hz</td>
<td>250, 500, 1000 Hz</td>
</tr>
<tr>
<td>Bandpass</td>
<td>0.05 – 250 Hz</td>
<td>0.05 – 250 Hz</td>
</tr>
<tr>
<td>High pass filter</td>
<td>35 Hz (myogram), 75 Hz</td>
<td>35 Hz (myogram), 75 Hz</td>
</tr>
<tr>
<td>Low pass filter</td>
<td>0.05 Hz (3.2 s)</td>
<td>0.05 Hz (3.2 s)</td>
</tr>
<tr>
<td>Additional filters</td>
<td>AC, drift filter</td>
<td>AC, drift filter</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>2.5, 5, 10, 20, 40 mm/mV</td>
<td>2.5, 5, 10, 20, 40 mm/mV</td>
</tr>
<tr>
<td>Paper speed</td>
<td>5, 10, 12.5, 25, 50, 75, 100, 200 mm/s</td>
<td>5, 10, 25, 50, 75, 100, 200 mm/s</td>
</tr>
<tr>
<td>Interface</td>
<td>USB</td>
<td>Bluetooth</td>
</tr>
<tr>
<td>Defibrillation protection</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Control of electrode setting</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Safety</td>
<td>class II, BF type</td>
<td>class II, BF type</td>
</tr>
<tr>
<td>Power supply</td>
<td>5 V (from PC)</td>
<td>2 batteries of AA type (R6)</td>
</tr>
<tr>
<td>Continuous working time</td>
<td>not less than 6 hours</td>
<td>not less than 6 hours</td>
</tr>
</tbody>
</table>
| Physiological signals transmission range | not less than 7 m in the direct visibility range | |}

**«Lode Valiant» Treadmill**

- Belt speed range 1 – 22.5 km/hr. (continuously variable)
- Smooth startup yes
- Elevation range 0 – 25% grade
- Maximum patient weight 204 kg
- Standard full handrail set yes
- Standard emergency stop switch yes
- Weight 181.4 kg
- Walking area width/length 457 mm/1524 mm
- Floor space required width/length 737 mm/1956 mm
- Power supply 208 – 240 V AC, 50/60 Hz
- Interface COM-port

**Cycle Ergometers**

- **Kettler X5**
  - Braking system electromagnetic
  - Load range, watt 25 – 400 (rpm independent)
  - Minimum increment 5
  - Maximum patient weight, kg 150
  - Blood pressure measurement module no
  - Dimensions, mm 1080×530×1230
  - Weight, kg 47

- **Lode Coirval**
  - Braking system electromagnetic
  - Load range, watt 7 – 750 (rpm independent)
  - Minimum increment 1
  - Maximum patient weight, kg 150
  - Blood pressure measurement module optional
  - Dimensions, mm 1150×600×1140
  - Weight, kg 56

- **SECA CARDIOTEST 100**
  - Braking system electromagnetic
  - Load range, watt 25 – 400 (rpm independent)
  - Minimum increment 5
  - Maximum patient weight, kg 120
  - Blood pressure measurement module no
  - Dimensions, mm 1195×490×850
  - Weight, kg 38

- **e-Bike Ergometer**
  - Braking system electromagnetic
  - Load range, watt 20 – 999 (rpm dependent)
  - Minimum increment 5
  - Maximum patient weight, kg 140
  - Blood pressure measurement module optional
  - Dimensions, mm 900×460×1350
  - Weight, kg 61

If you intend to use the exercise testing device which is not supported by Poly-Spectrum-Ergo software, Neurosoft Company can modify the software. In this case the approval of the exercise testing device manufacturer and the provision of the interface protocols are required.