COMPUTER-AIDED RESEARCH SYSTEM OF THE FUNCTIONAL CONDITION OF A HUMAN

OMEGA

User's manual

Research and Production Company Dinamika Technologies
St. Petersburg, 2019
www.dyn.ru

GENERAL INFORMATION **6**
Purpose 6
Features 6
Principle of Operation 7
Requirements 7

DELIVERY PACKAGE **8**
Standard Complete Set of Single-Channel Diagnostic Complex 8
Base Configuration of Multi-channel Diagnostic Complex 8

STANDARDS **9**

EQUIPMENT **10**

TECHNICAL CHARACTERISTICS **11**
Dinamika Cardio Recorder 11

INTEROPERATION OF EQUIPMENT AND SOFTWARE **12**

GETTING STARTED **13**
Connecting and Configuring Equipment 13
Software Installation and Configuration 13
Connecting Cardio Recorder to a Patient 18

ECG RECORDING **20**

VIEW RESULTS **21**

PRINT REPORT **22**

SOFTWARE **23**
Omega Diagnostics App 23
Navigation Bar 24
Add Folder 25
Folder Recovery from Archive 26
Removing Folder 28

Adding a Patient Account 28
Restoring a Patient Account from the Archive 30
Deleting a Patient Account 31
Workspace 32
Operating Modes Bar 32
Search 33
Database 34
ECG Recording 35
Analytics 37
Functional State Diagram 37
Main Indicators 38
Blood Pressure Indicator 39
Notes 39
Overall Conclusion 39
Variation Analysis 40
Spectral Analysis 41
Neurodynamic Analysis 43
Biorhythms Mapping 44
Fractal Analysis 46
Reports 47
Deleting Examinations 48
Data Sorting 49
Data Filtering 50
Configure Table Columns 51
Standard Report 51
Patient Report 53
Group Report 55
Advanced 57
Add Database 57
Import ECG 58
Import Patient Accounts 59
Import Smart Cards and Photos 61
Contacting Skype Technical Support 63
TeamViewer Technical Support App 63
Developer Website 64
About 64

Settings 65
Application Language 65
Application Profile 66
Enable Software Updates 66
Automatic Data Archiving 66
FS Evaluation Ranges 67
HR Evaluation Ranges 67
BP Evaluation Ranges 68
Duration of ECG Recording 68
Alcohol Test Only at Low Rates of FSI 69
Management of Diagnostic Terminals 69
Spline-Maps of Psycho-Emotional Activity in the High Resolution Mode 71
Highlight the results of inspections in the reports 71
Only for Low Functional State Results 71
Signature on the Report Page 71

TROUBLESHOOTING 72
The Application Does Not Start 72
The Application Does Not Detect a Cardio Recorder 72
Database Issues 73
No ECG Signal 74
ECG Recording Issues 74

GENERAL ISSUES 79
Examinations Disappeared from the Database 79
Hiding Folders and Patients 81
How to Import Data from Previous Versions of the Application 81
How to Register a Smart Card 82
Switching between Single-Channel and Multi-Channel recording 82
Deleting Examination 82
Connecting the Database 82

TECHNICAL SUPPORT 83

MAINTENANCE 85

Performing Maintenance of the Diagnostic Complex 85
Database 85
Removing Unnecessary Data from the Database 85
Removing Unnecessary Data from the Archive 86

EDUCATION FOR WORKING WITH DIAGNOSTIC COMPLEX 87

TERMS AND DEFINITIONS 88

GENERAL INFORMATION

Purpose

The **Omega** hardware-software diagnostic complex designed to assess the functional condition of the human body. The basis of the complex is certified equipment **Dinamika** (cardio recorder, TU9442-001-50904116-2005) and software that allows evaluate the functional status of the human body by analyzing heart rate variability. The complex recommended for use in medical institutions, medical diagnostic centers, sports and health clubs.

Attention!
The results of functional status measuring will be unreliable if the patient uses a pacemaker or has cardiac arrhythmias (atrial fibrillation, extrasystole, etc.).

Important!
Always consult a doctor! Self-diagnosis based on measurements and self-medication are dangerous.

Features

- ECG registration in I standard lead by means of a digital cardio recorder.
- Express diagnostics of the functional and psychophysical status of the patient with a computerized printout on the examination results.
- Identification of patients in need of additional clinical examination with specialist doctors in specialized medical institutions.
- Efficacy evaluation of traditional and non-traditional methods of therapy.
- Monitoring the functional status of athletes during intense physical exertion.
- Smart card identification.
- Pre-shift inspection of employees employed at hazardous production facilities.
- Self-monitoring of health at home.
- The ability to distribute the complex database on multiple media on local network.
- Quick search in databases in local network.
- Automatic backup and recovery of obsolete data.

Principle of Operation

The complex's operating principle is in recording an electrocardiogram, converting it into digital form and further processing on a computer, where the indicators of a human's functional status are calculated and the examination results displayed in a visual form.

A complex feature is the ease and simplicity of its practical application. The work with the complex does not require specialized medical education. To obtain all the necessary information, it is enough to register the ECG in the first standard lead for 5 minutes. The patient could be in a sitting or lying position.

Requirements

- A personal computer is required to organize a diagnostic location.
- The computer that is part of the complex must be running **Windows 7** or higher.
- The minimum system requirements for the computer must meet the recommended requirements for the operating system **Windows 7** or higher.
- It is necessary to provide uninterrupted power for the PC and equipment.
- It is necessary to provide grounding in the 220V electric network.

DELIVERY PACKAGE

Diagnostic complexes of the **Dinamika Technologies** divided into **single-channel** and **multi-channel**. Single-channel complexes are capable of simultaneously receiving an ECG from only one cardio recorder, and multichannel complexes – **from 4** or more cardio recorders.

Standard Complete Set of Single-Channel Diagnostic Complex

Cardio recorder	1 pc.
Cardiographic electrodes	2 pcs.
USB 2.0 interface cable	1 pc.
Case	1 pc.
Omega Diagnostics software on a USB drive	1 pc.

Base Configuration of Multi-channel Diagnostic Complex

Cardio recorder	7 pcs.*
Cardiographic electrodes	14 pcs.*
USB 2.0 hub	1 pc.*
USB 2.0 interface cable	7 pcs.*
Case	1 pc.*
Omega Diagnostics software on a USB drive	1 pc.*

*Quantity may vary depending on configuration.

STANDARDS

The technology, used by the **Dinamika Technologies,** approved by the Ministry of Health of the Russian Federation, medicinally authorized and protected by patents and authorship certificates of the Russian Federation.

Software and hardware diagnostic complexes of the **Dinamika Technologies** meets the requirements of standards for measurement, physiological interpretation and clinical use of cardiointervalometry indicators adopted by the European Society of Cardiology and the North American Electrophysiology Association.

The production complex of the **Dinamika Technologies** meets ISO 13485: 2016 quality standards.

EQUIPMENT

The cardio recorder is an analog-to-digital converter of the body's bioelectric signals. During its development, the **Dinamika Technologies** used the original patented method of differential digital filtering. The use of this method made it possible to abandon the use of a three-electrode ECG registration scheme and at the same time ensure high noise immunity.

The cardio recorder powered from a computer via a USB-interface. Patient safety ensured by optocoupler isolation, which eliminates direct electrical contact between computer and human.

In some laptop models, when working from the mains (110-220V, 50-60Hz), interference may occur during the ECG recording. To eliminate interference, recommended to use an electrical outlet with grounding, or disconnect the laptop power adapter from the mains during recording and switch to battery power. It is also recommended to disconnect other devices connected to the electrical network (printers, routers, etc.) from the computer to eliminate interference when ECG recording.

TECHNICAL CHARACTERISTICS

Dinamika Cardio Recorder

Input voltage range	0.03 – 5 mV
DC current in patient circuit	not more than 0.1 µA
Input sampling rate	1000 Hz
ADC resolution	12 bit
Electrical safety	complies with GOST R 50267.0 and GOST 50267.25 (IEC 601) for products of protection class II, BF type
Operation temperature	0°C to +50°C
Body material	ABS plastic
Body color	matt white
Number of leads	1
Number of electrodes	2 pcs.
Lead cable length	1 m
Computer communication interface	USB 2.0
USB cable length	1.8 – 3.0 m
Power supply	from computer via USB, +5 V, 100 mA
Dimensions	100 x 50 x 25 mm
Weight	83 g
Precious metal content	none
Manufacturer	Dinamika Technologies, Russia

INTEROPERATION OF EQUIPMENT AND SOFTWARE

Each model of cardio recorder designed to operate with certain software. Using the serial number of the cardio recorder, determine its compatibility with the desired software in the compliance table:

Serial no.	Omega	Lotos	Onix	LifeLine	XTerm
70xxxx			✓	✓	
71xxxx	✓	✓	✓	✓	
72xxxx		✓	✓	✓	
73xxxx	✓*				
74xxxx				✓	
75xxxx					✓

* To register ECG, at least 4 cardio recorders should be connected to PC.

GETTING STARTED

Install **Windows 7** (or higher) on the computer and connect the equipment. After that, install specialized software.

> *The cardio recorder belongs to the class of equipment that is particularly sensitive to interference in the AC network. For normal operation, the computer, to which the cardio recorder is connected, must be connected to the 210-230V AC network with the obligatory presence of grounding.*

Connecting and Configuring Equipment

Connect the following equipment to the computer:

- **Webcam** (if equipped)
- **Printer** (if equipped)
- **Cardio recorder**

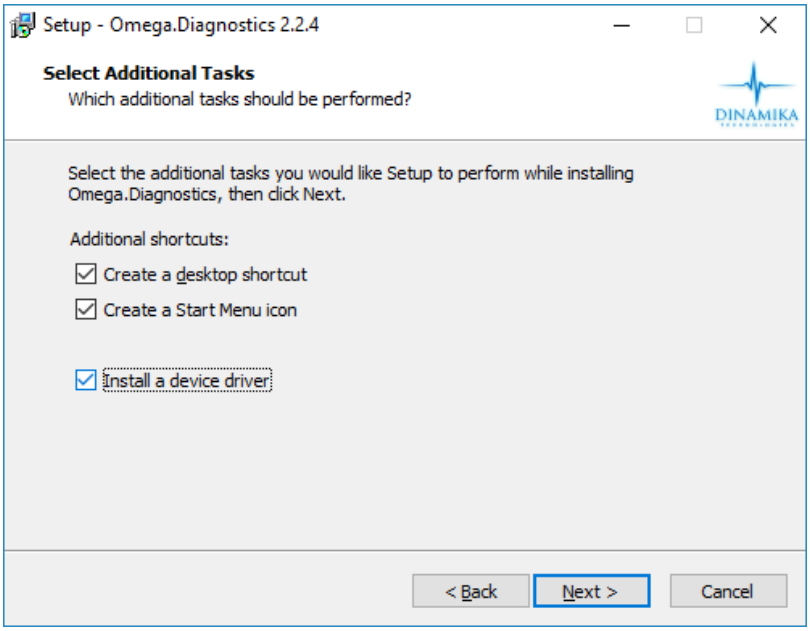
If necessary, install drivers. The equipment does not require additional hardware setting.

> *Recommended that you first connect the cardio recorder to a PC before installing the software.*

Connect the electrodes to the cardio recorder plugs and fix them securely with the screws.

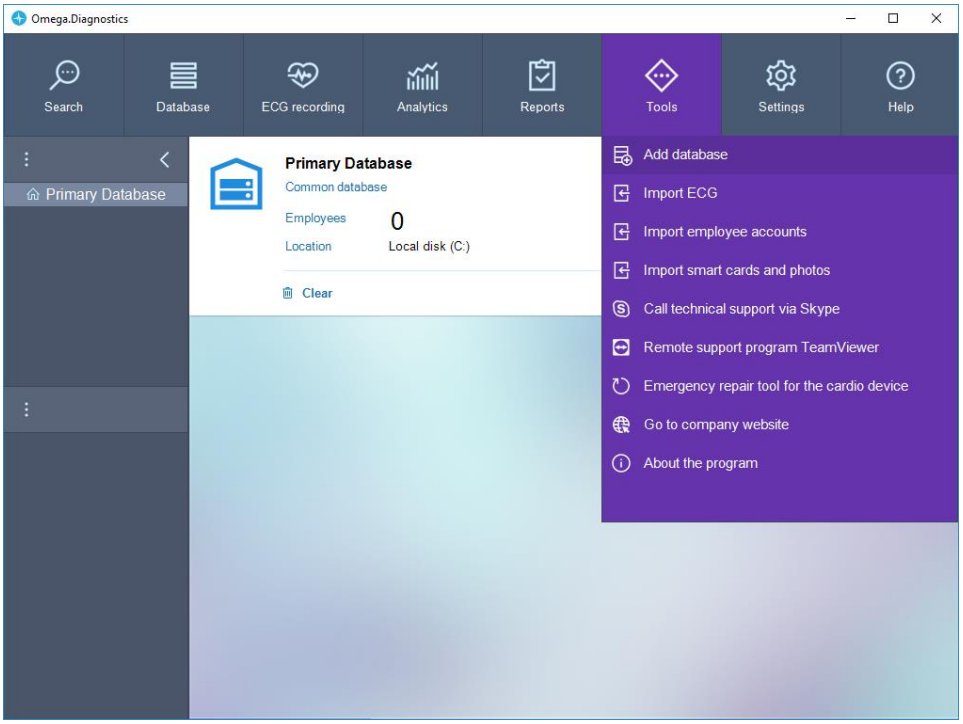
Software Installation and Configuration

Using the installation wizard, install the **Omega Diagnostics** software and the cardio recorder **driver** on the computer.



Launch the **Omega Diagnostics** application using the shortcut on the Windows **desktop** or from the **Start** menu.

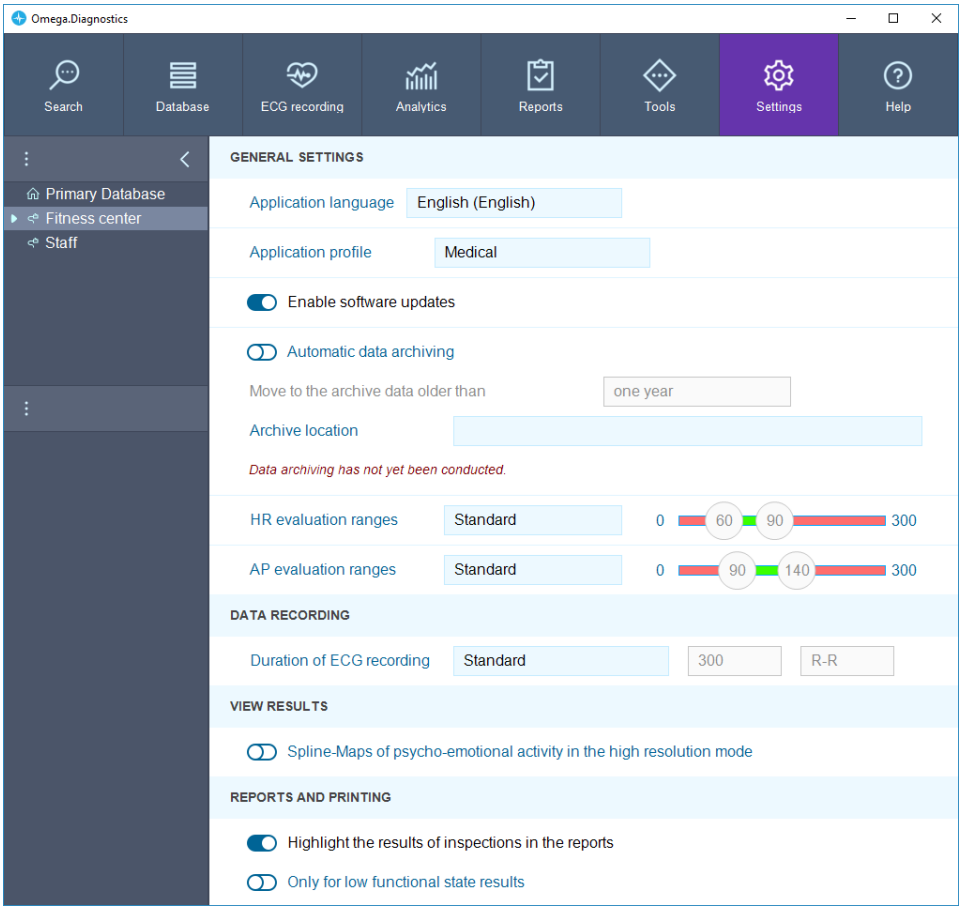
If, after starting the program, the operating system displays a warning that the **Windows firewall** has blocked the network capabilities of the **Dinamika Device Driver** program, then in this case it is necessary to allow this program to work on private and public networks. **Dinamika Device Driver** is part of the **Omega Diagnostics** software and used to access the cardio recorder.



To store patient accounts and examination results, it is possible to use the built-in **Primary Database** or organize a new database.

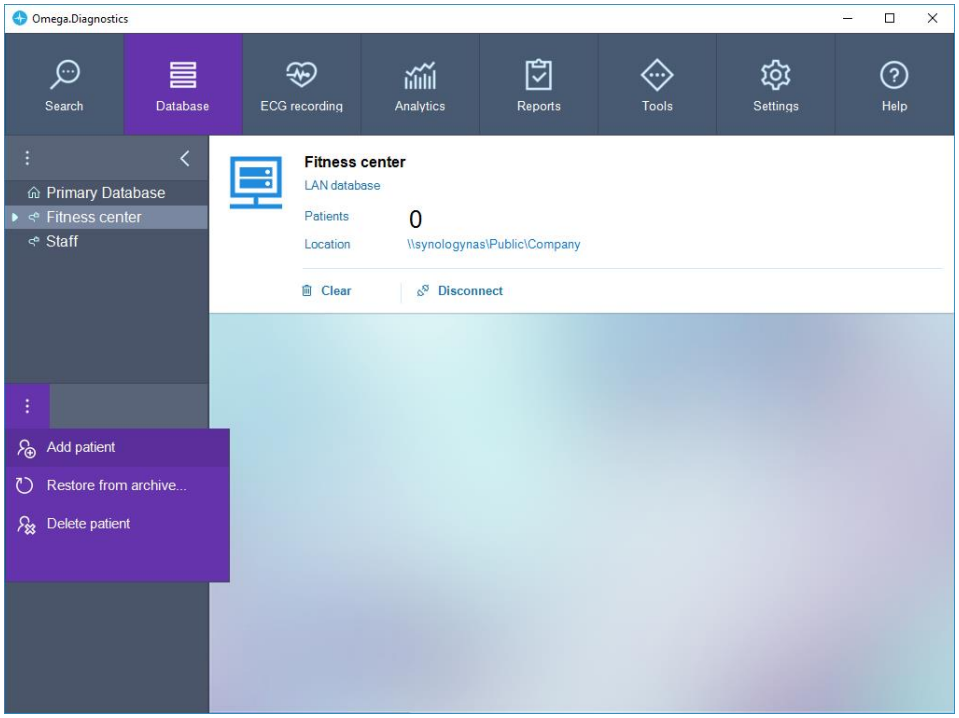
To organize a new database, create a folder with any name on the PC, network attached storage or on another PC on the local network. Allow this folder **read/write** permissions for the diagnostic complex computer. After that, connect this folder in the **Omega Diagnostics** application.

Go to the settings page.

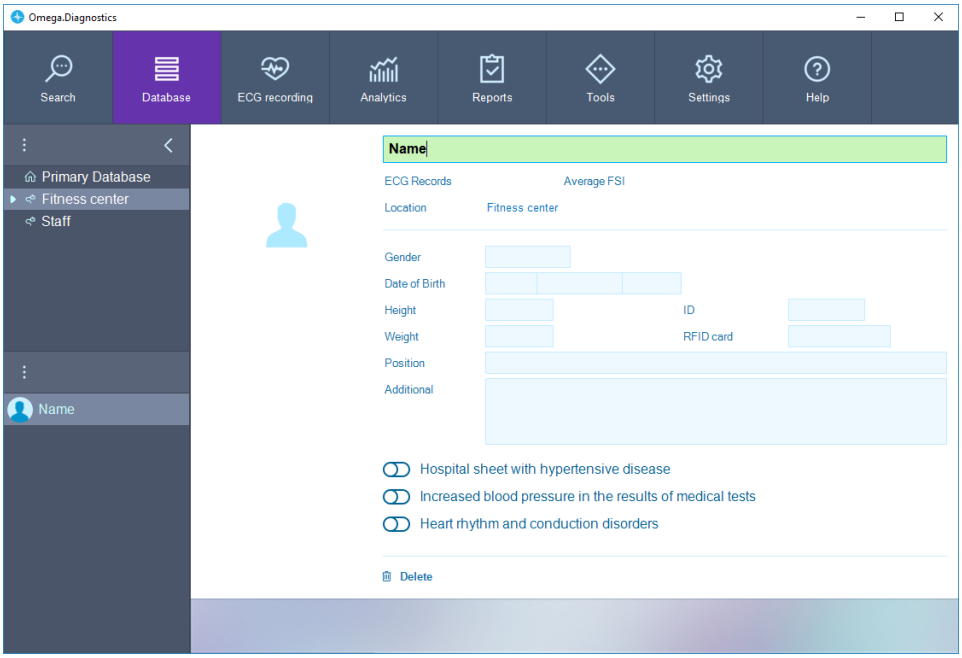


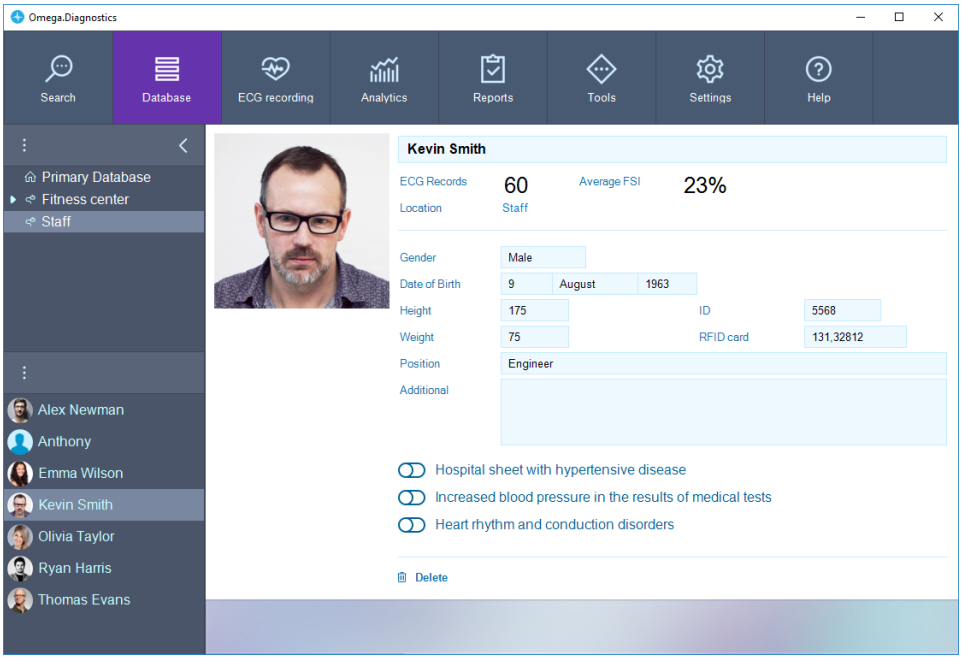
If necessary, enable and configure the automatic data archiving function, change the ranges for evaluating the main parameters and the FS examination duration.

To add a patient account, open the auxiliary menu in the navigation panel above the patient list and click **Add Patient**.



Fill in all the necessary fields in the card.

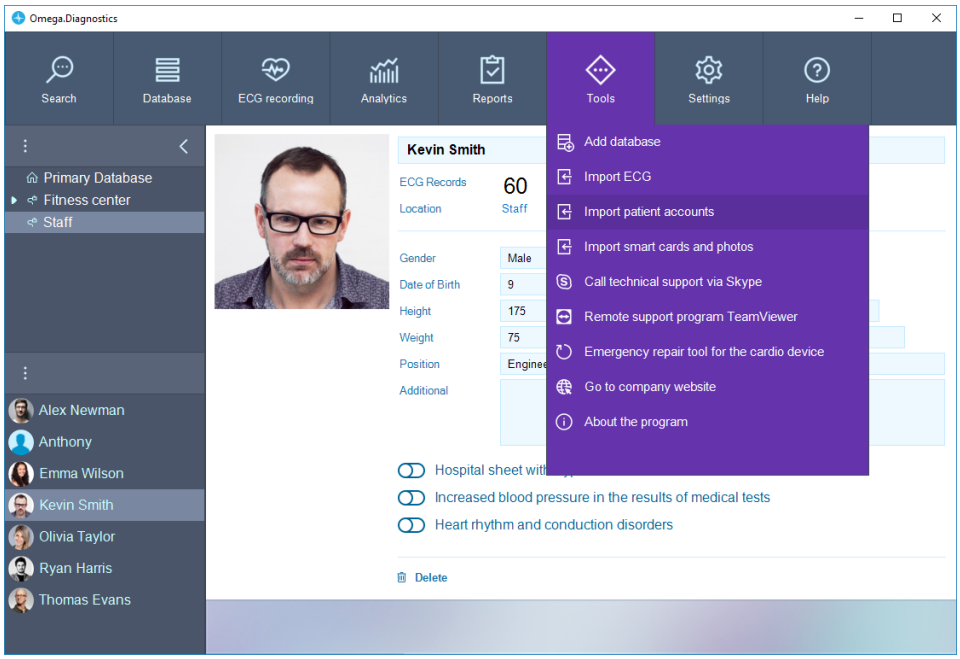




To add a large amount of patient accounts, use the import function.

Prepare a **CSV** file with patient data in tabular form.

Select the folder where you want to add patient accounts, open the **Advanced** menu on the operating modes bar and select **Import patient accounts**.



Connecting Cardio Recorder to a Patient

The application of electrodes performed by the contact pad on the inside of the patient's wrists.

> ⚠ *The electrode with the red plug put on the right hand, and with the yellow plug – on the left. Please note: this is not the color of the electrode, but the color of the plug on the wire connected to the electrode.*

Recommended to moisten the wrists in the place of contact with saline or water.

During examination, the patient should be at rest in **seated** or **supine** position.

In some cases, with a very low amplitude of the R-wave on the electrocardiogram, the electrode with the red plug applied on the right wrist, and with the yellow plug – on the left ankle.

To reduce interference when ECG recording, observe the following rules:

- Patient's hands should be immobile and relaxed. In seated position, the patient's hands are on the knees, in supine – along the body.
- Within a radius of 1.5–2 meters from the patient nobody should walk.
- During the recording process, the patient should be in the most comfortable and relaxed state. Not recommended to distract the patient by talking and showing him/her the computer screen from the recorded ECG. The patient may close the eyes.

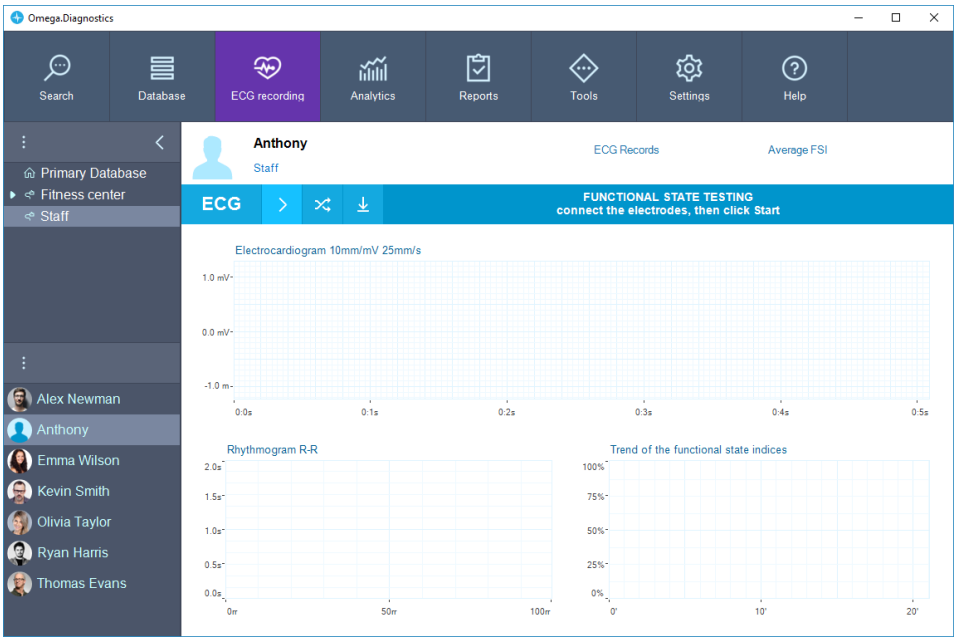
When the ECG signal recording, interference from the 220V electrical network is possible. Most often, this is due to the lack of grounding in the electrical network. The line interference is also possible due to high-powered industrial equipment operating nearby: fans, transformers, air conditioners, etc. The signal coming from the cardio recorder has the appearance of a frequently repeated pattern that has little in common with the correct cardio complexes. Despite the fact that the diagnostic complex can recognize this interference as a valid ECG signal, the result of such examination will have nothing in common with the examined patient. Read more about interference in the ECG Recording Issues section.

If the patient has a heart rhythm disorder (ciliary arrhythmia, premature ventricular contraction, etc.), or if the patient uses a cardiac pacemaker, the functional status calculation will be incorrect.

Always consult a doctor! Self-diagnosis based on calculations and self-medication are dangerous.

ECG RECORDING

Click on the **ECG Recording** tab.



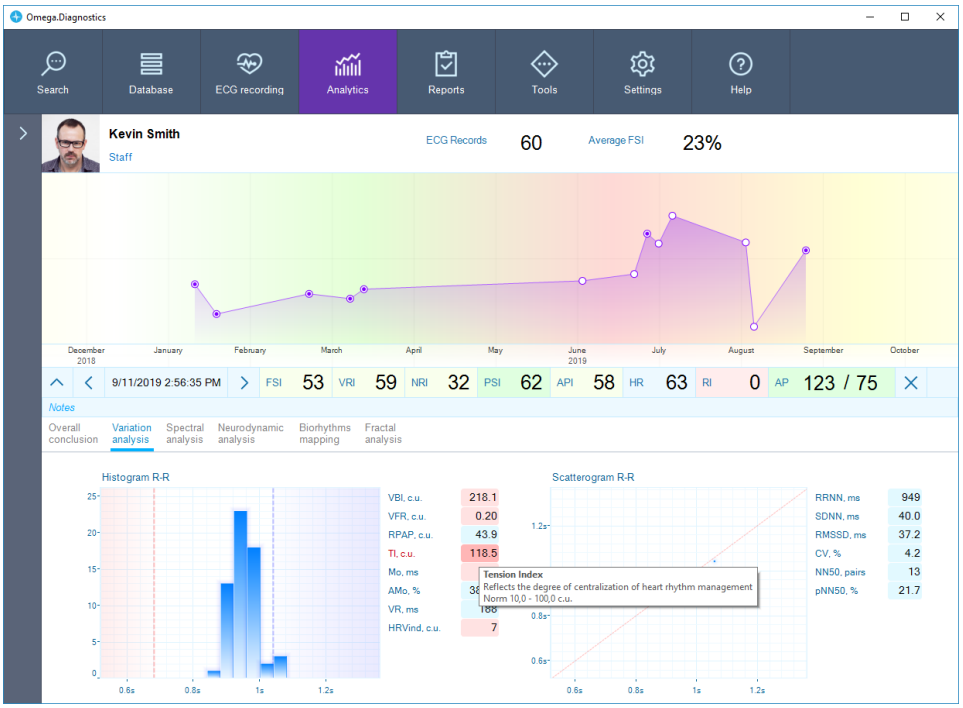
To begin the recording, click the **Start** button.

The application automatically detects the ECG polarity. If the application detected the polarity incorrectly, press the **ECG Inversion** button to invert the signal.

Please wait until the ECG recording completes automatically.

VIEW RESULTS

Click on the **Analytics** tab.

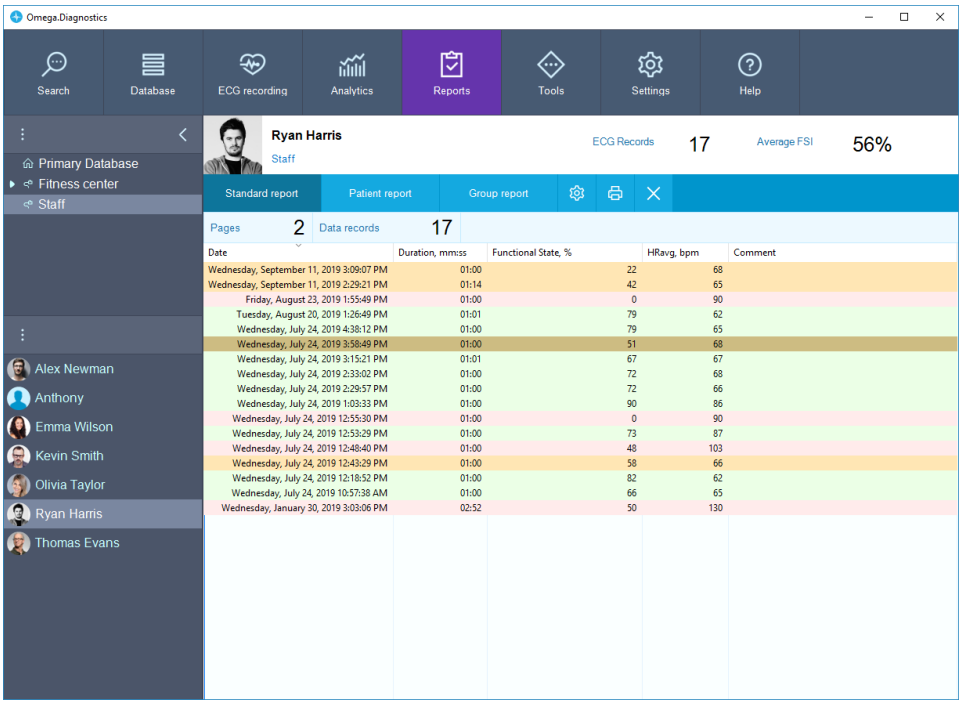


If a new record not selected, select it by clicking on the graph point or use the navigation buttons.

To view the analytics feed use the mouse wheel or the corresponding tabs.

PRINT REPORT

Click on the **Reports** tab.



Select a report type by clicking on the appropriate button.

Select the examination(s) you need from the list.

Click on the **Settings** button to configure the report contents.

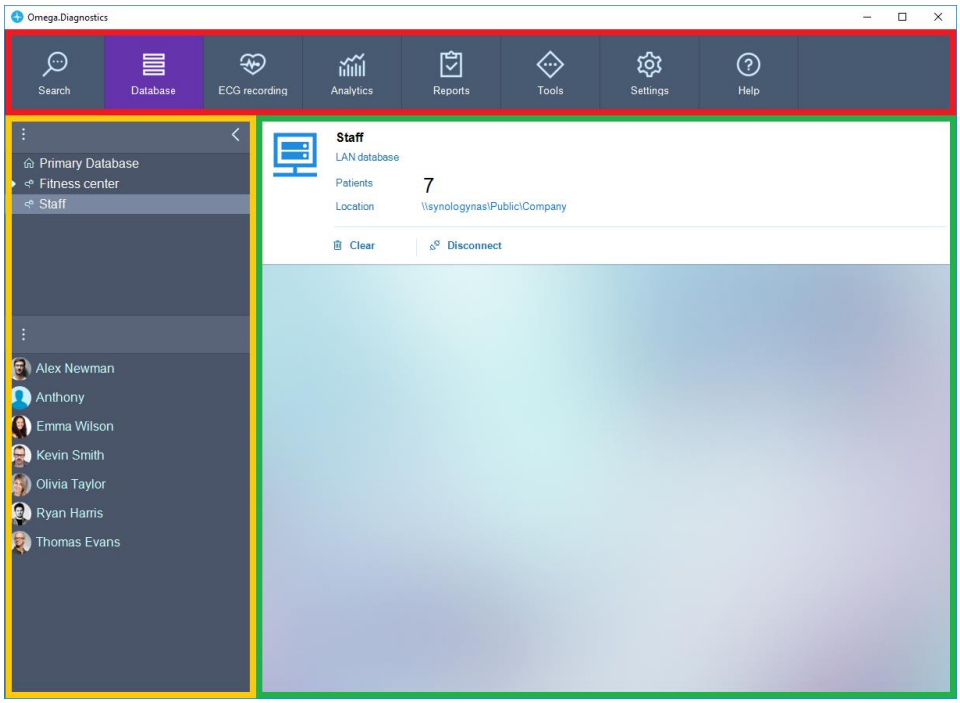
Click on the **Print** button to print the report.

SOFTWARE

Omega Diagnostics App

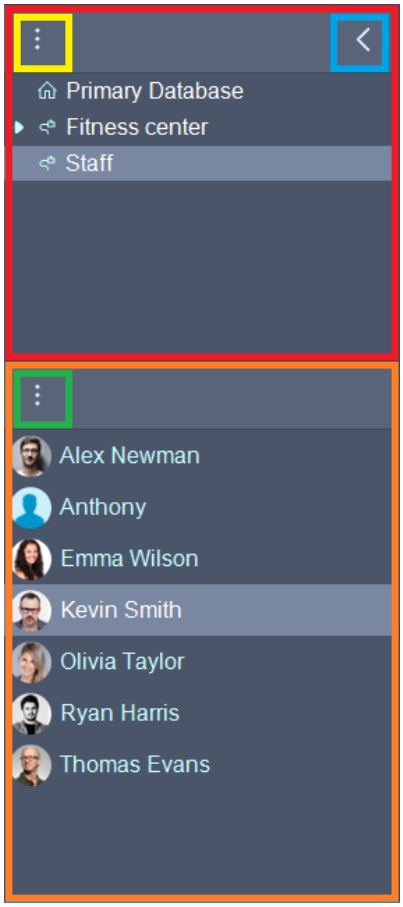
The application window can conditionally divided into three areas:

- Operating modes bar;
- Navigation bar;
- Workspace;



Navigation Bar

The navigation panel is located on the left side of the application window and serves for quick access to patient accounts.

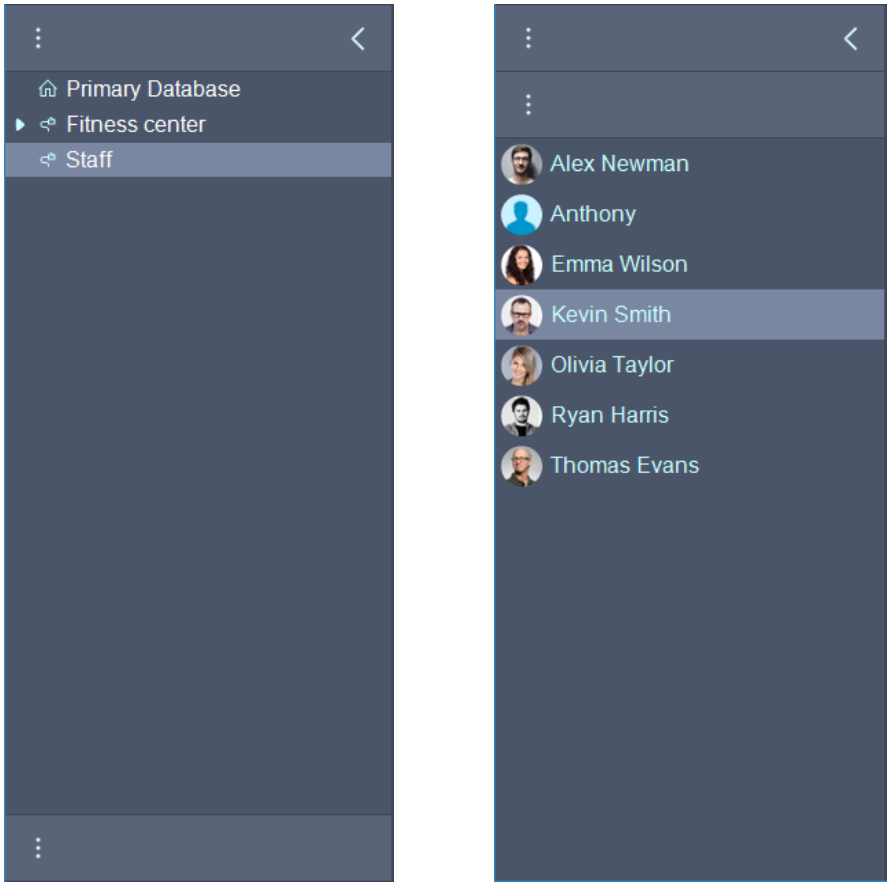


The navigation bar contains the following elements:

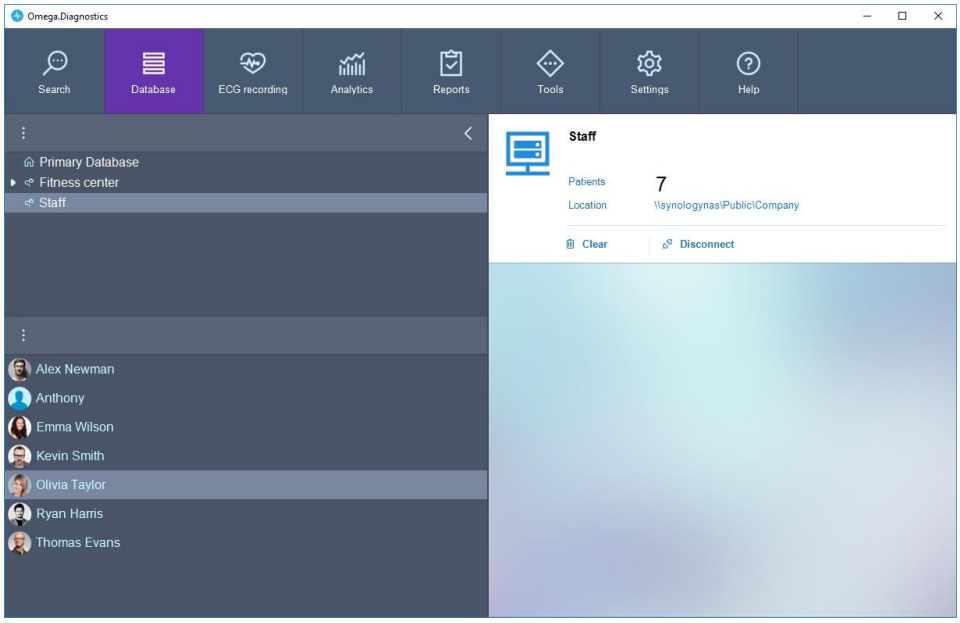
- Databases and directories structure;
- Patient list in the selected directory;
- Context menu for directories;
- Context menu for Patient list;
- Hide/show the navigation bar;

In order to completely hide or restore the navigation bar, click on the **Hide/Show** button.

If required to hide only the patient list or the database structure in the navigation bar, drag the mouse **up** and **down** the **horizontal border** between these lists.

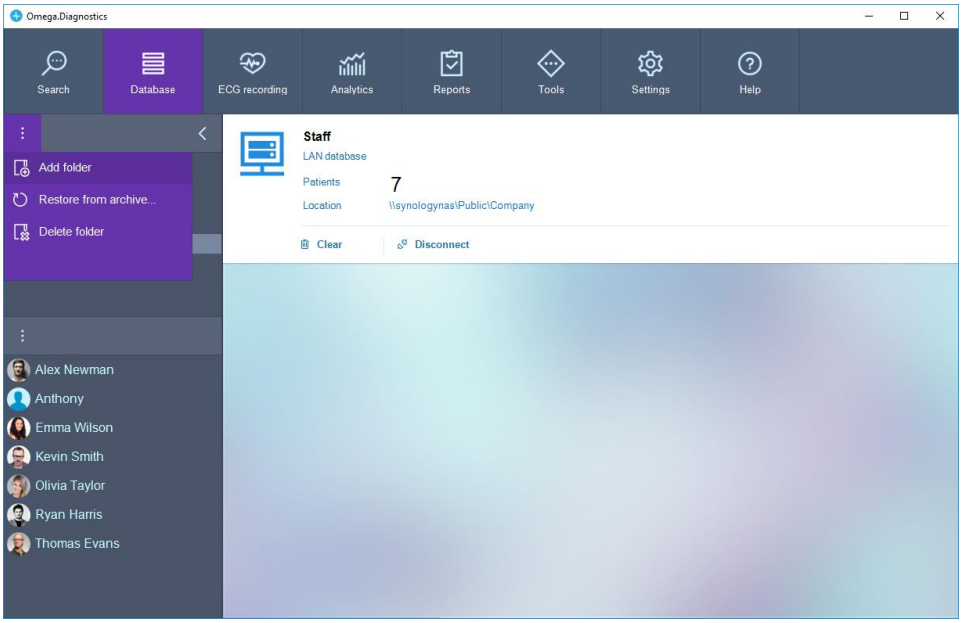


In order to change the width of the navigation bar, drag the mouse to the **right** or **left** of the **vertical border** between it and the application workspace.

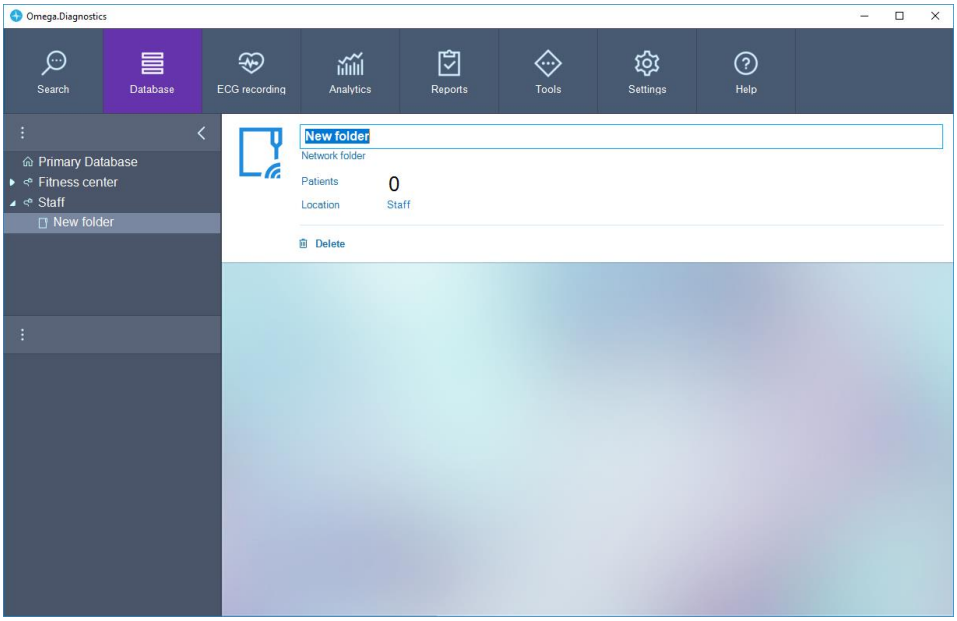


Add Folder

Select the directory where you want to add the folder. Open the context menu and click **Add Folder**.



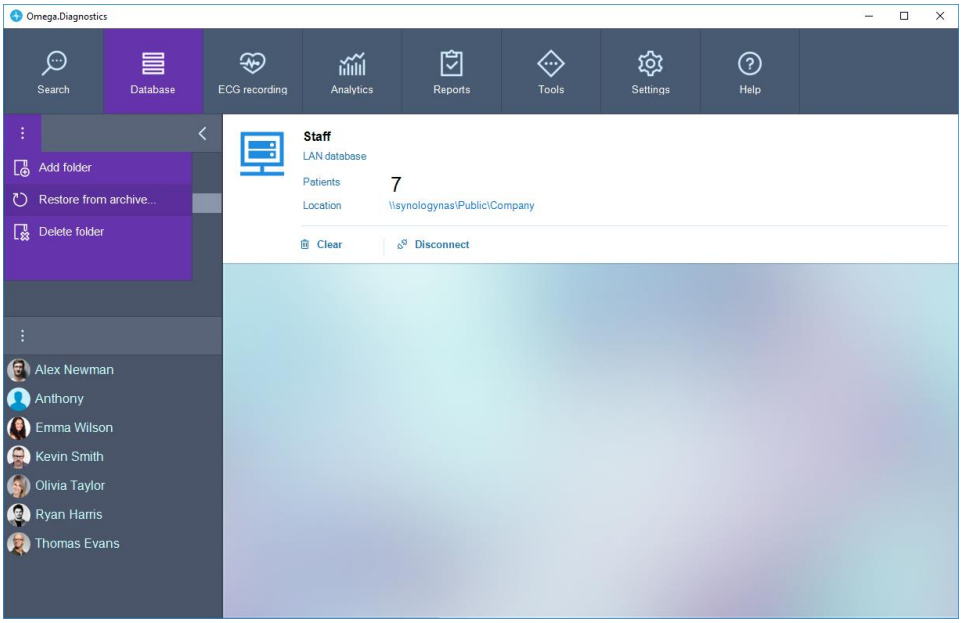
Enter a name for the folder.



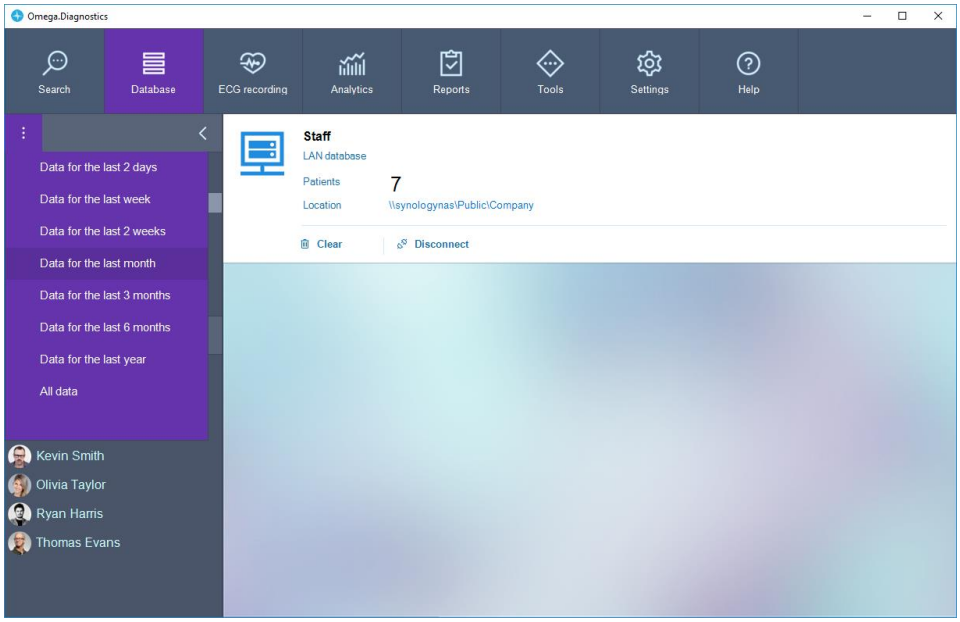
Folder Recovery from Archive

If the application uses automatic data archiving, then after a specified time, the accumulated data will automatically move to the archive directory.

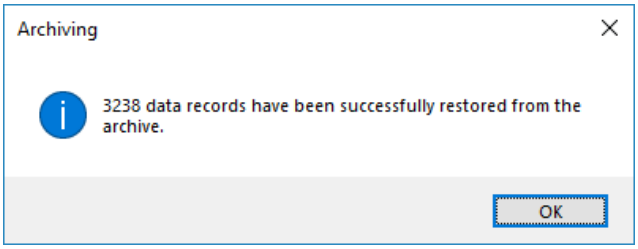
In order to recover the contents of a folder from the archive, select the desired directory, open the context menu and click **Restore from archive**.



Choose the depth of data recovery.



The recovery process will start in background mode. After the completion of this process, statistics on the recovered data will be shown.

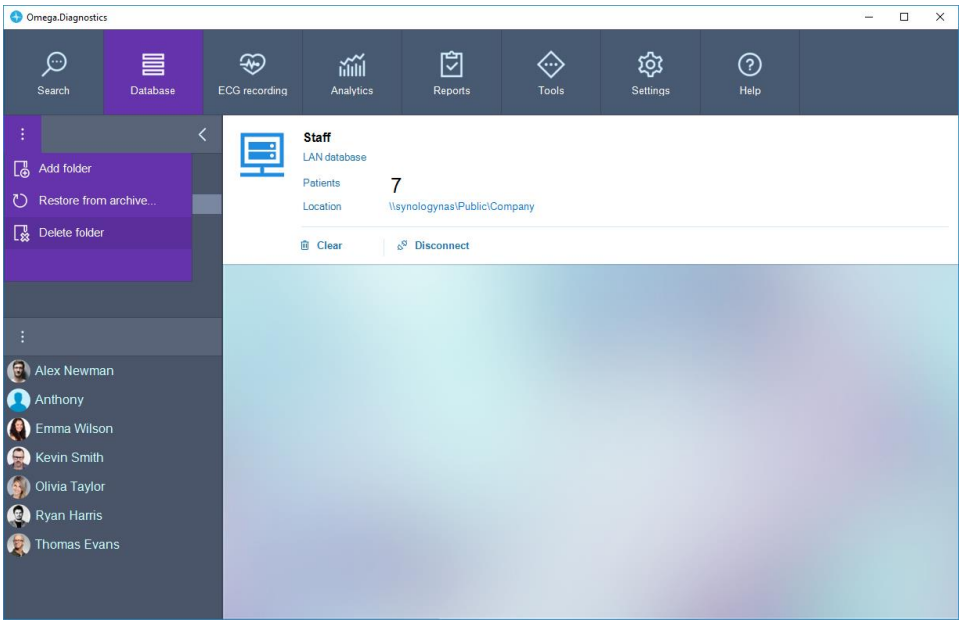


The recovered data will be available until the application is closed. After restarting the application, this data will again automatically moved to the archive directory. Disable

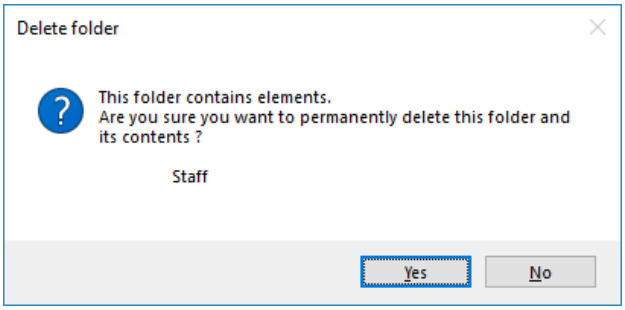
automatic data archiving or configure a longer data storage period in the database if you want to leave the recovered data.

Removing Folder

Select the folder you want to delete in the directory list. Open the context menu and click **Delete Folder**.



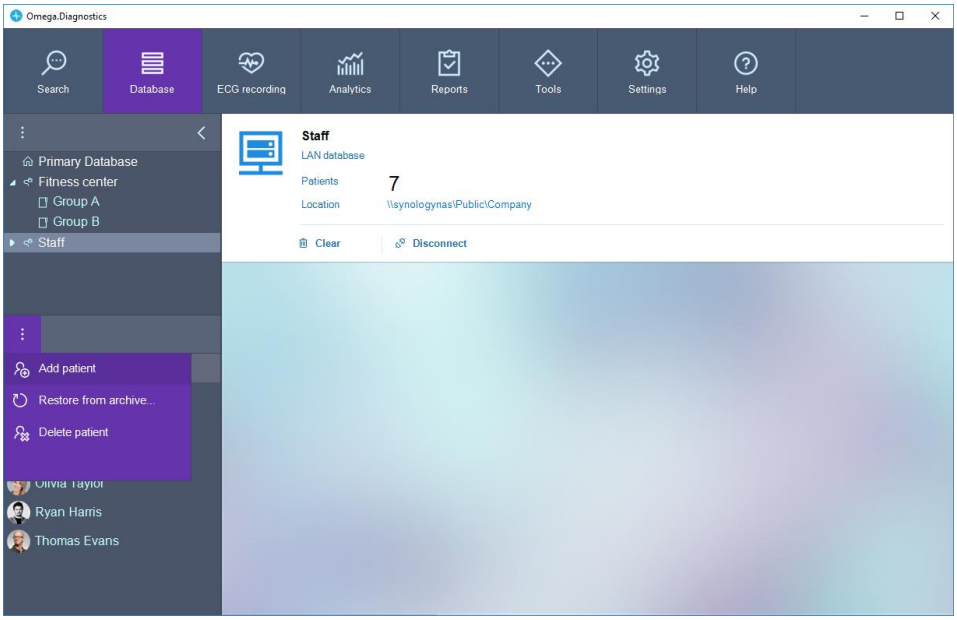
If the directory contains subdirectories or patient accounts, a window with confirmation of deletion will open.



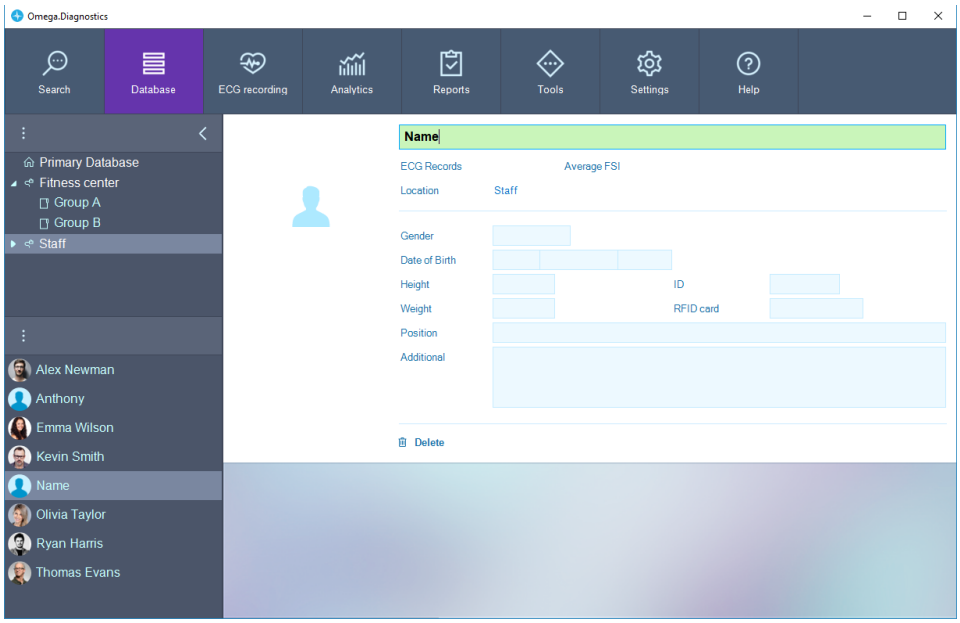
The folder and its contents will permanently deleted. Partial restoration of the folder contents will be possible only if this folder has been previously placed in the archive directory using automatic data archiving.

Adding a Patient Account

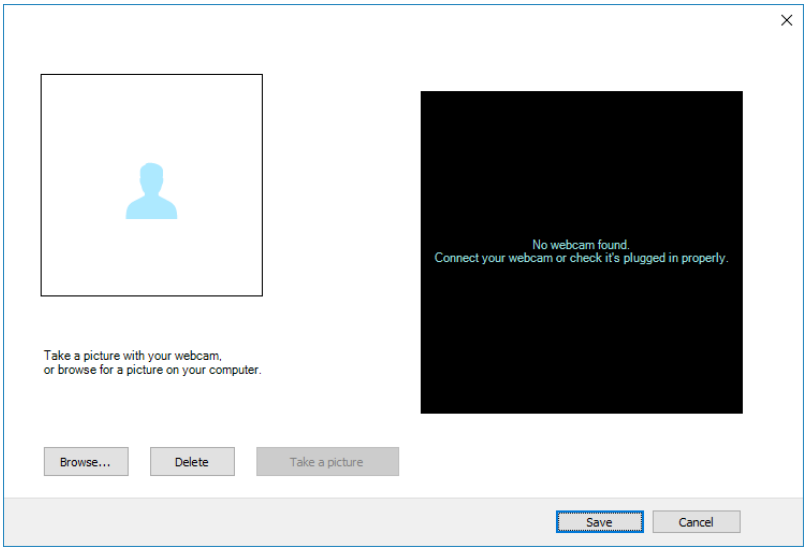
Select the directory where you want to add the patient. Open the context menu of the patient list and click **Add Patient**.



Fill in all the necessary data on the patient card.



In the upper left corner of the patient card, click on the image of the person contour to add the photo.

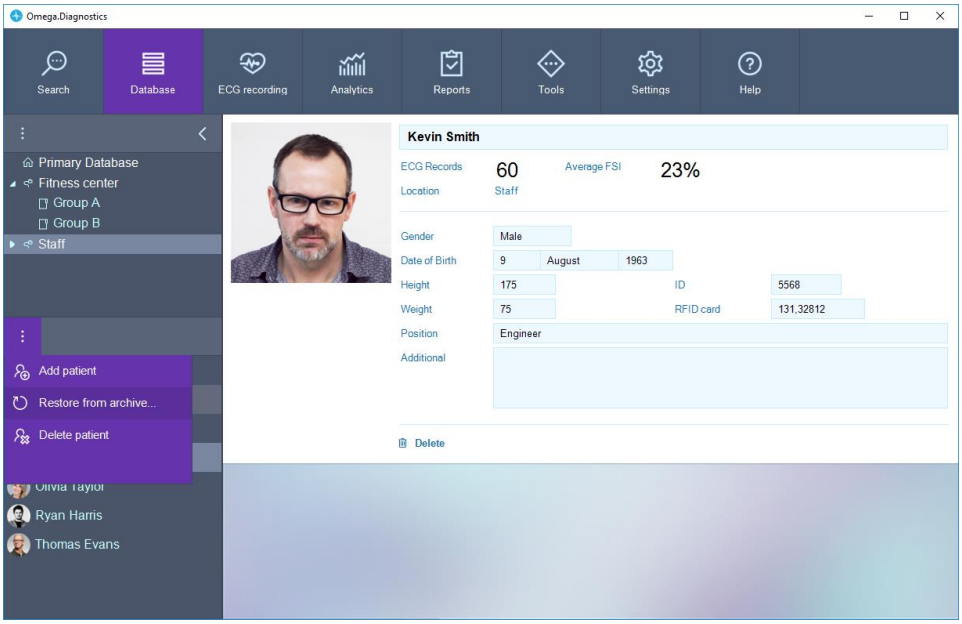


In the photo settings window, you can select an image located on a computer or take a picture from a webcam, if it connected to the PC.

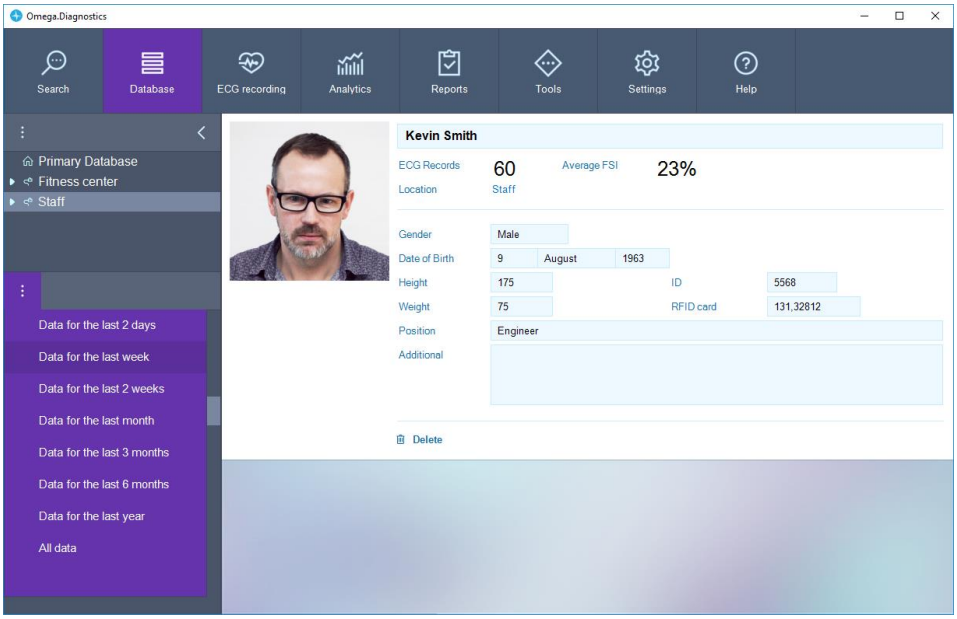
Restoring a Patient Account from the Archive

If the application uses automatic data archiving, then after a specified time, the accumulated data will automatically move to the archive directory.

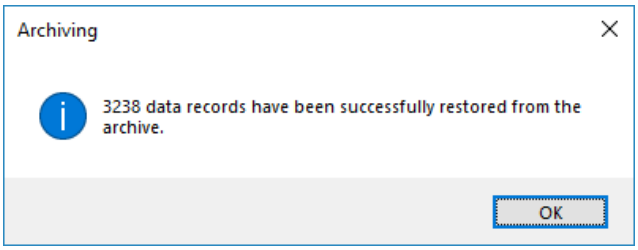
In order to restore data from the archive, select the desired patient, open the context menu and click **Restore from Archive**.



Choose the depth of data recovery.



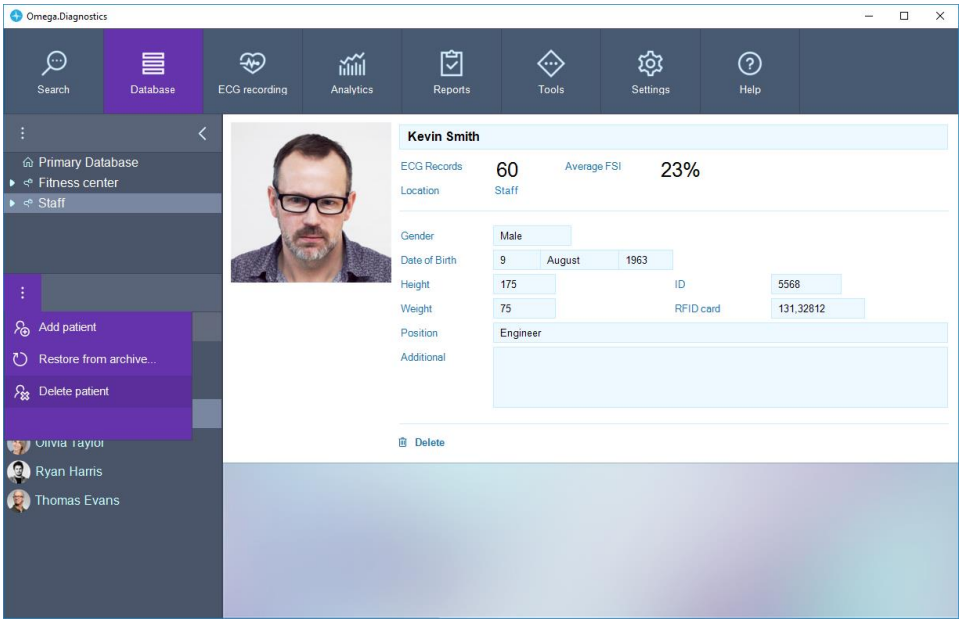
The recovery process will start in background mode. After the completion of this process, statistics on the recovered data will be shown.



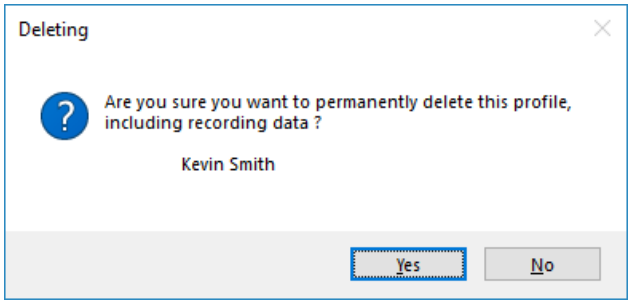
The recovered data will be available until the application is closed. After restarting the application, this data will again automatically moved to the archive directory. Disable automatic data archiving or configure a longer data storage period in the database if you want to leave the recovered data.

Deleting a Patient Account

Select the patient to delete in the list. Open the context menu and click **Delete Patient**.



Confirm the deletion.



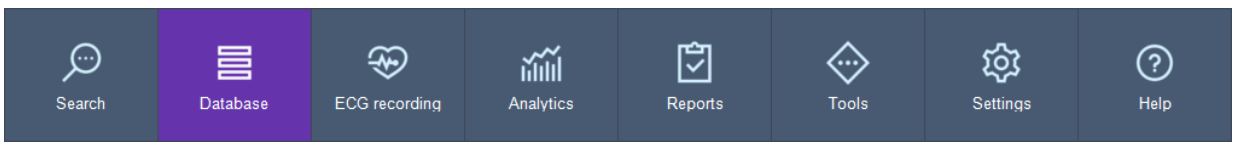
The patient’s account and examinations will permanently deleted. Partial restoration of the patient's data will be possible only if it has been previously placed in the archive directory using automatic data archiving.

Workspace

The main part of the window occupied by the workspace. It displays various information, depending on the selected operating mode.

Operating Modes Bar

At the top of the application window located a panel of operating modes.

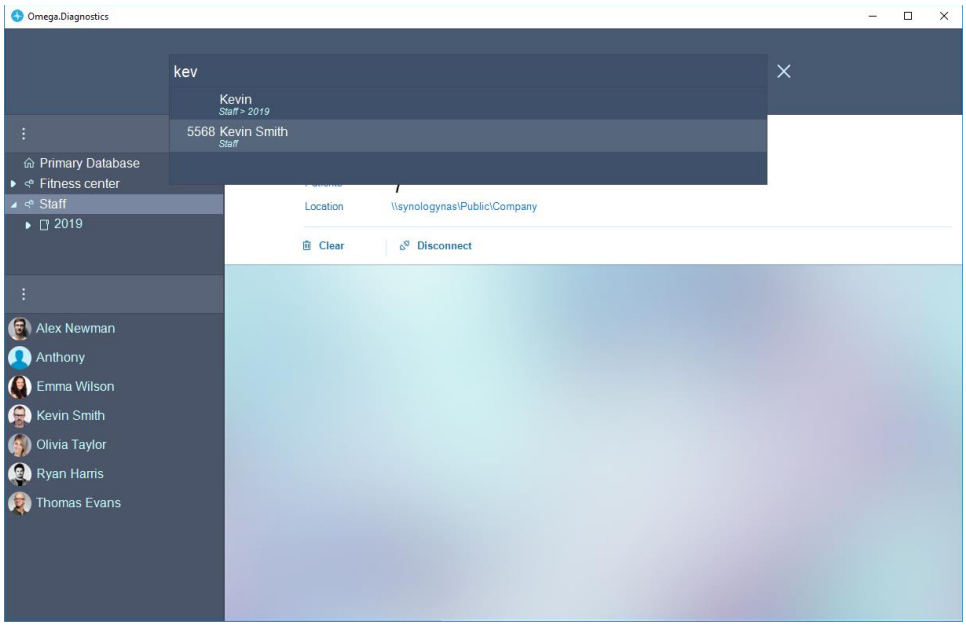


Search

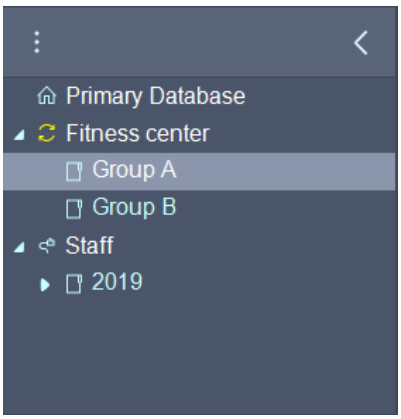
The search function is available in any application mode. It intended to quickly search for patient accounts and folders.

As a search request, you can use any fragment or strict correspondence of the last name, first name, middle name, folder name or unique patient number. The most suitable results will be shown at the top of the drop-down list.

The search performed on all available databases that connected in the application, including databases located on the Ethernet LAN.

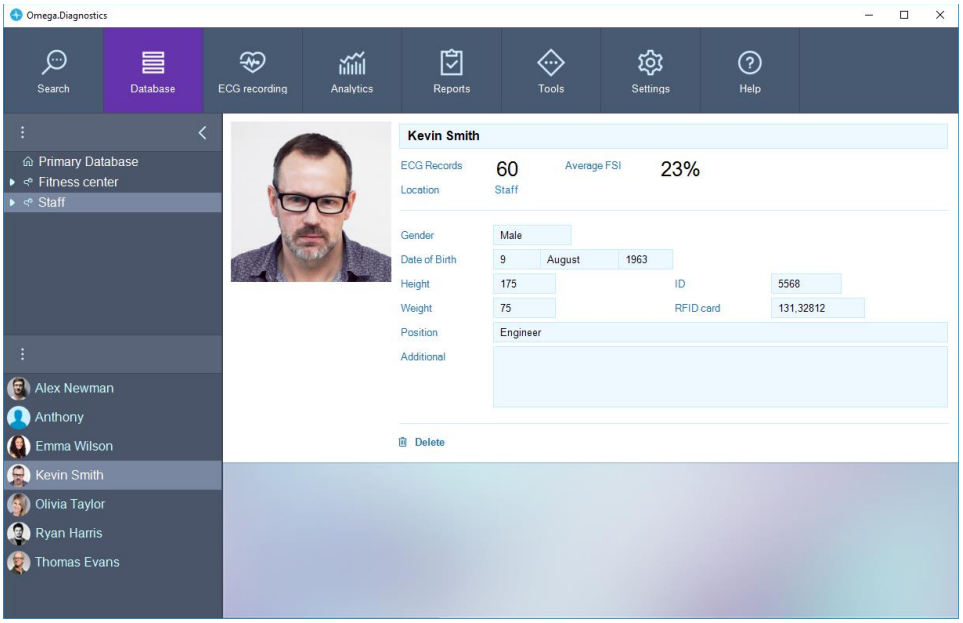


The database may be temporarily unavailable for search if an update symbol appears near to its name. In this case, repeat the search later.

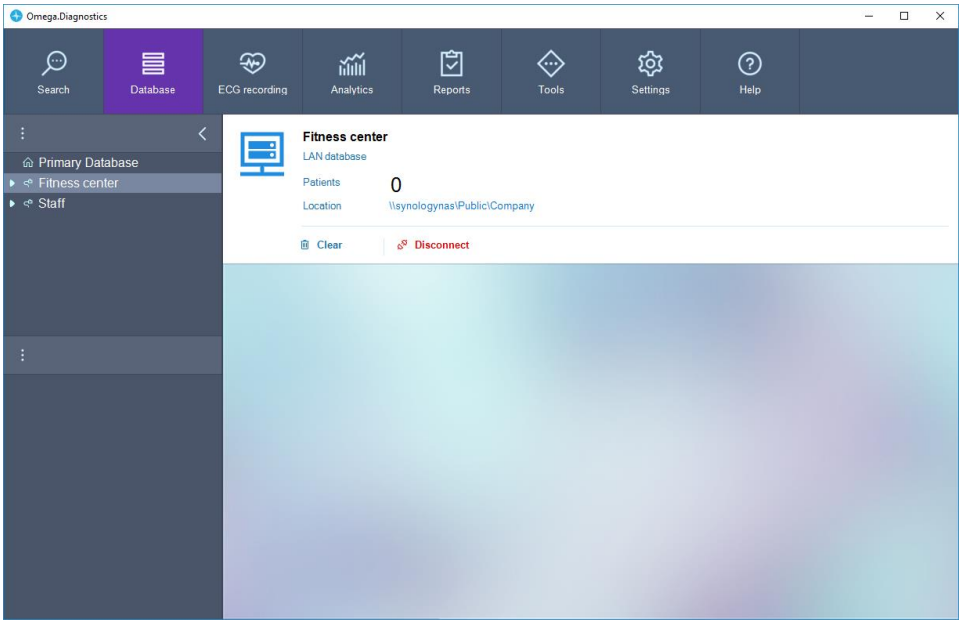


Database

In **Database** mode, the card of the active database element displayed in the application workspace. This mode intended for edit patient data or for edit directory names.



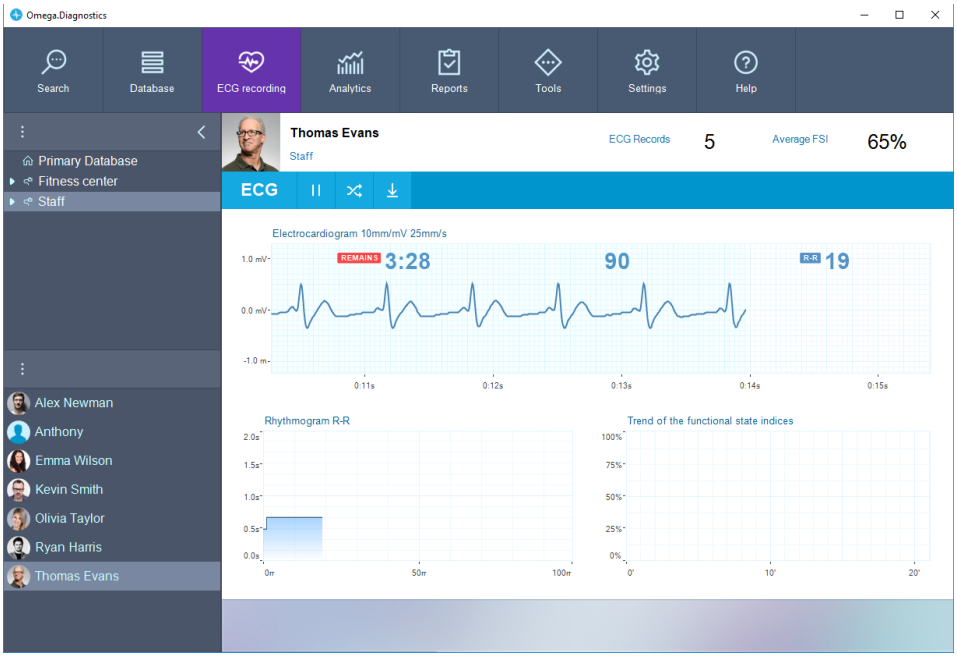
In this mode, you can also completely clear or disconnect the selected database.



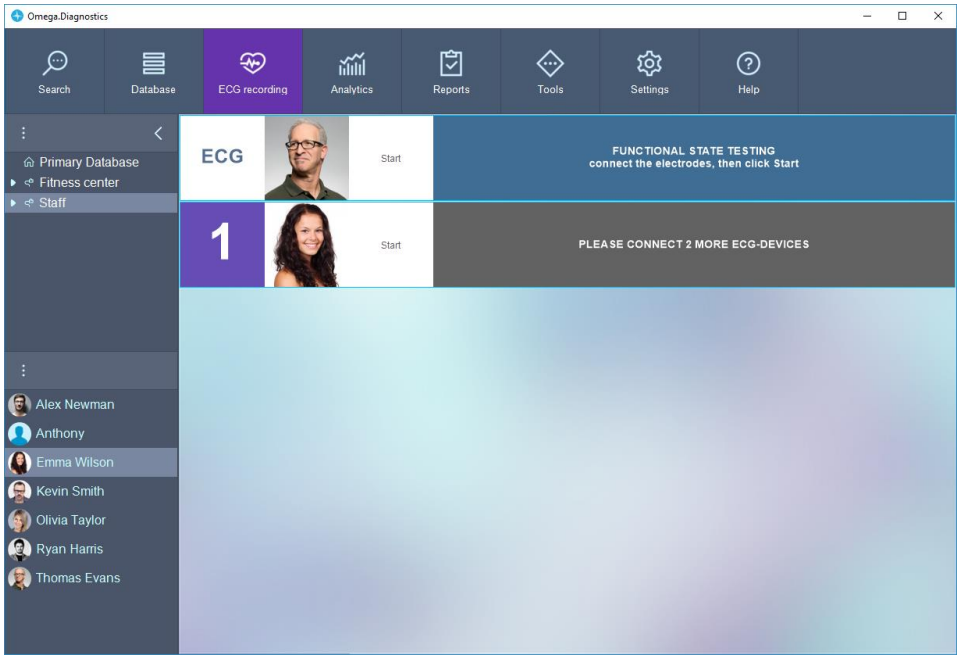
Pressing the **Database** button again will switch between the cards of the selected patient and his catalog.

ECG Recording

In this mode, ECG recorded using a cardio recorder. If one cardio recorder connected to the PC, the window of the standard ECG recording mode displayed in the workspace.



If several cardio recorders connected, the application will switch the recording mode to multi-channel mode. Switching between standard and multi-channel modes occurs when pressing the **ECG Recording** button again, or by double-clicking on the ECG graph.

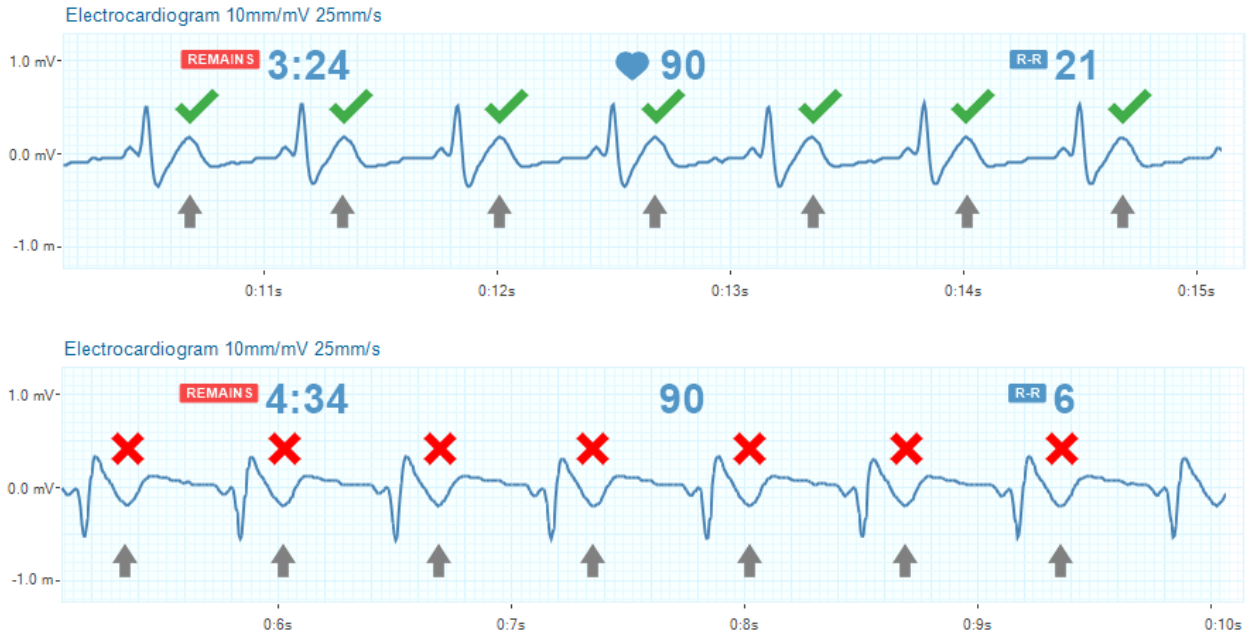


To start the recording, select a channel (if more than 1 cardio recorder is connected), select a patient from the list in the navigation bar, use the search in the modes bar or place a smart card to the reader and press the **Start** button.

When recording an ECG, recommended to remain calm and not to move. The duration of the recording can be changed in the application settings.

The application analyzes the ECG and automatically determines the signal polarity. If the polarity not detected correctly, click on the **ECG Inversion** button.

Make sure that the ECG looks correctly – the cardiac complexes are clearly visible and their peaks are pointing up.

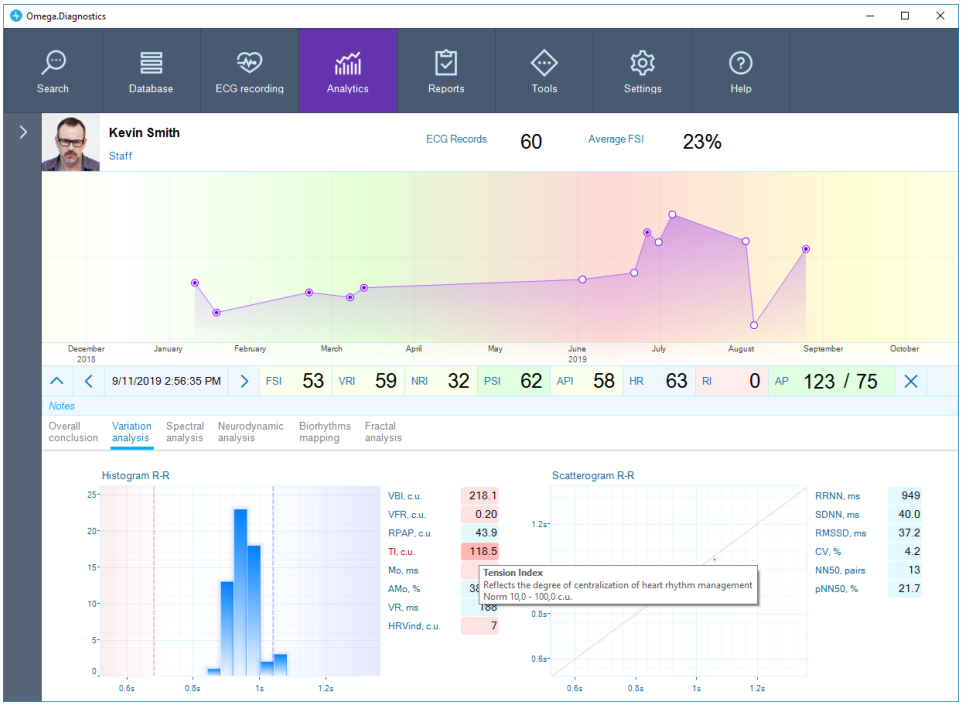


> *Attention!*
> *The results of functional status measuring will be unreliable if the patient uses a pacemaker or has cardiac arrhythmias (atrial fibrillation, extrasystole, etc.).*

During the ECG recording, you can save the accumulated data at any time (72 or more R-R intervals must be accumulated), to do this, click the **Save** button.

Analytics

The **Analytics** mode used to view the examination results.



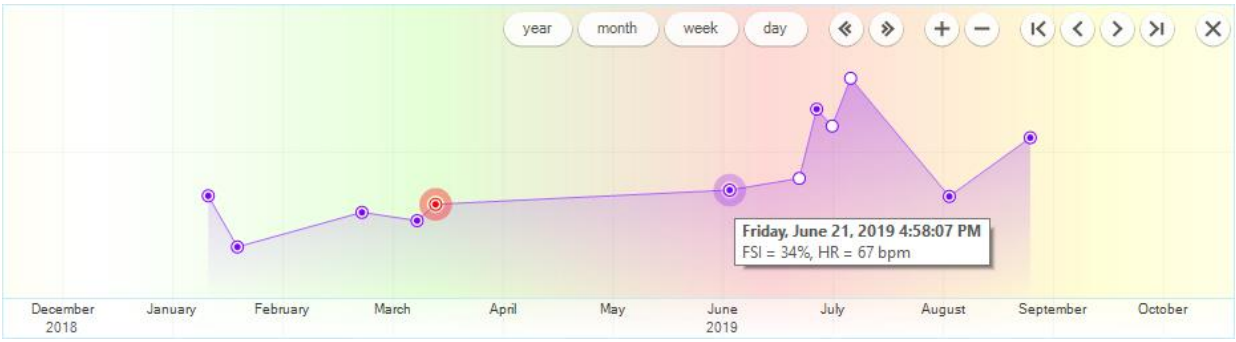
On the analytics ribbon are located the various charts with calculated parameters. To learn more about a desired parameter, click on it or hover over it. If the value of the parameter is outside of the norm, then it is marked in **red**.

Most charts support the zoom feature. Select the desired diagram with a mouse click, then change zoom using the scroll wheel and drag the contents with the left mouse button. In some cases, changing the zoom occurs by pressing and moving the right mouse button.

Use the mouse wheel or the corresponding tabs to scroll through the **analytics ribbon**.

Functional State Diagram

On the diagram, dots indicate functional state (FS) values for each examination. The dark points contains several examinations, zoom in to view the FS curve in more detail.



To change the diagram zoom, use the scroll wheel or the pop-up navigation buttons on the diagram.

To view the results, select the required examination on the diagram or use the navigation arrows located below the diagram.

To delete an examination, right-click on it in the diagram or click on the **Delete** button below the diagram.

In order to hide the functional state diagram, click on the **Hide/Show** button.

Main Indicators

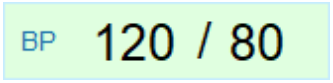
The indicators with main calculated parameters located below the functional state diagram:

- **FSI** – functional state index;
- **VRI** – vegetative regulation index;
- **NRI** – neurohumoral regulation index;
- **PSI** – psychoemotional state index;
- **API** – adaptation possibilities index;
- **HR** – heart rate;
- **RI** – reliability index;

Indicators with low values are highlighted in **red**, indicators with medium values are highlighted in **yellow**, and indicators with high values are highlighted in **green**. The indicators of the functional state and **RI** are normalized in the range from **0 to 100%**.

Blood Pressure Indicator

To the right of the main indicators located the edit field for **blood pressure** values. This field is also highlighted in color depending on blood pressure values.



> *Attention!*
> *This field will not be available for editing if the diagnostic complex uses the terminals for automated blood pressure measurement.*

Notes

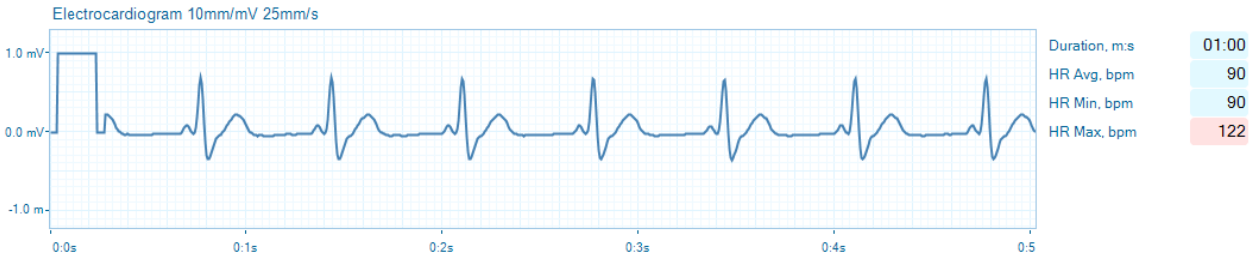
Below the indicators with the main parameters located the field **Notes**, click on it to add a note.

Overall Conclusion

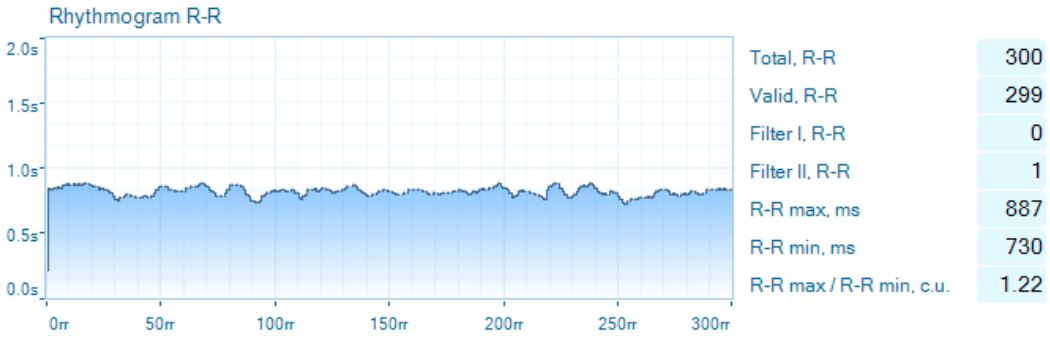
The section begins with a text block, which presents the conclusion and recommendations on the main functional state indices.

Further, in the section there are diagrams: **Electrocardiogram**, **Rhythmogram R-R** and a **Trend of Functional State Indices**.

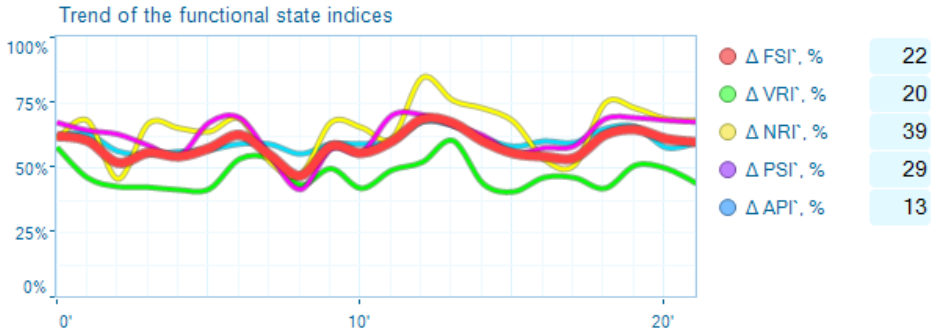
The **Electrocardiogram** displays the signal received from the cardio recorder during the patient examination. All further calculations based on ECG analysis.



Rhythmogram is a graph in which the number of the R-R interval plotted along the horizontal axis, and the duration of the R-R interval in seconds along the vertical axis. The graph allows you to get an initial assessment of the quality of the examination and detect heart rhythm disturbances.



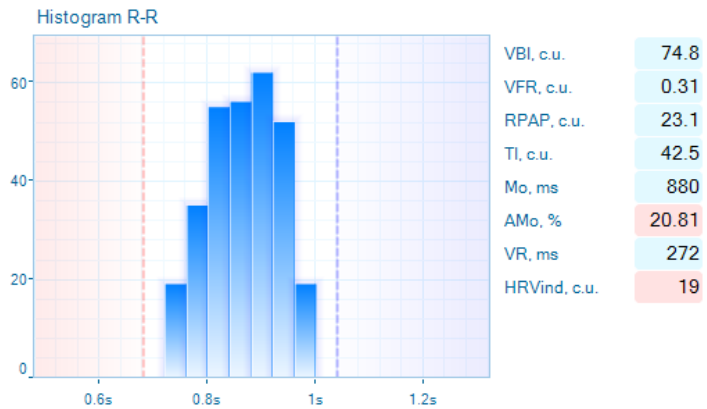
The **Trend of Functional State Indices** clearly demonstrates how these indices changed during the examination. It allows you to evaluate the reliability of the results obtained during the examination. The larger the amplitude of the oscillations, the less reliable the examination.



Variation Analysis

This section contains charts: **Histogram R-R**, **Scatterogram R-R**.

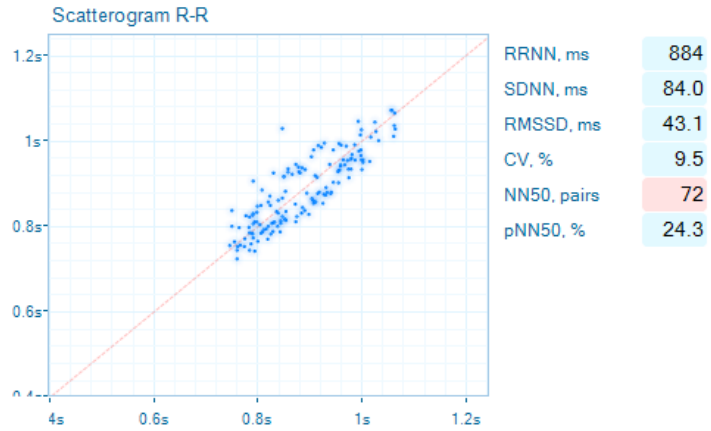
The **R-R Histogram** is a graph of the distribution of R-R intervals by duration. The duration of R-R intervals plotted along the abscissa, and the number of R-R intervals within the corresponding range plotted along the ordinate. Histogram step - **0.04 sec**.



The state of vegetative equilibrium characterized by a central arrangement of the columns of the diagram with the localization of the highest column (mode) in the range

of 0.7–1.0 sec. In the case of the prevailing influence of the sympathetic part of the autonomic nervous system, a significant left shift and narrowing of the base of the histogram are characteristic. The opposite effect observed with parasympathetic influence.

The **Scatterogram R-R** is a two-dimensional display of the heart rhythm, which allows detect heart rhythm disturbances. On the abscissa axis, the value of the R-R_i interval in seconds is plotted, on the ordinate axis, the value of R-R_{i+1} interval in seconds.

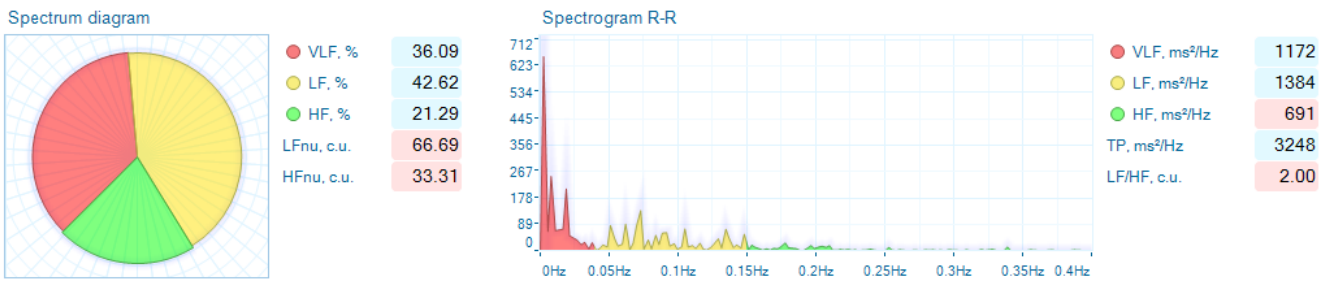


A uniform cloud indicates the equilibrium state of the autonomic nervous system. The constriction of the scatterogram cloud and its displacement from the center to the lower left corner indicates the predominance of the sympathetic part of the autonomic nervous system. On the contrary, a significant scatter of the scatterogram points and its shift to the right indicates the predominance of the influence of the vagus nerve on the sinus node.

Spectral Analysis

Spectral analysis is based on the physical conversion of cardiac rhythm oscillations into simple harmonic oscillations (fast Fourier transform) with different frequencies.

For a visual assessment of the patient's health condition by spectrogram, designed the **Spectrum Diagram**, which consists of three sectors for different frequency components.

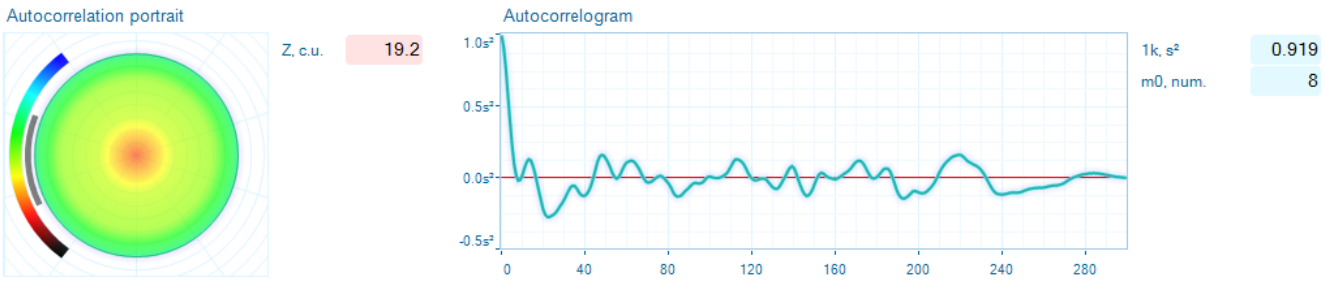


High Frequency (HF) – 0.15-0.40 Hz. The primary role of the parasympathetic division of the autonomic nervous system in oscillation formation in this frequency range is assigned. Power in this frequency range increases during breathing with a certain frequency and depth, as well as when exposed to cold. In athletes and well-trained people, HF power is higher than in untrained ones and should prevail over low-frequency power. A decrease in HF power among athletes may indicate a tension in the regulatory systems of the heart, and overtraining, although its excessive increase indicates the danger of sinus rhythm disturbance.

Low Frequency (LF) – 0.04-0.15 Hz. Physiological interpretation of this indicator is ambiguous. Believed that power in this frequency range affected by both a change in the tone of the parasympathetic and sympathetic parts of the nervous system. The ratio of sympathetic and parasympathetic influences characterized by the power ratio LF/HF. At the same time, with an increase in sympathetic division tone, this indicator increases significantly, with vagotonia – vice versa. A significant increase in LF power was noted with orthostatic test, psychological stress, moderate physical activity in healthy individuals. Therefore, the point of view has recently been widespread that power in the LF range, as well as the LF/HF index, can serve as an indicator of the activity of the sympathetic part of the autonomic nervous system.

Very Low Frequency (VLF) – 0.003-0.04 Hz. The physiological significance of this frequency range has not been elucidated. However, there is an opinion that the power of this range increases significantly with the depletion of the regulatory systems of the body.

An **Autocorrelogram** or an autocorrelation function (ACF) constructed by analyzing the dynamic series of RR intervals.



With a strong connection between the central and autonomous circuits, the dynamic row of R-R intervals is more organized, and the autocorrelogram fades out slowly. A rapid initial decline in ACF followed by a slow decay indicates the warring effects of an autonomous and central circuit on the heart rhythm.

For a visual assessment of the patient's condition using the autocorrelogram, the **Autocorrelation Portrait** is used, the color scheme of which corresponds to various health conditions. Shades of red in the portrait indicates a violation of regulatory mechanisms.

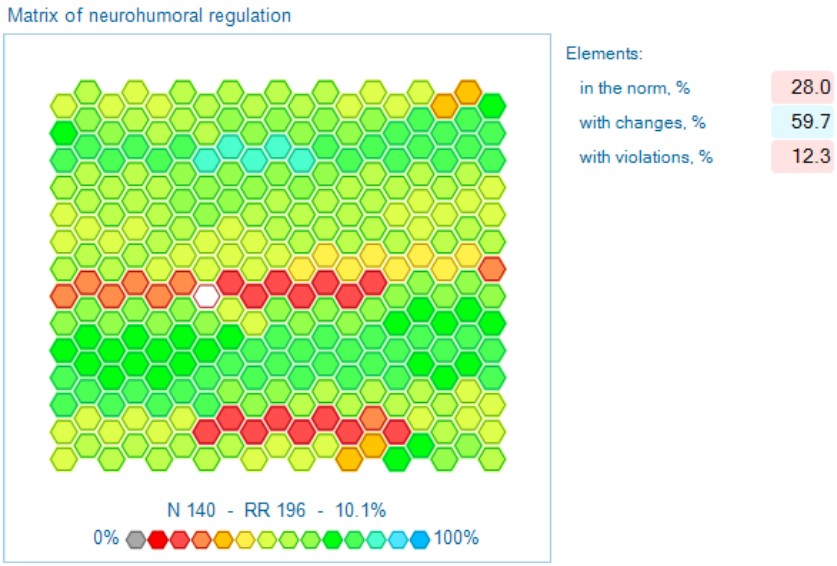
Neurodynamic Analysis

In the section **Neurodynamic analysis**, displays information on the parameters of neurohumoral regulation of the patient.

The neurohumoral regulation system controls the composition and structure of biochemical substances in the body, ensuring the internal environment constancy and the organism adaptation to changing conditions of existence in long-run period.

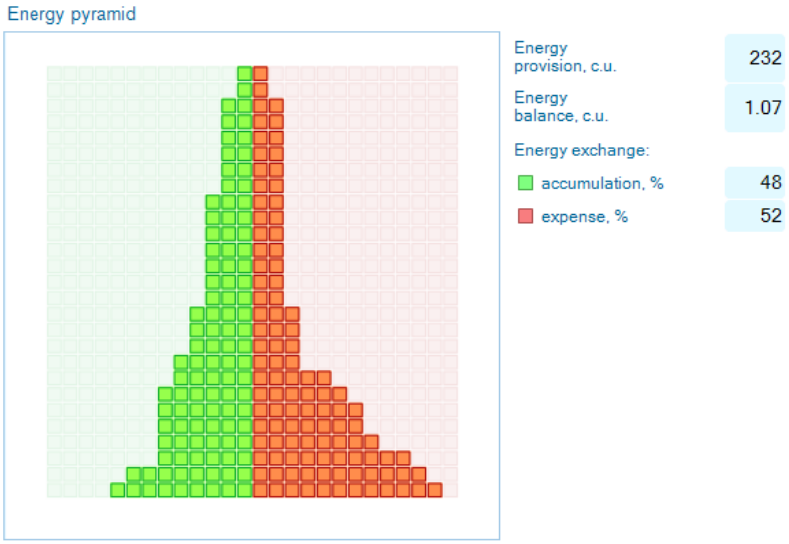
Neurohumoral Regulation Index (NRI) characterizes the endocrine system efficiency and determines how optimally the body uses its energy and physiological resources. The neurohumoral regulation system is responsible for the internal environment constancy and the organism adaptation to changing conditions of existence.

The physiological rhythms structure presented in the form of a **Neurohumoral Regulation Matrix**, each element of which characterizes the dynamics of the corresponding rhythms. The matrix's individual elements are the rhythms of the individual body systems, and the color of each element determines the degree to which the parameters of these rhythms correspond to the single universal law of the functioning of living nature – the law of two exponents. The Ideal Exponent parameters obey the **Golden Ratio**. Compliance with such parameters ensures the most efficient operation of the life support systems of the body with minimal energy costs.



The yellow-red colors of the matrix elements indicate that the parameters of this rhythm are far from optimal.

Energy Pyramid characterizes the total amount of physiological resources of the body and the balance between the spending and recovery cycles of these resources with the existing pace of living. The ratio of the left and right areas of the pyramid characterizes the dynamics of anabolic and catabolic processes occurring in the body.

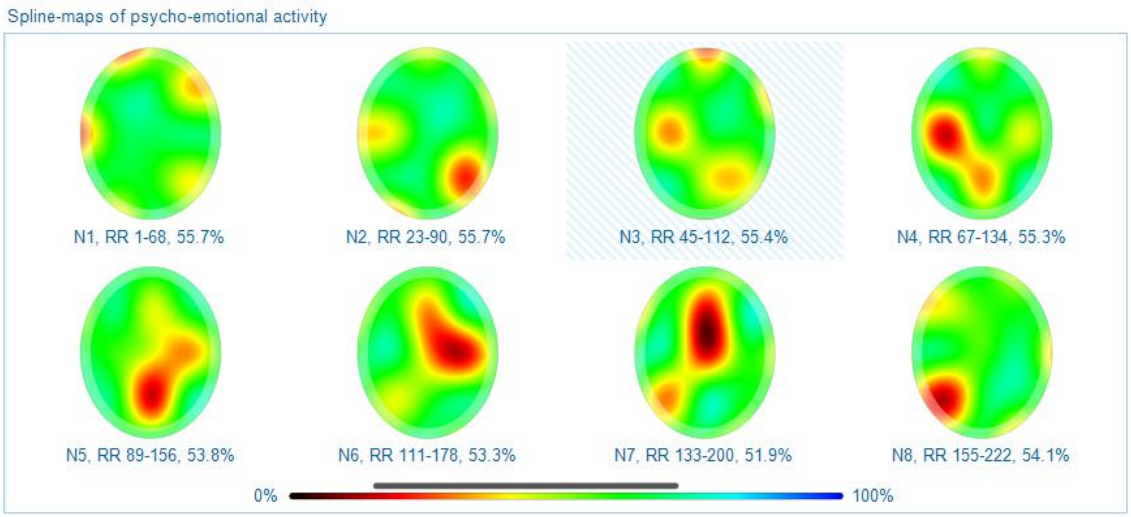


The size of the **green** part of the pyramid is proportional to the time of recovery of resources, and the size of the **red** part is proportional to the time of spending resources. The minimum size of the entire pyramid signals the depletion of the physiological resources of the body.

Biorhythms Mapping

In the section **Biorhythms Mapping**, displays information on the parameters of psycho-emotional state of the patient.

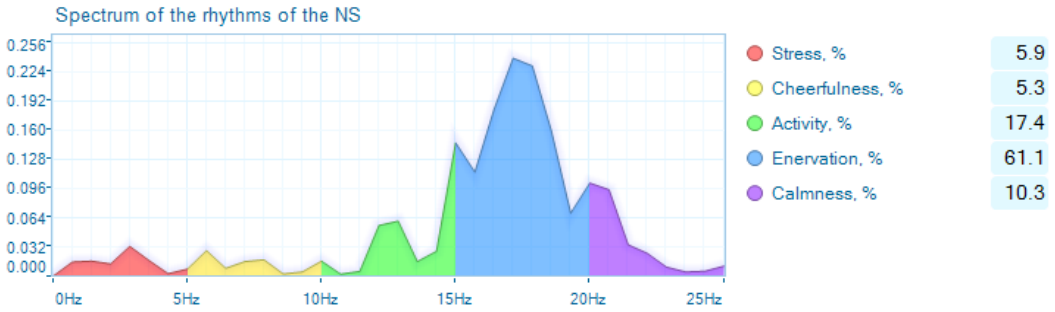
Spline-Maps of Psycho-Emotional Activity are the result of spline interpolation of dynamic psycho-emotional state indices obtained by the method of neurodynamic analysis of heart rhythms.



Areas with black and yellow-red colors indicates reduced psycho-emotional activity due to a painful condition, nervous overwork or stress.

> *Attention!*
> *Spline-maps are not analogous to electroencephalogram mapping and cannot be used to diagnose brain pathologies.*

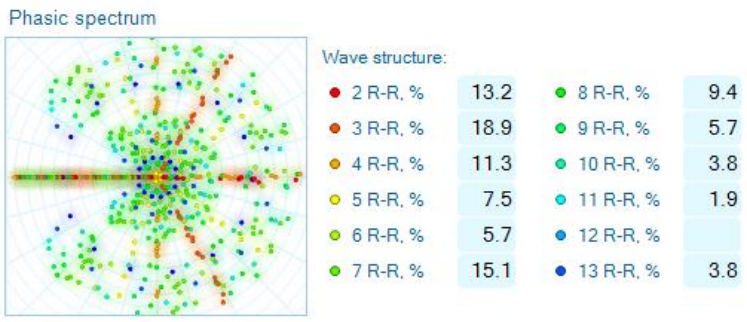
Spectrum of the Rhythms of the Nervous System (NS) shows the distribution of various states of the nervous system during the examination.



The normal state corresponds to a uniform distribution of rhythms over the entire frequency range. The prevalence of stress rhythms indicates a painful state or nervous overwork.

> *Attention!*
> *The frequency ranges in the diagram do not correspond to delta, theta, alpha, beta and gamma rhythms obtained from the electroencephalogram.*

The **Phasic Spectrum** is a circular diagram of the rhythms of the nervous system during the examination.

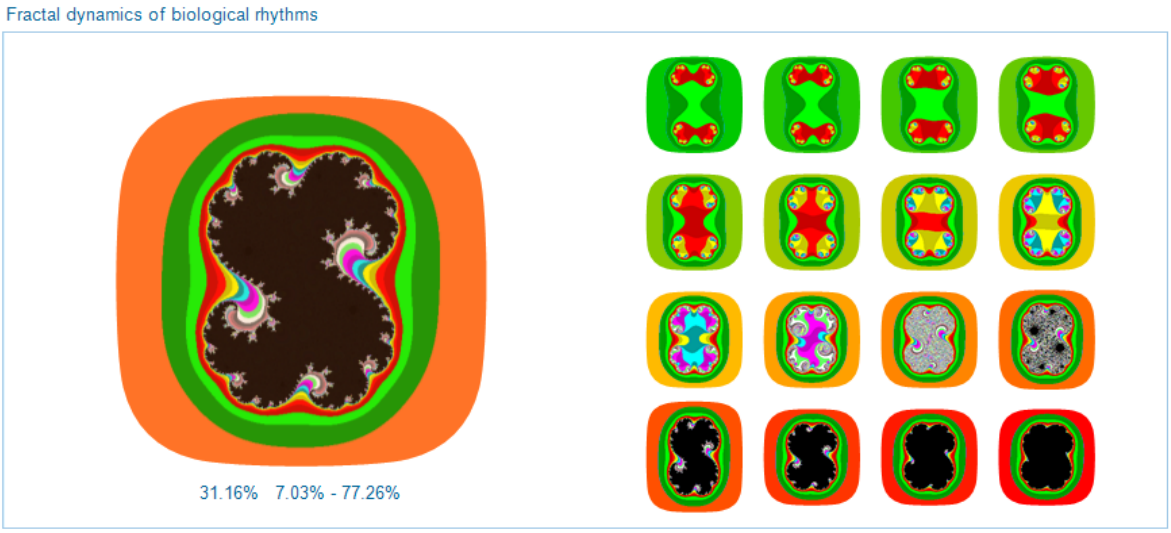


A normal state corresponds to a diagram with a uniform distribution of dots of various colors over the entire area. A small number of rays in a yellow-red color scheme signals a depressed state of the psyche due to a painful state, overwork or stress.

Fractal Analysis

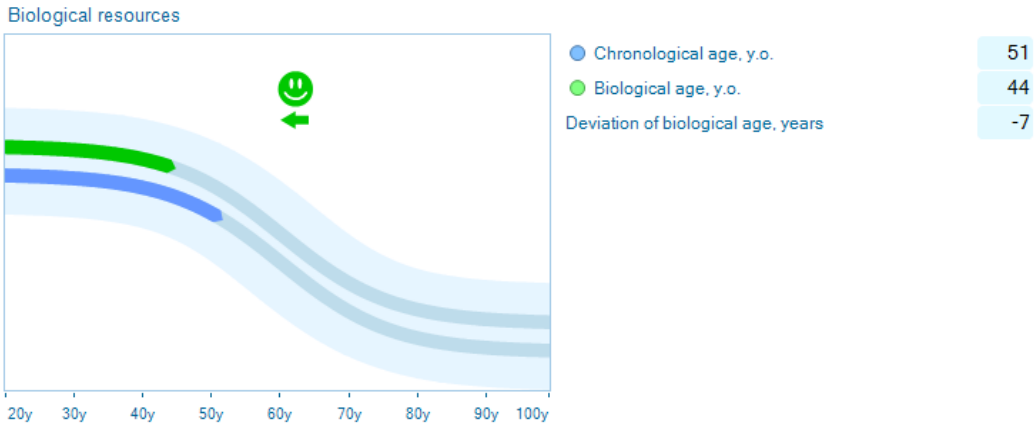
Fractal Analysis designed to visually assess the degree of harmonization of the rhythms of various organs and systems of the body. The degree of consistency of these rhythms determines the quality of the functioning of the organism as a whole. The ability to maintain and preserve such harmony characterizes the body's resistance to changing conditions of the external and internal environment and reflects its adaptive capabilities (immunity).

The chart **Fractal Dynamics of Biological Rhythms** allows to show changes in the rhythm consistency during the examination.



On the right in the diagram located the etalons, corresponding to different levels of rhythms harmonization, from maximum to minimum.

The **Biological Resources** chart shows how the functional state of the patient’s body at the time of the examination corresponds to the average indicators of his age group.

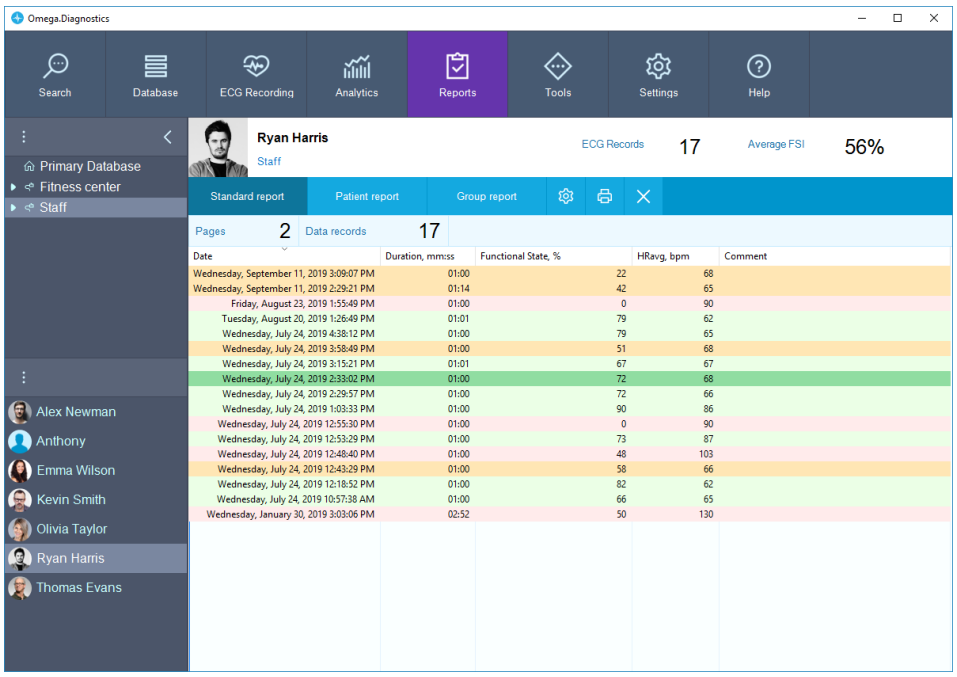


From the point of view of biology, the body may be younger or older than the years actually lived, therefore, diseases and death associated with aging occur at different calendar ages. The differences between calendar and biological age determined by both genetics and human lifestyle. The biological age of a person is determined not by the time elapsed since birth, but by indicators that reflect his vitality.

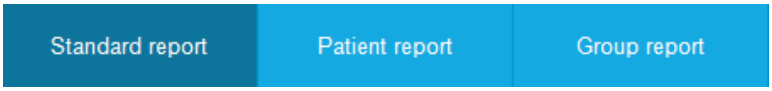
> *Attention!*
> *The calculation of biological age is possible for patients older than 20 years, provided that the date of birth is indicated.*

Reports

Three types of reports are available in the **Omega Diagnostics** application: **standard**, **by patient**, and **by patient group**.



Switching between types of reports is done by repeated pressing of the **Reports** button or by buttons on the reports page.



The contents of the reports can be customized by clicking on the **Settings** button.

When all is ready to print the report, check off the required records and click on the **Print** button.

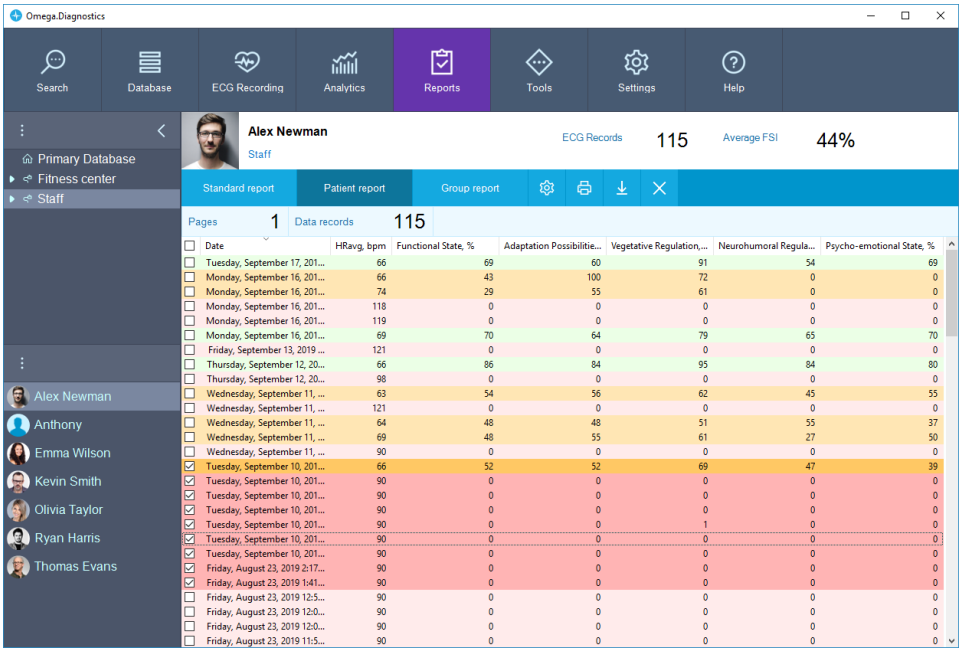
Depending on the application settings, rows in the tables may be highlighted in **red**, **yellow** or **green**. Color is determined based on the measured values of **Functional State**, **Heart Rate** and **Blood Pressure**. The evaluation ranges of these parameters can be changed in the **Settings** page.

Deleting Examinations

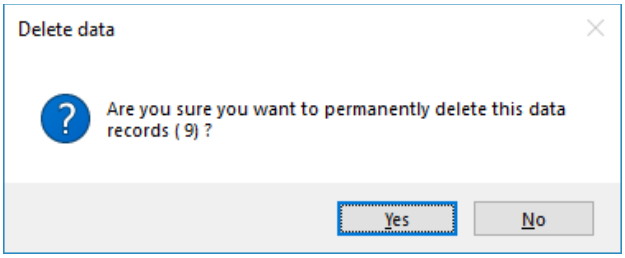
On the page of any report, you can delete records from the database.

In the **Standard** report mode, select an examination in the list and click the **Delete** button.

To delete examinations on the **Patient Report** page or on the **Group Report** page, check off the necessary examinations and click the **Delete** button.

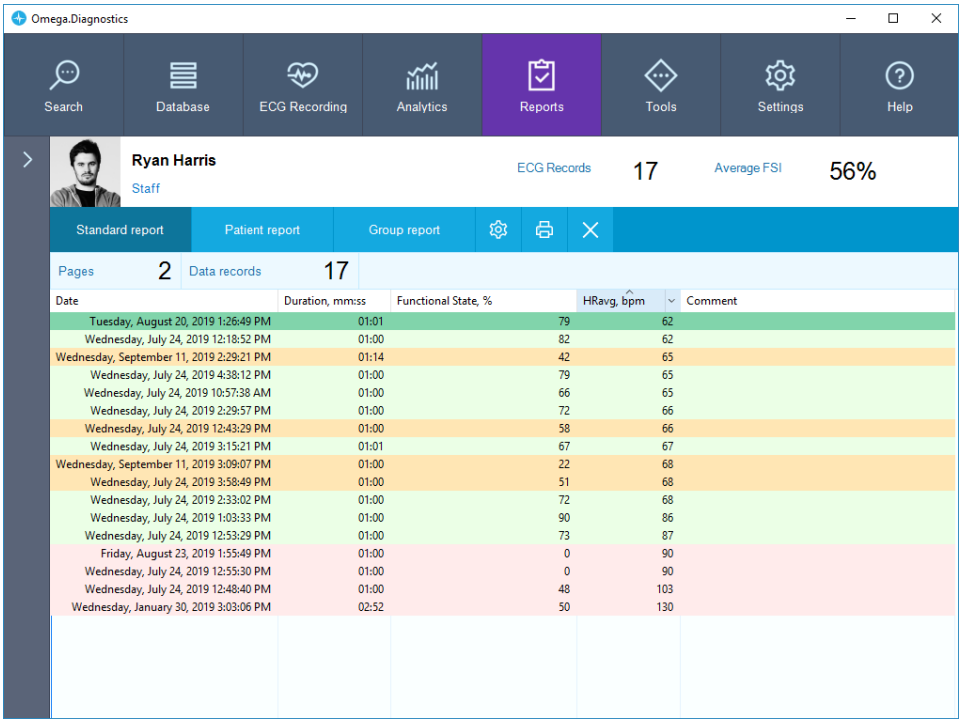


Confirm data deletion.



Data Sorting

By default, sorting in the table occurs by the examination date. In order to sort by another parameter, click on the desired column heading. Click on the column heading again to change the sort direction.

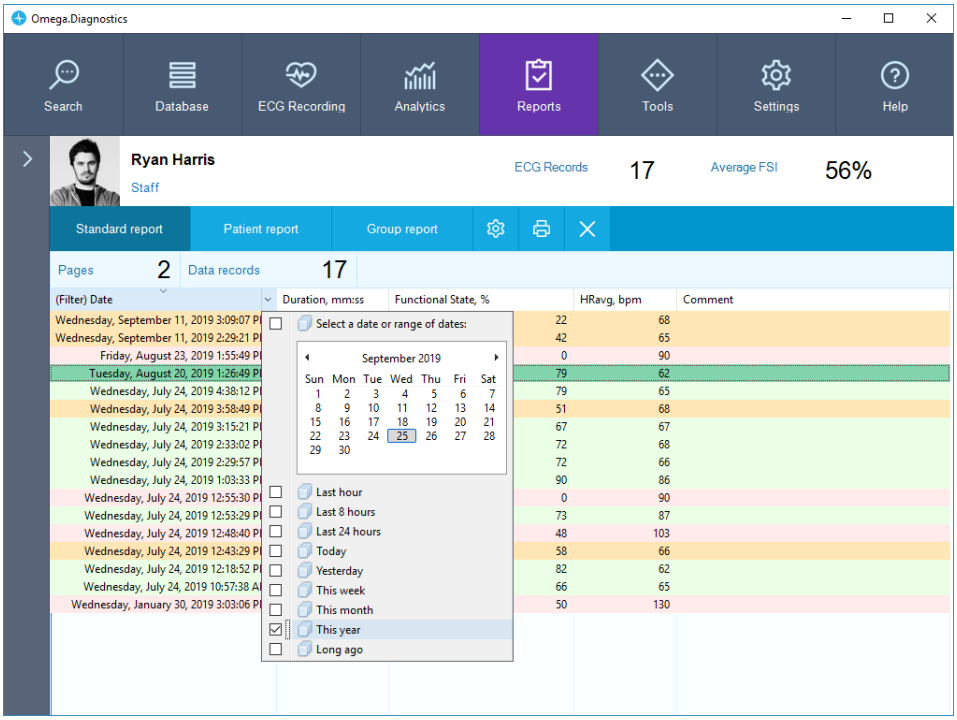


Data Filtering

Using the drop-down menu in the column headings, you can use the filtering of examinations in the table according to various conditions, for example, select data for the **last hour**, determine the **risk group** by functional state or blood pressure, etc.

After applying the filter, only those data that correspond to the filter conditions will be shown in the table.

If filtering is enabled by any column, its heading will be marked with the **(Filter)**.



Configure Table Columns

Change the column width in the table if necessary. This can be done by pulling the right edge of the header of the desired column.

Column width adjustment may also be required in the patient report or in the group report. In this case, the column width in the printed table on paper will be proportional to the column width in the table on the computer screen.

Move the columns in the desired order if necessary. Drag and drop the column heading to the desired position.

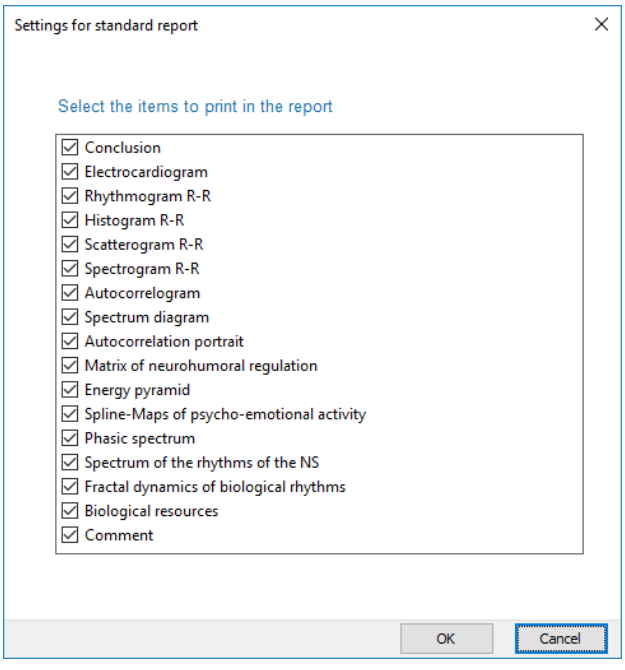
Column reordering may be required in the patient report or in the group report. The column order in the printed table on paper will correspond to the column order in the table on the computer screen.

Standard Report

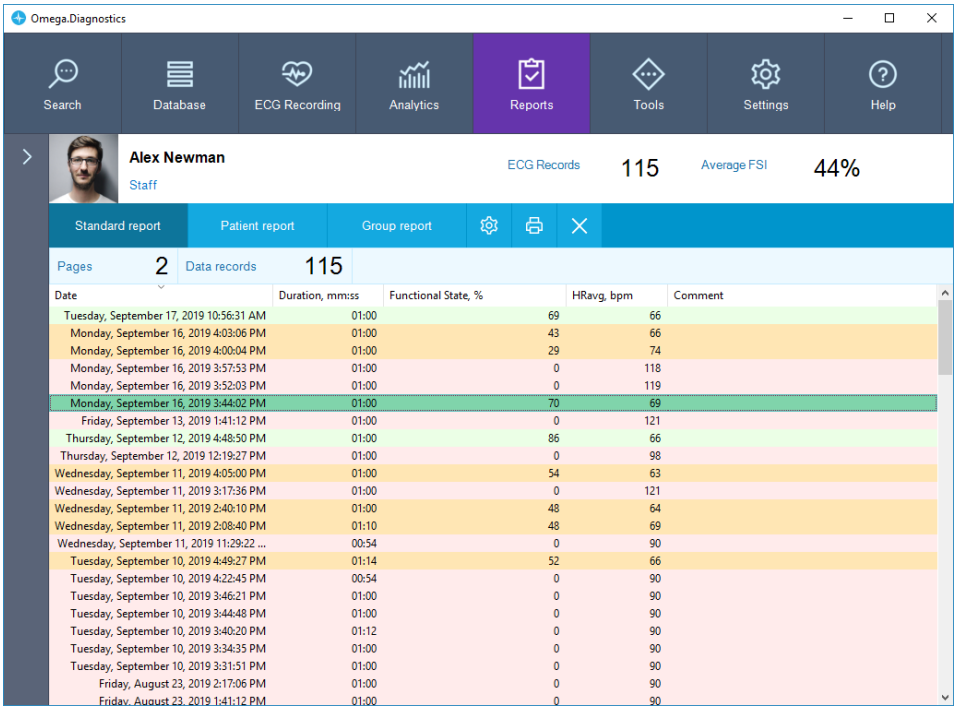
The report intended for printing the results of **one examination**.

The standard report consists of patient card, conclusion on the main indices of the functional state, graphical diagrams with calculated parameters and notes for examination.

To configure the report contents, click on the **Settings** button.



Mark the necessary elements for printing in the report and click the **OK** button.

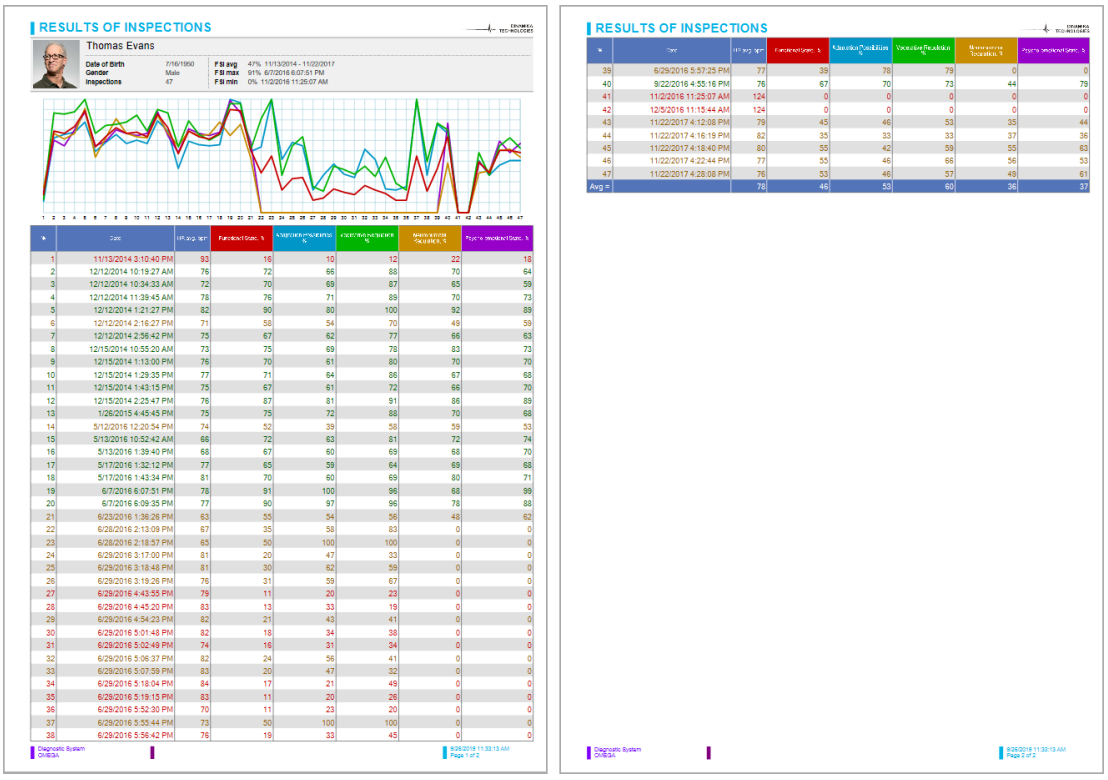


Select an examination in the table and click the **Print** button.

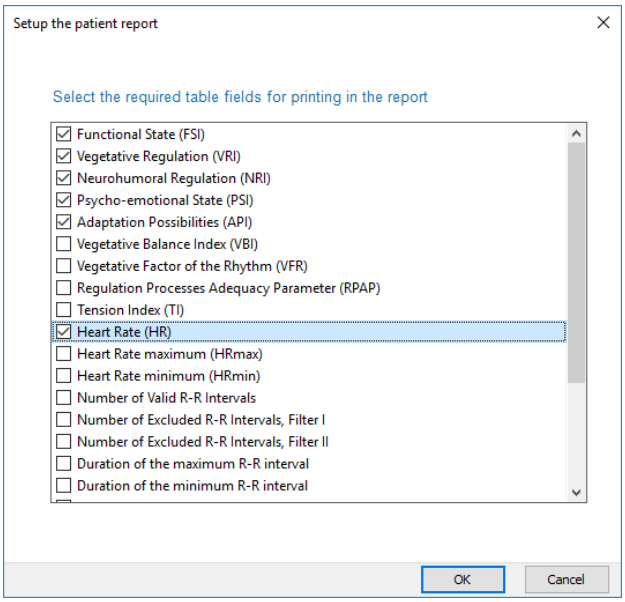
Patient Report

The report intended for printing the results of examinations for **one patient**.

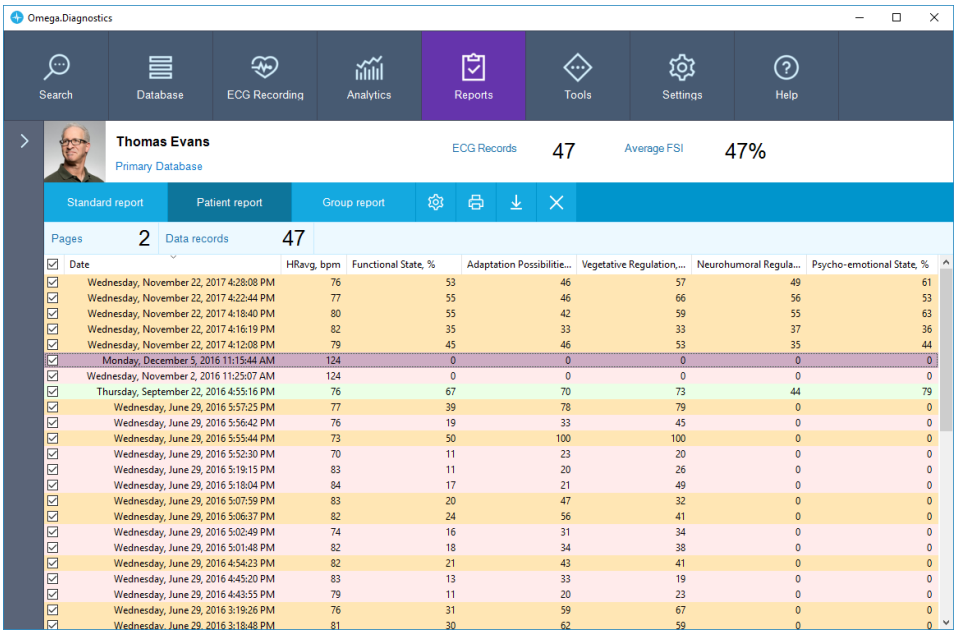
The report consists of a patient card, a functional state diagram and a table with calculated parameters for the selected examinations.



To configure the report contents, click on the **Settings** button.



Mark the necessary calculated parameters of the table for printing in the report and click the **OK** button.



When printing, the report includes examinations that are marked with checkboxes in the table. To exclude some examinations from the report, uncheck them.

Adjust the order and column width in the table, if necessary, use data filtering and change the sorting.

The table printed in the report in accordance with all the changes that were made to the table settings on the report page.

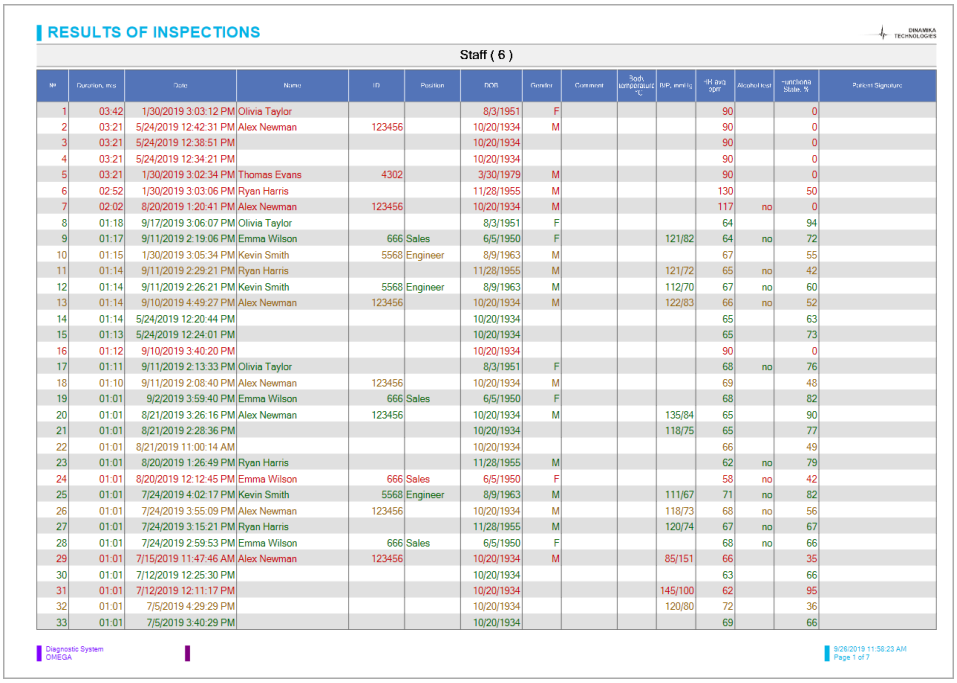
To print the report, click on the **Print** button.

The prepared report can save to a file in **CSV format**. This is a text format, that can be opened, for example, in **MS Excel**. To save the report to disk, click on the **Save** button.

Group Report

The report intended for printing the examination results of a **group of patients**.

The report consists of a table with the calculated parameters from selected examinations.



RESULTS OF INSPECTIONS

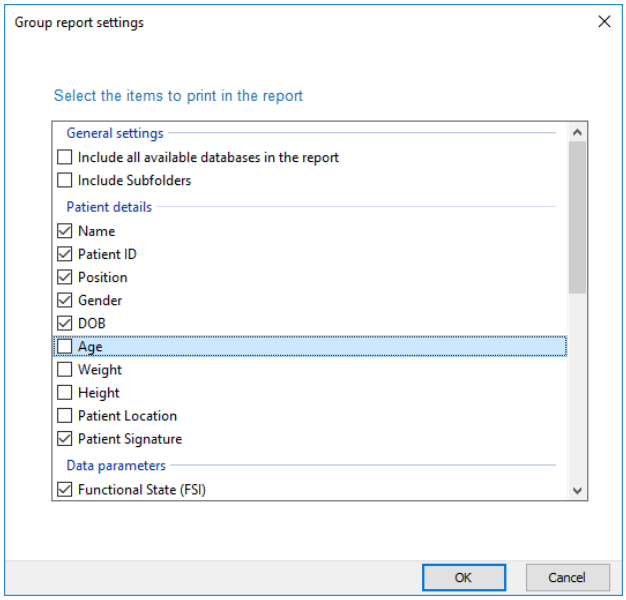
Staff (6)

№	Duration, mm:ss	Date	Name	ID	Position	DOB	Gender	Comment	Body temperature, °C	B/P, mm Hg	HR (bpm) SpO2	Alcohol test	Functional State, %	Patient Signature
1	03:42	1/30/2019 3:03:12 PM	Olivia Taylor			8/3/1951	F				90		0	
2	03:21	5/24/2019 12:42:31 PM	Alex Newman	123456		10/20/1934	M				90		0	
3	03:21	5/24/2019 12:38:51 PM				10/20/1934					90		0	
4	03:21	5/24/2019 12:34:21 PM				10/20/1934					90		0	
5	03:21	1/30/2019 3:02:34 PM	Thomas Evans	4302		3/30/1979	M				90		0	
6	02:52	1/30/2019 3:03:06 PM	Ryan Harris			11/28/1955	M				130		50	
7	02:02	8/20/2019 1:20:41 PM	Alex Newman	123456		10/20/1934	M				117	no	0	
8	01:18	9/17/2019 3:06:07 PM	Olivia Taylor			8/3/1951	F				64		94	
9	01:17	9/11/2019 2:19:06 PM	Emma Wilson	666	Sales	6/5/1950	F			121/82	64	no	72	
10	01:15	1/30/2019 3:05:34 PM	Kevin Smith	5568	Engineer	8/9/1963	M				67		55	
11	01:14	9/11/2019 2:29:21 PM	Ryan Harris			11/28/1955	M			121/72	65	no	42	
12	01:14	9/11/2019 2:26:21 PM	Kevin Smith	5568	Engineer	8/9/1963	M			112/70	67	no	60	
13	01:14	9/10/2019 4:49:27 PM	Alex Newman	123456		10/20/1934	M			122/83	66	no	52	
14	01:14	5/24/2019 12:20:44 PM				10/20/1934					65		63	
15	01:13	5/24/2019 12:24:01 PM				10/20/1934					65		73	
16	01:12	9/10/2019 3:40:20 PM				10/20/1934					90		0	
17	01:11	9/11/2019 2:13:33 PM	Olivia Taylor			8/3/1951	F				68	no	76	
18	01:10	9/11/2019 2:08:40 PM	Alex Newman	123456		10/20/1934	M				69		48	
19	01:01	9/2/2019 3:59:40 PM	Emma Wilson	666	Sales	6/5/1950	F				68		82	
20	01:01	8/21/2019 3:26:16 PM	Alex Newman	123456		10/20/1934	M			135/84	65		90	
21	01:01	8/21/2019 2:28:36 PM				10/20/1934				118/75	65		77	
22	01:01	8/21/2019 11:00:14 AM				10/20/1934					66		49	
23	01:01	8/20/2019 1:26:49 PM	Ryan Harris			11/28/1955	M				62	no	79	
24	01:01	8/20/2019 12:12:45 PM	Emma Wilson	666	Sales	6/5/1950	F				58	no	42	
25	01:01	7/24/2019 4:02:17 PM	Kevin Smith	5568	Engineer	8/9/1963	M			111/67	71	no	82	
26	01:01	7/24/2019 3:55:09 PM	Alex Newman	123456		10/20/1934	M			118/73	68	no	56	
27	01:01	7/24/2019 3:15:21 PM	Ryan Harris			11/28/1955	M			120/74	67	no	67	
28	01:01	7/24/2019 2:59:53 PM	Emma Wilson	666	Sales	6/5/1950	F				68	no	66	
29	01:01	7/15/2019 11:47:46 AM	Alex Newman	123456		10/20/1934	M			85/151	66		35	
30	01:01	7/12/2019 12:25:30 PM				10/20/1934					63		66	
31	01:01	7/12/2019 12:11:17 PM				10/20/1934				145/100	62		95	
32	01:01	7/5/2019 4:29:29 PM				10/20/1934				120/80	72		36	
33	01:01	7/5/2019 3:40:29 PM				10/20/1934					69		66	

Diagnostic System OMEGA

9/26/2019 11:58:23 AM Page 1 of 7

To configure the report contents, click on the **Settings** button.

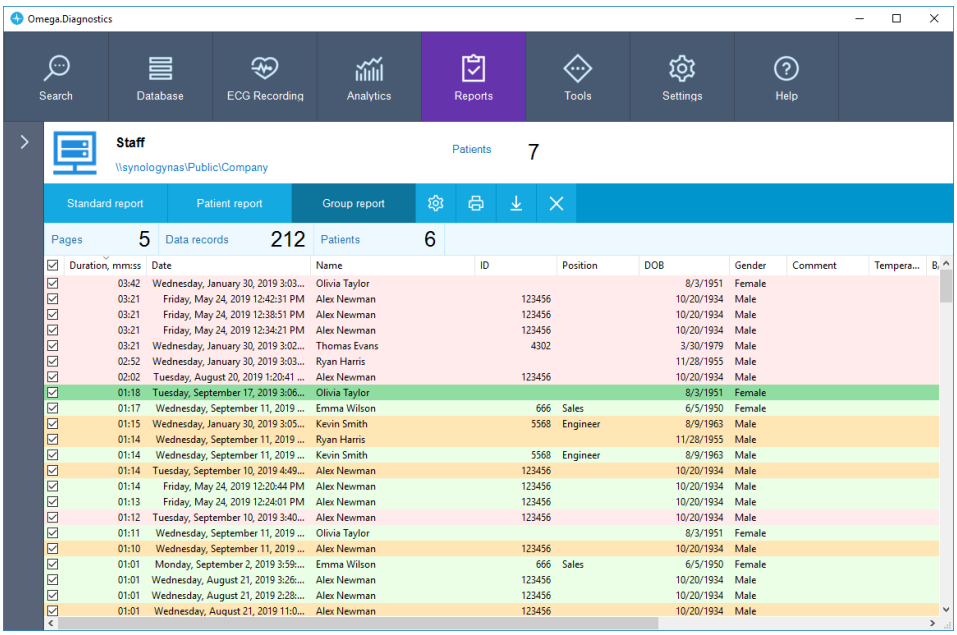


The option **Include All Available Databases in the Report** adds data from all connected databases to the report. This may be required to create an enterprise-wide report, when employee accounts grouped by departments in different databases.

The option **Include Subfolders** adds data from subdirectories of the selected folder to the report. By default, data from the current folder only gets into the report.

The **Patient Location** option adds a column to the table with the folder name in which the patient account is located. This may be required when enabled the options **Include All Available Databases in the Report** and **Include Subfolders**.

Mark the necessary elements for printing in the report and click the **OK** button.



When printing, the report includes examinations that are marked with checkboxes in the table. To exclude some examinations from the report, uncheck them.

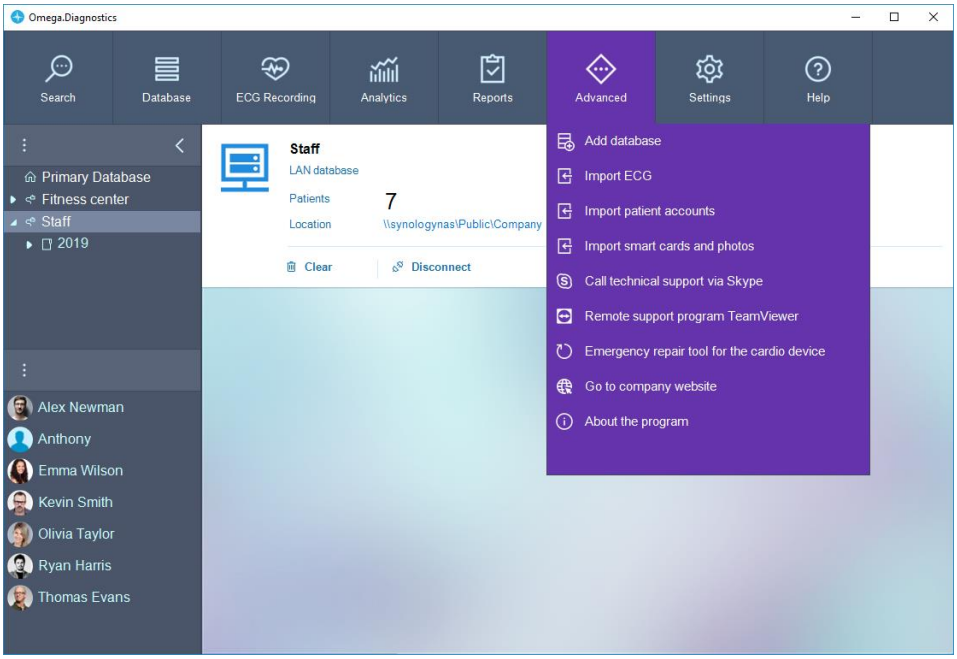
Adjust the order and column width in the table, if necessary, use data filtering and change the sorting.

The table will print in report in accordance with all changes that were made to the table settings on the report page.

To print the report, click on the **Print** button.

The prepared report can save to a file in **CSV format**. This is a text format, that can be opened, for example, in **MS Excel**. To save the report to disk, click on the **Save** button.

Advanced



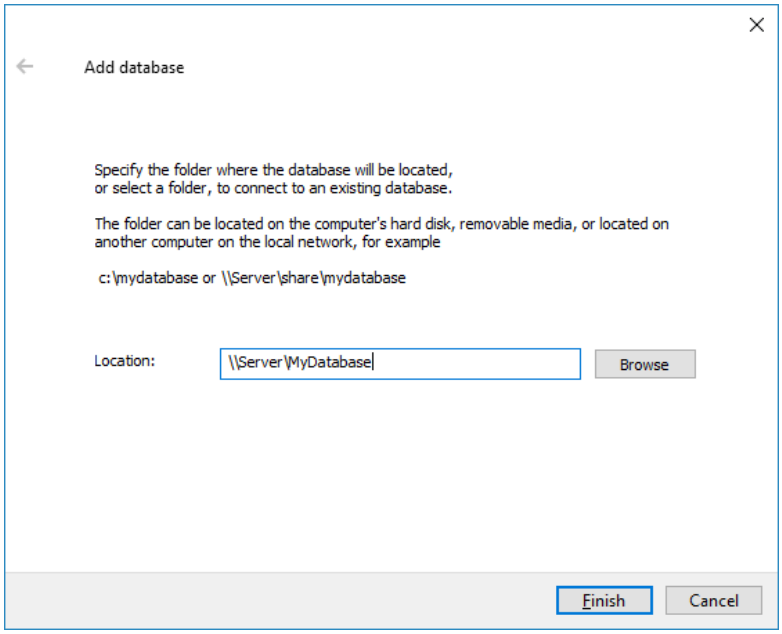
Add Database

In most cases, it is enough to use the **Primary Database**, which is located in a special directory on the local PC.

In some cases, may be required to place the additional database in some other place: in specific directory on the local PC, on external media connected to the PC, on remote computer on the local network, on network attached storage, etc.

To organize a new database, create a folder with any name on the PC, network attached storage or on another PC on the local network. Grant to this folder **read/write** permissions for the diagnostic complex computer. After that, connect this folder in the **Omega Diagnostics** application.

On the operating modes bar, click **Advanced**, and then click **Add Database**.

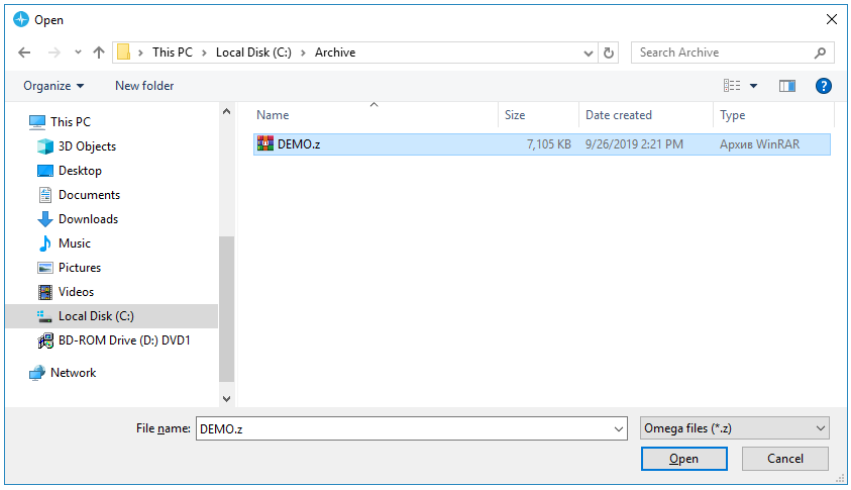


In the opened window, specify the path to the database folder. If you create a new database, make sure that the folder is empty. Next, click **Finish**.

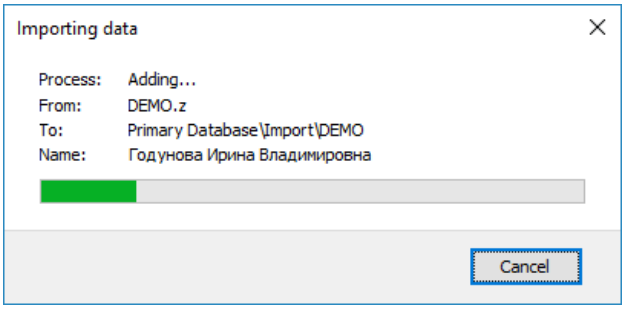
Import ECG

This function intended to import accumulated data from previous versions of the **Omega** application. To do this, first place this data in the archive file.

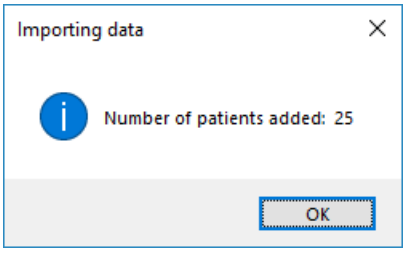
In the navigation bar, select the folder into which data will be imported. Next, on the operating modes bar, click **Advanced**, and then click **Import ECG**.



Specify the archive file location.



Progress information of the import process will displayed in a window. You can cancel the operation at any time.



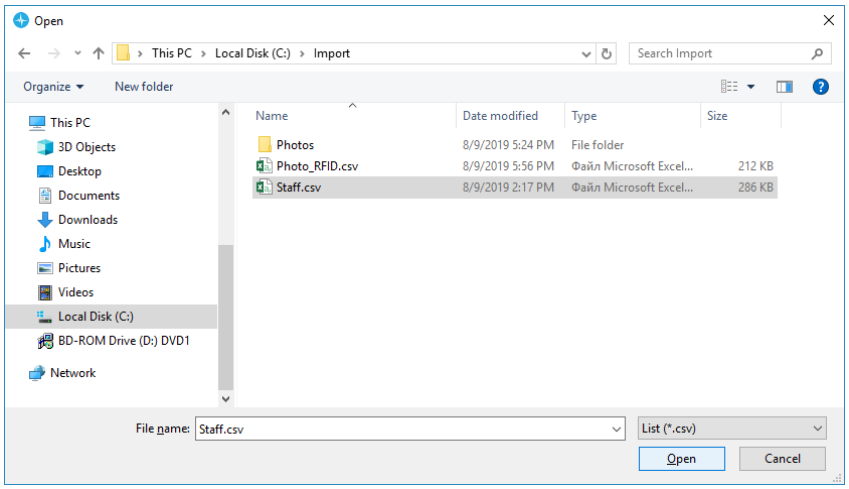
After the data import process is completed, the number of added patients will displayed.

Import Patient Accounts

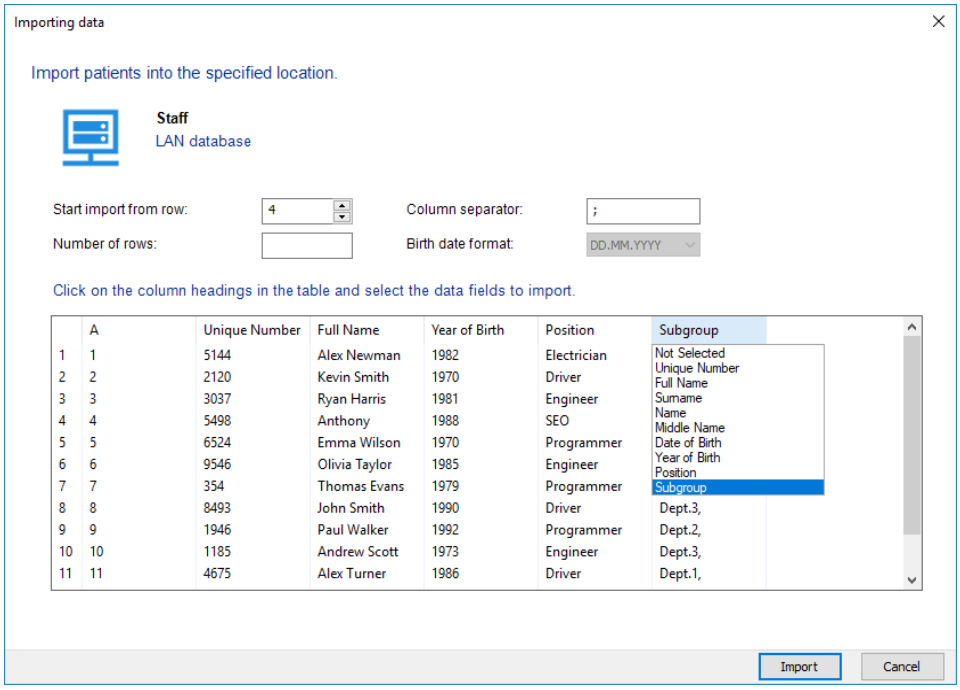
To add a large amount of patient accounts to the **Omega Diagnostics** database, use the import function.

Prepare a **CSV** file with patient data in tabular form. A file in this format can be prepared, for example, in **MS Excel**.

In the navigation bar, select the folder where you want to add patient accounts, open the **Advanced** menu on the operating modes bar and select **Import Patient Accounts**.



Specify the **CSV** file location with a list of patient accounts and click **Open**.



Preview window will open, in which you need to define data areas for import and their type.

If the data in the table does not display correctly, try changing the **delimiter character**.

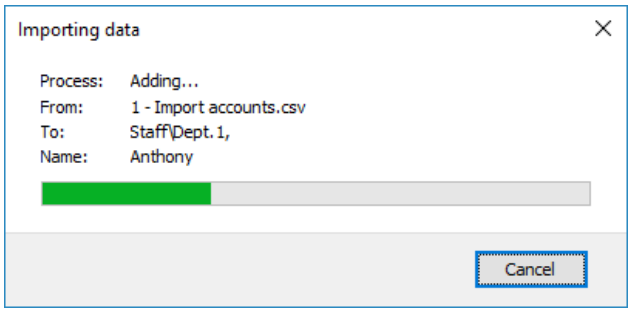
Select the necessary columns to import by specifying the data type for them. To do this, click on the column heading and select a value from the list that matches its contents.

If the **Date of Birth** column is imported, specify the format for this date.

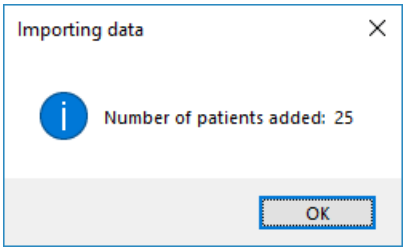
If the **Subgroup** column is imported, then the employees' accounts will placed in the appropriate **subfolders** with the names of subgroups.

If necessary, specify the line number from which the import starts and the number of lines to import.

After setting is completed, click on the **Import** button.



Progress information of the import process will displayed in a window. You can cancel the operation at any time.



After the data import process is completed, the number of added patients will displayed.

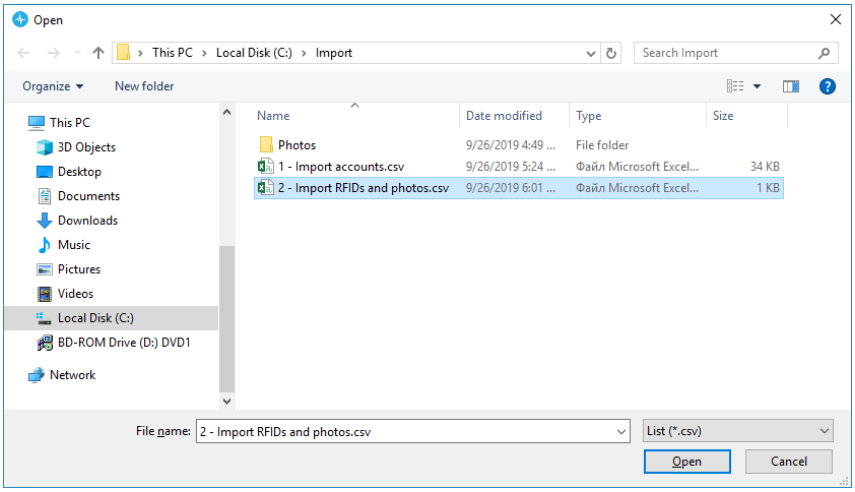
Import Smart Cards and Photos

This feature allows update or add **smart card identifiers** and **photos** of existing employees to **Omega Diagnostics** database.

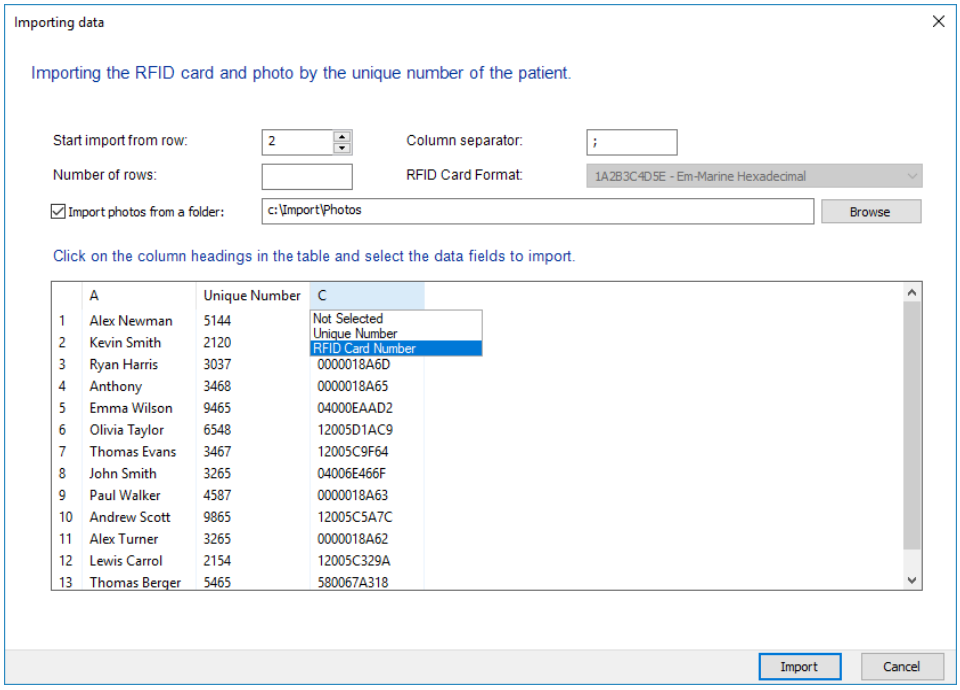
The key parameter for adding data is the employee **Unique Number**. Employee search in all connected databases and updating of his data, will be made by unique number.

Prepare a **CSV** file with employee data in tabular form. The table should contain a required column with the employee unique number. A file in this format can be prepared, for example, in **MS Excel**.

Open the **Advanced** menu on the operating modes bar and select **Import Smart Cards and Photos**.



Specify the **CSV** file location with employee data and click **Open**.



Preview window will open, in which you need to define data areas for import and their type.

If the data in the table does not display correctly, try changing the **delimiter character**.

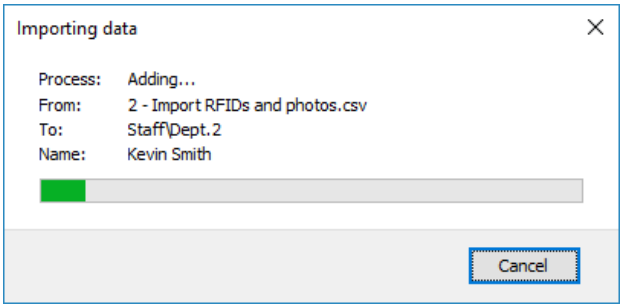
Select the column with employee **unique numbers** and, if necessary, the column with smart card identifiers. To do this, click on the column heading and select a value from the list that matches its contents.

If the **RFID Card Number** column is imported, specify the smart card format.

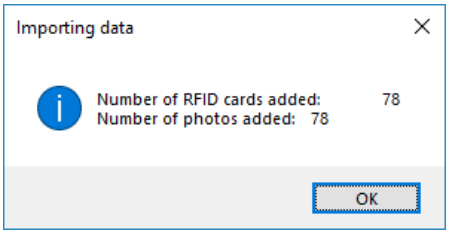
If photos of employees are imported, specify the path to the folder with photos. In this case, the names of the photo files should contain employee unique numbers.

If necessary, specify the line number from which the import starts and the number of lines to import.

After setting is completed, click on the **Import** button.



Progress information of the import process will displayed in a window. You can cancel the operation at any time.



After the data import process is completed, the number of smart cards and employee photos added will displayed.

Contacting Skype Technical Support

In case of any difficulties or questions regarding the work with the diagnostic complex, please contact the **Dinamika Technologies** technical support service.

If **Skype** installed on the computer, open the **Advanced** menu on the operating modes bar and select **Contacting Skype Technical Support**.

The work schedule of technical support service is available on the company's website at:

https://dyn.ru/en/support

TeamViewer Technical Support App

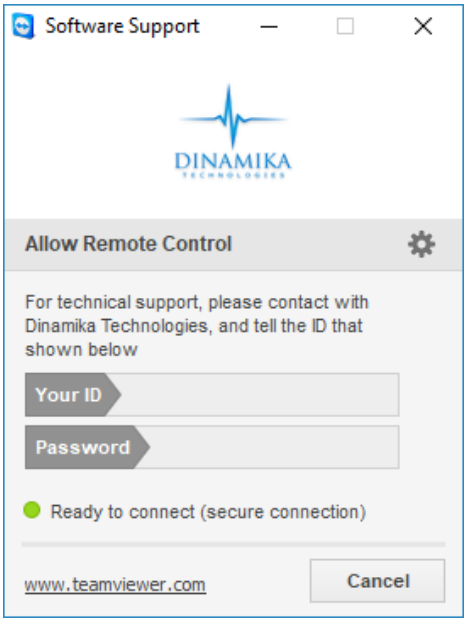
In some cases, a remote connection to your computer may be required to solve the problem.

Technical support carried out using a special application that is part of the software. Using this application, a technical specialist can connect to your PC and fix the problem.

This is absolutely safe, since it uses a specialized version of the remote control application from the well-known company **TeamViewer**.

> *Attention!*
> *If the standard TeamViewer application is already running on your computer, you will need to exit it. The support service uses a specialized version of TeamViewer, so the specialist will not be able to connect to the standard TeamViewer application.*

Open the **Advanced** menu on the operating modes bar and select **TeamViewer Technical Support App**.



After starting the application, contact the **Dinamika Technologies** technical support service.

Developer Website

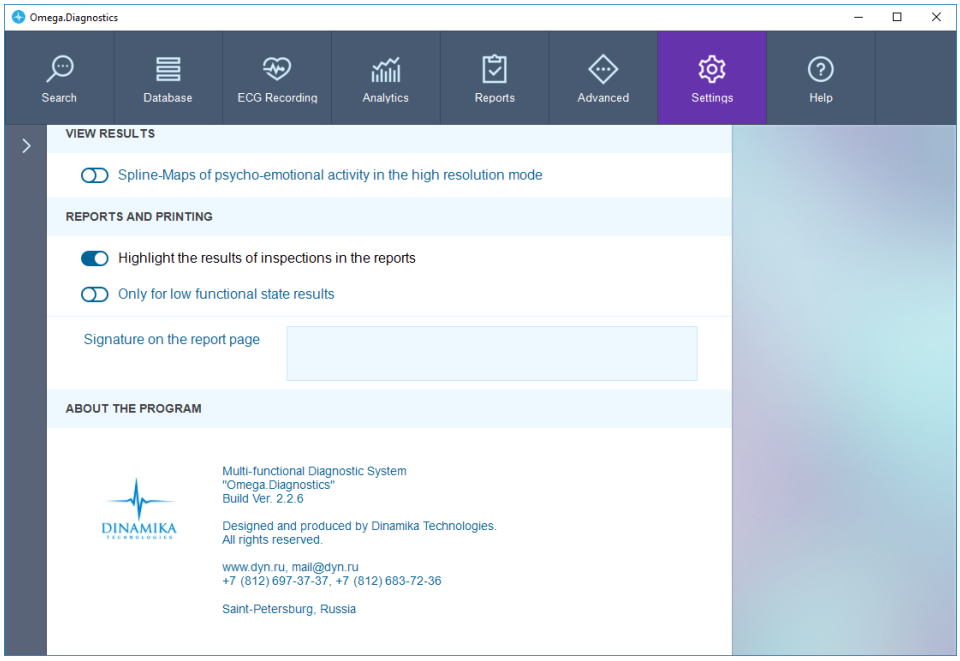
On the official website of the **Dinamika Technologies,** you can find out about the latest news, read useful articles, download the latest software, contact a company specialist and get any information that interests you.

To go to the website, open the **Advanced** menu on the operating modes bar and select **Developer Website**.

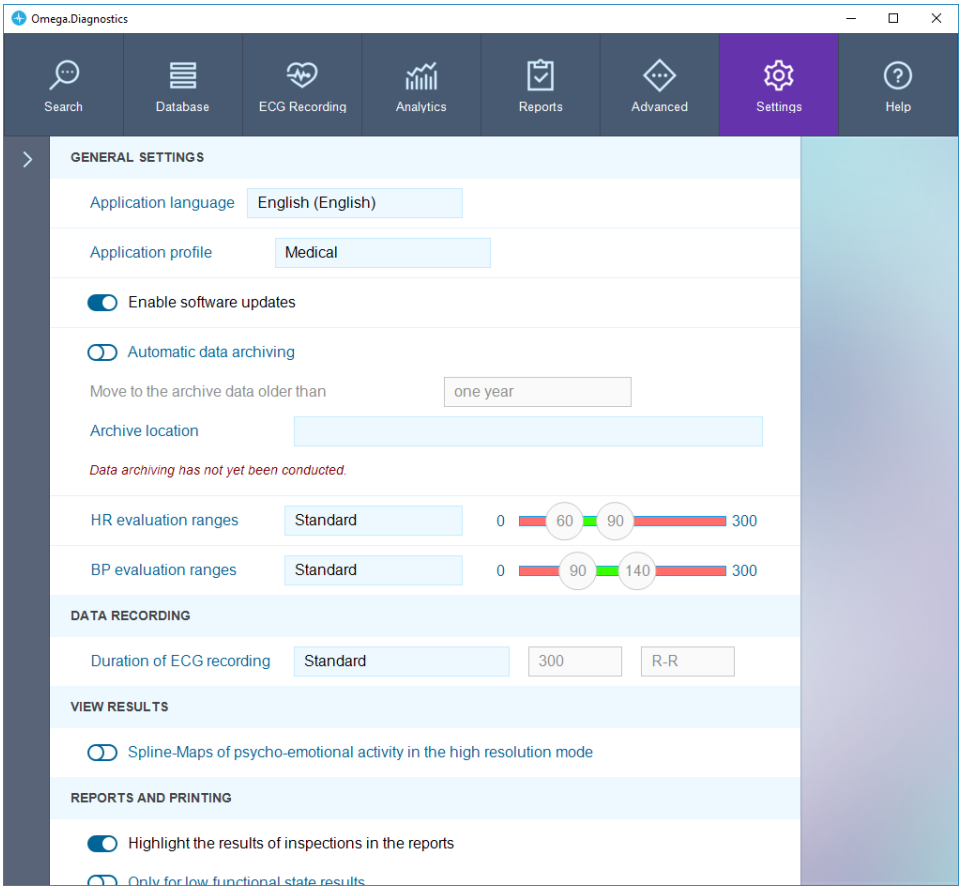
About

The basic information on the application can found on the application settings page. This information may be required when contacting a technical support specialist.

Click **Settings** on the operating modes bar and scroll down the page or open the **Advanced** menu and select **About**.

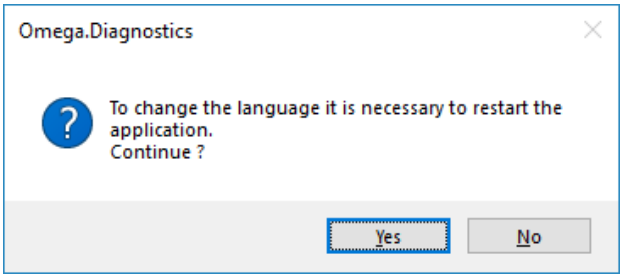


Settings



Application Language

Select one of the available languages from the drop-down list. In order for the changes to take effect, restart the application.



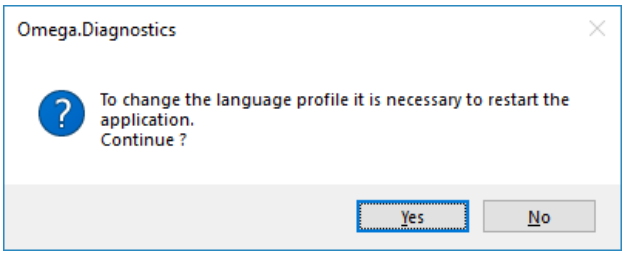
Confirm the language change, and the application will restart automatically.

Application Profile

From the drop-down list, select the application profile in accordance with the application area of the diagnostic complex. A profile defines the wording in the interface and some functionality of the application.

Please note that the **Industrial** profile opens up application's additional functionality.

In order for the changes to take effect, restart the application.



Confirm the profile change, and the application will restart automatically.

Enable Software Updates

Recommended not to disable the software updates, as the software is constantly being improved to increase reliability and new features are added.

If this setting enabled, then the updates will be check every time the application starts. If an update for the application is detected, it will be downloaded in the background and installed before the next application launch.

Automatic Data Archiving

In some cases, for example, during daily pre-shift inspections at the enterprise, the database size can grow significantly, which makes it difficult to quickly work with current

data. In this case, you can use the data archiving, which will occur automatically, without distracting the system operator.

If this setting is enabled, the data archiving process will start in the background each time the application starts. Data that will exceed the storage interval in the database will automatically moved to the archive directory.

Indicate the depth of data storage and the directory where the archive will be stored. Prepare an empty folder if data has not been archived yet, or select the folder in which the archive was previously located.

Recommended to place the archive on another PC on the network or on a network storage.

At any time, a data from the archive for the specified period can be recovered.

FS Evaluation Ranges

Available only for the Industrial profile.

The final result of the diagnosis is determined using the main measured parameters. Evaluation ranges used to determine the quality of each measured parameter.

Assessment of the **functional state index** occurs in 3 ranges: **red** – low values, **yellow** – average values, **green** – high values. The functional state index values are normalized from **0 to 100%**.

Standard evaluation ranges are usually used, but in some cases it may be necessary to change these ranges if the target group of patients has deviations in health condition.

To change the evaluation ranges, select **Standard**, **Low**, or **Custom** values from the drop-down list.

If selected the custom values, drag the sliders on the scale to set the desired ranges.

HR Evaluation Ranges

The final result of the diagnosis is determined using the main measured parameters. Evaluation ranges used to determine the quality of each measured parameter.

Assessment of **heart rate** occurs in 2 ranges: **red** - below or above normal, **green** – in the norm. Heart rate units – **bpm.**

Standard evaluation ranges are usually used, but in some cases it may be necessary to change these ranges if the target group of patients has deviations in health condition.

To change the evaluation ranges, select **Standard** or **Custom** values from the drop-down list.

If selected the custom values, drag the sliders on the scale to set the desired ranges.

BP Evaluation Ranges

The final result of the diagnosis is determined using the main measured parameters. Evaluation ranges used to determine the quality of each measured parameter.

Assessment of **blood pressure** values occurs in 2 ranges: **red** - below or above normal, **green** – in the norm. Blood pressure units – **Mmhg**.

Standard evaluation ranges are usually used, but in some cases it may be necessary to change these ranges if the target group of patients has deviations in health condition.

To change the evaluation ranges, select **Standard** or **Custom** values from the drop-down list.

If selected the custom values, drag the sliders on the scale to set the desired ranges.

Duration of ECG Recording

The standard ECG recording duration for determining the functional status is **300 R-R intervals** (about 5 minutes). Recommended to use a standard recording duration.

In some cases, it may be necessary to decrease or increase the duration of the recording.

Important!
The shorter the duration of the ECG recording, the less accurate the calculation of the indices of the functional state will be, and vice versa, the longer the duration of the ECG recording, the more accurate the calculation will be.

To change the recording duration, select from the drop-down list the **Standard**, **Short** or **Custom** duration of the ECG recording.

If selected the custom duration, specify the time in minutes or the number of R-R intervals until the recording is completed.

Alcohol Test Only at Low Rates of FSI

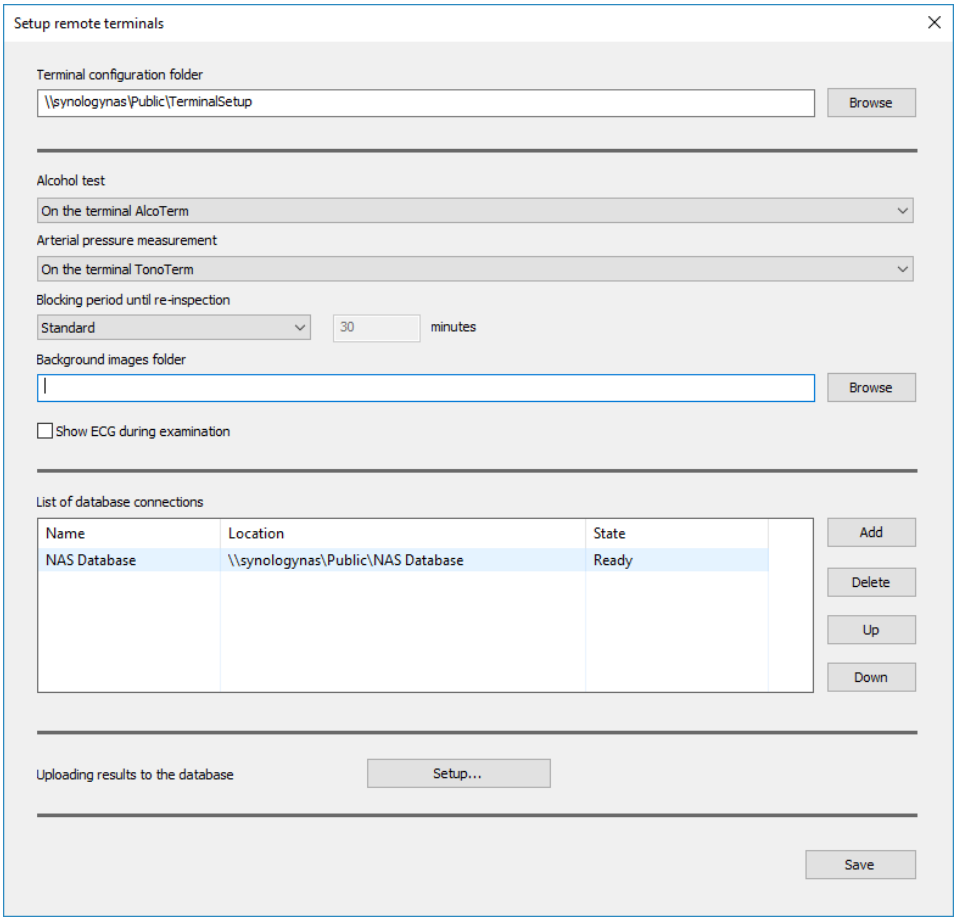
Available only for the Industrial profile.

If an alcohol detection device connected to the computer on which the **Omega Diagnostics** application opened, when this parameter is turned on, the alcohol test will be carried out only at low functional state indices after the examination, otherwise the examination will begin with the test for alcohol.

Management of Diagnostic Terminals

Available only for the Industrial profile.

If the complex includes diagnostic terminals, then the **Omega Diagnostics** application can configure them remotely.



Terminal Configuration Folder

Create a folder for storing the configuration of the terminals with any name on the operator's PC, in a network attached storage or on another PC in the local network, grant this folder read/write permissions for all computers in the diagnostic complex and specify its location in the settings window.

The **Omega Diagnostics** application updates the configuration for terminals only if the path to the folder for storing is specified.

Alcohol Test, Blood Pressure Measurement

Depending on the terminal configuration, select the rules for passing alcohol tests and measuring blood pressure.

List of Database Connections

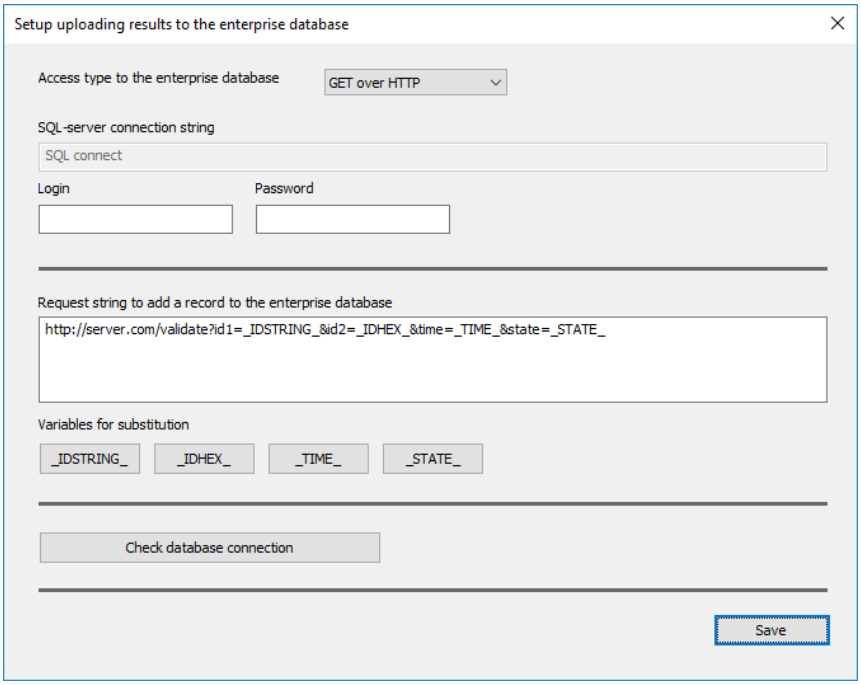
Add a connection of terminals to the database. Specify the folder that was connected in the **Omega Diagnostics** application and in which the accounts of employees and the results of their examinations are located.

For all connections, must be used a network folder names.

If there are several connections, you can set their priority using the **Up** and **Down** buttons.

Uploading Results to the Database

If necessary, configure the examination results uploading to the internal database of the enterprise, to do this, click on the **Settings** button.



Choose access type to the enterprise database, specify authorization parameters, make a request to send the results using special variables, and perform a final test of the connection to the database.

Spline-Maps of Psycho-Emotional Activity in the High Resolution Mode

Setting the operating mode of the chart **Spline-Maps of Psycho-Emotional Activity** in the **Analytics** section. Allows to show a higher detail spline-maps.

Highlight the results of inspections in the reports

If this setting is enabled, then the data in the tables in **printing** and in the **Reports** mode will be highlighted in **3 colors** (red, yellow, green) in accordance with the final results of the diagnostics.

Only for Low Functional State Results

If this setting enabled, then in the tables in **printing** and in the **Reports** mode, examinations will highlighted in **red** only with low final diagnostic results.

Signature on the Report Page

Indicate the name of the organization or any other necessary information as a signature. When a report is printed, the signature will displayed in the page footer.

TROUBLESHOOTING

The Application Does Not Start

Description: *When trying to launch the application, nothing happens or an error message occurs.*

1. **Check Operating System Version**

   The diagnostic complex software designed to work only under the control of **Microsoft Windows 7** and higher operating systems. The software on **Apple** computers is only possible using the **Boot Camp** utility and installing the **MS Windows 7/8/10** OS. Work in the virtual operating system is not supported.

2. **Reinstall the Software**

   The software files may have been corrupted by some other programs. The easiest way to fix this situation is to reinstall the software. No patient data will be affected. You can always download the latest software versions from the **Dinamika Technologies** website in the Downloads section.

3. **Check Your Antivirus Software**

   Perhaps the diagnostic software was blocked for some reason by the antivirus installed on your computer. This could be caused by a virus attack on your computer, as a result of which the diagnostic software files were infected by the virus and subsequently blocked by the antivirus.

   Carefully check your computer for viruses, and then reinstall the diagnostic software. Strongly recommended that you download the latest version of the software from the **Dinamika Technologies** website again.

The Application Does Not Detect a Cardio Recorder

Description: *The software is running, the cardio recorder connected to the computer, but it is not possible to start ECG recording, since the software considers that the cardio recorder is not connected.*

1. **Check the Device Connection to Your Computer**

The USB cable connecting the cardio recorder and the computer should be **no longer than 3 meters**. Longer cables or various USB extension cables can interfere with the correct operation of the device.

Check the USB port on your computer by plugging in any operating USB device, such as a USB drive. If the computer has multiple USB ports, try to connect the cardio recorder in different USB ports.

2. Check the Cardio Recorder

The cardo recorder and connecting cables should not have any visible damage. If the USB cable damaged, replace it with a similar one purchased at any computer store. If the cardio recorder or electrode cables are damaged, contact the **Dinamika Technologies** or your local representative.

3. Check Cardio Recorder Driver

Make sure that the cardio recorder correctly recognized by the operating system of your computer.

To do this, open the Windows **Device Manager**. In the Device Manager, expand the **USB Controllers** group and make sure that the **USB Serial Converter** device is listed.

Next, right-click on this item and select **Properties** in the menu that opens. The device properties window opens. Make sure that **This device is working properly** is written in the **Device Status** field, then switch to the **Driver** tab and make sure that the version of the installed driver is **2.8.14.0** or higher.

If any of the above is not true, reinstall the cardio recorder driver. To do this, open the Windows **Start menu**, select **All programs**, and click the **Dinamika Technologies/Omega Diagnostics/Utilities/Install device driver**. As well, the device driver can be downloaded from the **Dinamika Technologies** website in the Downloads section. Before driver installing, make sure that the cardio recorder connected to your computer.

Database Issues

Description: *The patient list does not contain names, it is impossible to delete some patients, the entered names and dates of birth of patients are not saved.*

Run the Software as Administrator

This problem occurs because the software does not get enough rights from the operating system to access the computer hard disk.

For normal operation, it is necessary to run the software with administrative privileges. To do this, locate the software icon on the desktop, right-click on it, and select **Run as Administrator** in the menu that appears. You may need an administrator password, which you can get from a person who installed the operating system on your computer.

No ECG Signal

Description*: The cardio recorder detected by the software, but when you click on the Start button, nothing happens.*

Check Your Firewall Settings

Your computer's firewall may have blocked the signal reading from the cardio recorder.

To fix this situation, open the Windows **Control Panel**, select **Windows Firewall** and in the settings window that opens, select **Allow an app through firewall**.

Next, click the **Allow another app...** button.

Select the **Dinamika Device Driver** file in the explorer window that opens (by default, it is located along the following path: **C:\Program Files (x86)\Dinamika Technologies\<your software name>\dnahost.exe**).

When the line **Dinamika Device Driver** appears in the **Allowed Apps and Features** table, three checkboxes should be checked – next to the name **Dinamika Device Driver**, in the column **Private Network** and in the column **Public Networks**.

After that, close the firewall settings window by clicking **OK**.

If any other firewall installed on the user's computer, configure it so that it does not block the network capabilities of the **Dinamika Device Driver**. To do this, see the operating instructions of this firewall.

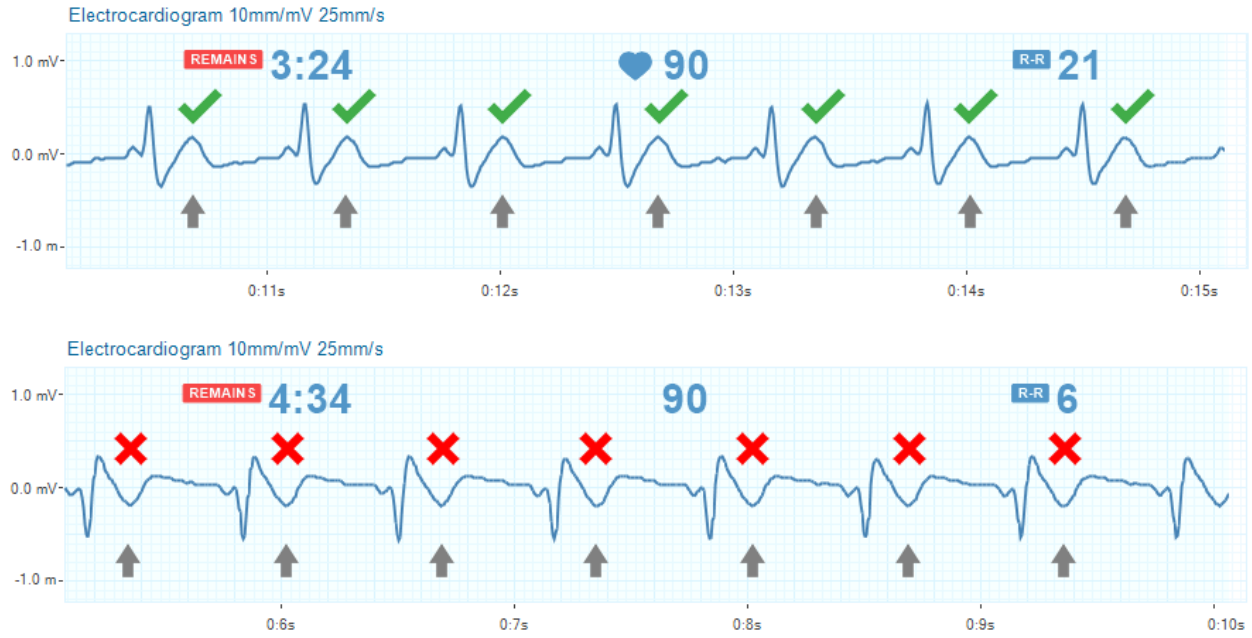
ECG Recording Issues

Description: *The ECG signal received from the cardio recorder, but the ECG recording does not start or recording interrupted during registration*.

1. **Check ECG Polarity**

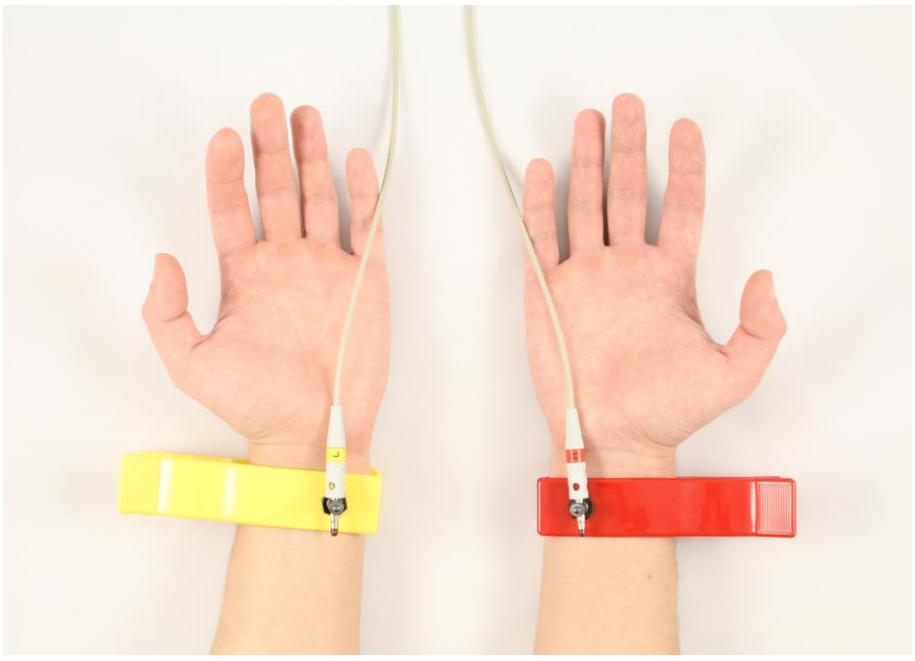
   It is important to make sure that the patient's ECG looks correct - the peaks of the cardiocomplexes should be clearly visible and they should be directed upwards. If they directed down, then the polarity of the ECG signal is reversed. In this case, you should

swap the electrodes worn on the patient or invert the polarity of the signal in the application.



2. Verify the Examination Procedure

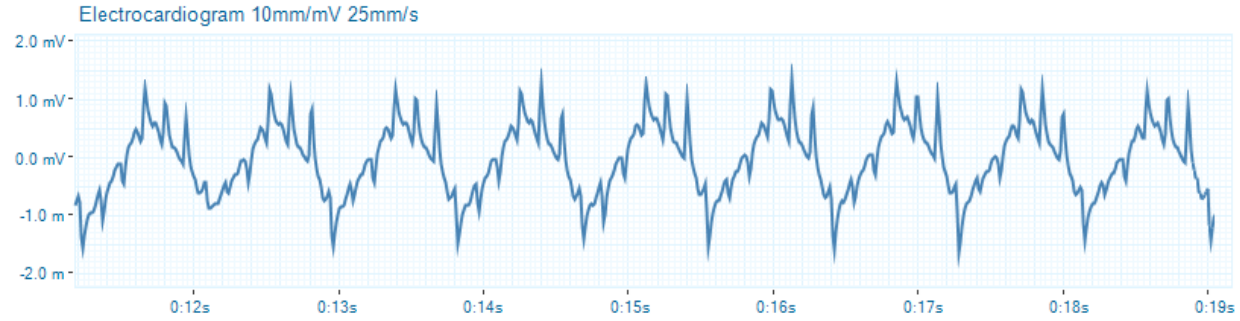
Make sure that the patient examination procedure is carried out correctly. Patient's hands and legs should be immobile and relaxed. In seated position, the patient's hands are on the knees, in supine – along the body. Within a radius of **1–2 meters** from the patient peoples should not walk. During the examination process, the patient should be in the most comfortable and relaxed state. It is not recommended to distract the patient by talking and showing him/her the computer screen from the recorded ECG. The patient may also close the eyes.



Electrodes should be worn on the patient's wrists so that the metal contact pad fits snugly on the inside of the wrist. Before starting work, the patient's wrists should be moistened with saline or ordinary water in places where they come into contact with the electrode pads. The use of distilled water not recommended because it practically does not conduct an electrical signal. If even after that the correct ECG signal does not appear on the screen, you can connect the electrode with a **yellow plug** instead of the left wrist to the left ankle, also having previously wetted the contact point.

3. Check for Interference in the ECG Signal

During the ECG recording, interference from the 220V electrical network is possible. Most often, this happens due to the lack of grounding in the electrical network. Network interference is also possible due to nearby powerful industrial equipment: fans, transformers, air conditioners, etc. In this case, the signal coming from the cardio recorder has the form of a frequently repeated pattern that has little in common with correct cardio complexes. Despite the fact that the diagnostic complex can recognize this interference as an ECG signal, the result of such an examination will not be correct.

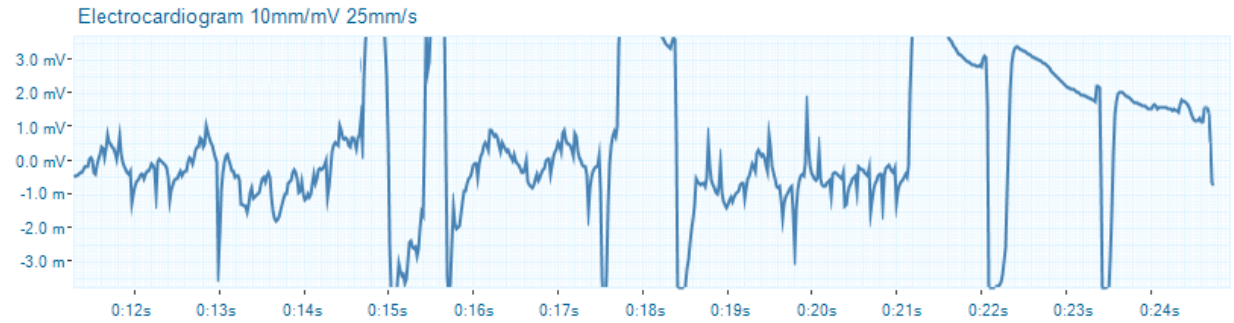


If you use a laptop to work with the diagnostic complex, then the simplest way to suppress interference will be to disconnect the power supply cable from it for the duration of working with the diagnostic complex, that is, so that the laptop works from the built-in battery. If you use a stationary computer, use high-quality network wiring with the obligatory presence of grounding. The presence of grounding in your network, or the possibility of connecting should be obtained from your electricity supplier.

Keep in mind that even if your laptop powered by the built-in battery, network interference can transmitted through peripherals connected to the laptop and at the same time to the power supply. Pay special attention to connected printers and network devices. Strongly recommended to disconnect all devices from your laptop, including a mouse, while searching for the interference source, even if you think that interference from this device cannot be transmitted. After discovering the interference source, it can either be completely disconnected from the computer, or temporarily disconnected for the examination period.

4. Check Electrode Cable Integrity

The electrode cable is made of a special thin copper conductor, which transfers the smallest changes in the electric potential well, and can be damaged during prolonged careless use. A cable break can be completely invisible from the outside, since the braid of the electrode cable is much stronger than the conductor itself. In this case, the ECG signal is chaotic, regardless of whether electrodes are worn on the patient or not.

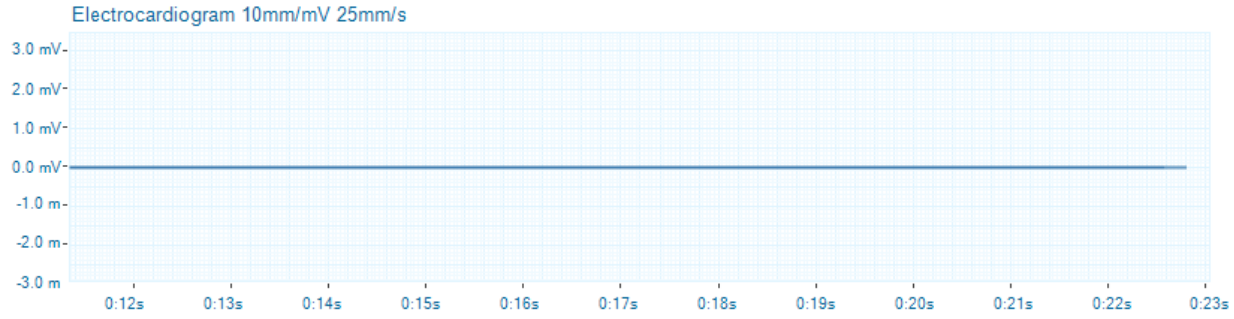


In order to determine the damage to the electrode cable, it is necessary to perform a simple procedure.

Launch the diagnostic complex software and start a new examination. The ECG signal should be visible on the screen, even if its shape is strange, and the program will report an incorrect signal.

Connect the metal plugs of the electrodes to close the electrical circuit.

If the electrode cable is operational, then when both electrodes are connected to each other, the ECG signal on the screen should quickly take the form of an ideal straight line. In the first seconds, this line will fluctuate from the top to the graph bottom, but very quickly, it should be located exactly in the center of the ECG graph and not change its shape until you open the electrodes.



If the electrode cable is damaged, then the electrodes connection with each other will not affect the shape of the ECG signal in any way – it will still remain chaotic. But even if this did not happen and the signal took the form of a flat line, you should make sure that this is not a coincidence, and the cable is really intact.

To do this, holding both electrodes with one hand closed with each other, with the other hand, carefully bend (but not breaking them!) the electrode cables along their entire length, while controlling the shape of the ECG signal on the screen. Most often, due to inaccurate use, the cable damaged next to its fastening to the electrodes clothespins, at the place where the braid of the plug ends and the cable itself begins.

If during the bending of the ECG signal cables becomes chaotic or the electrodes contact with each other does not at all lead to a flat line on the ECG graph, then the electrode cable has an internal gap and needs to be replaced. Repeat the above procedure again to make sure that the problem is in the cable, and, for example, not in poor contact of the electrodes with each other.

After that, contact **Technical Support** and allow a specialist access to your computer. If the specialist confirms that the problem is in the damage to the electrode cable, then you can send the cardio recorder for repair to the **Dinamika Technologies**.

If you have sufficient skills in the repair of electrical equipment or want to use the services of a qualified specialist, then you can order a new cable from the **Dinamika Technologies** and replace it yourself, having previously agreed to repair.

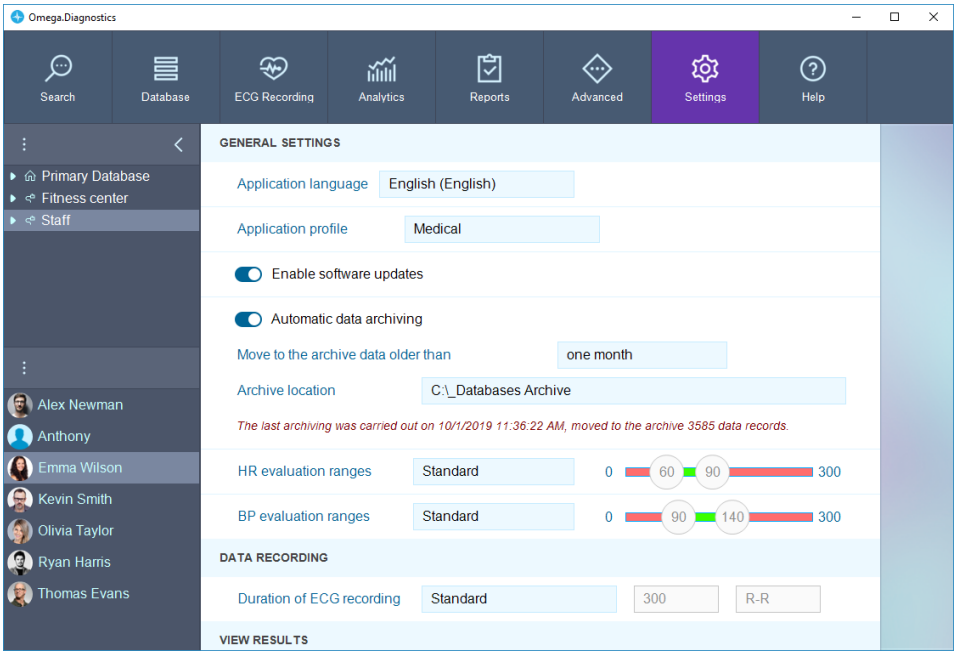
> *Attention!*
> *Any mechanical or electrical damage to the equipment will void the warranty. If you are not confident in your strength, then send the equipment for repair to the Dinamika Technologies.*

GENERAL ISSUES

Examinations Disappeared from the Database

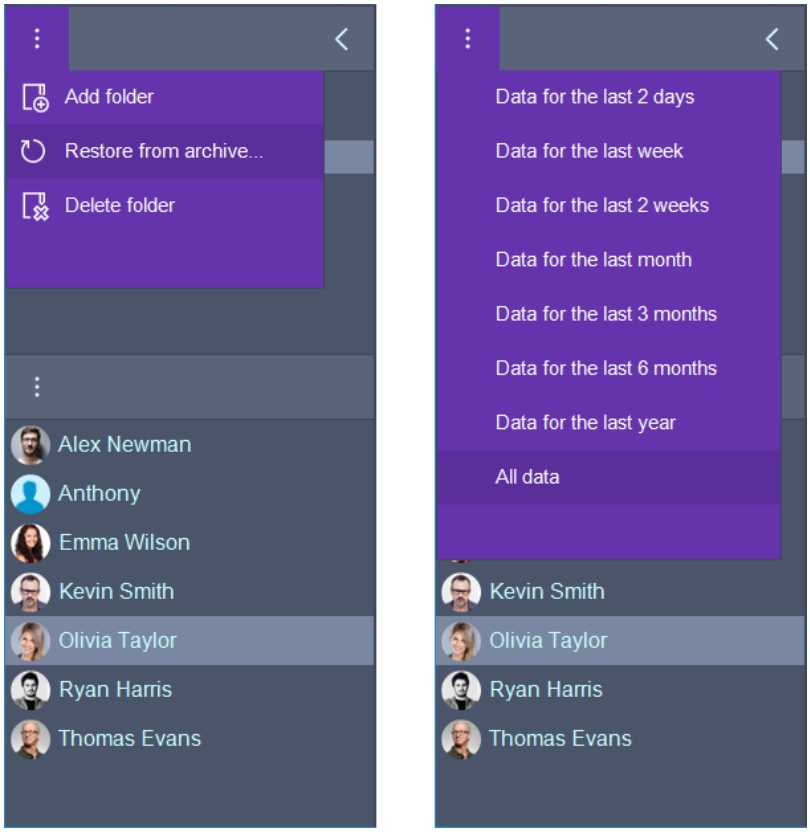
Perhaps the data was automatically moved to the archive.

Go to the **Settings** page. Check if automatic data archiving is enabled and disable this function if it is not necessary.



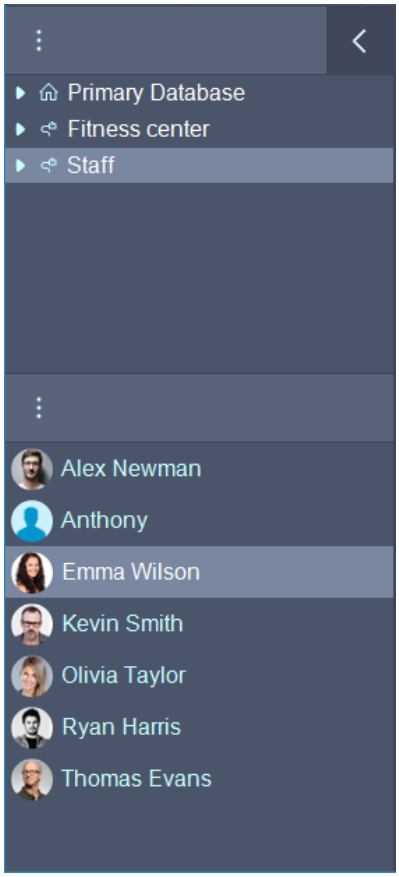
If archiving enabled, then when the application starts, the archiving process starts in the background. Archived data is stored in the folder specified in the **Archive Location** field. You can restore data from the archive at any time.

To recover, select the folder or patient in the navigation bar, click on the **Restore from Archive** in the context menu and select the depth of data recovery.



Data recovery will begin immediately, and the next time you start the application, the data will be moved to the archive again.

Hiding Folders and Patients



To hide or show the navigation bar, click on the **Hide/Show** button.

The navigation bar divided into 2 parts. In the upper part, there are folders, and in the lower part, there are patients from active catalog. If you mouse over the border between the upper and lower parts, press the left button and move, you can change the size occupied by folders and patients. In this way, you can completely hide one of the parts.

How to Import Data from Previous Versions of the Application

If you exported data from a previous version of the application, then the data was saved in the **.Z** archive file. On the panel of operating modes, click **Advanced**, then **Import ECG** and specify the location of the **.Z** archive. Follow the instructions in the data import wizard.

How to Register a Smart Card

Activate the **RFID Card** field in the employee card. Enter the card number using the keyboard or, if you have a card-reader, attach the card.

Switching between Single-Channel and Multi-Channel recording

Switching between recording modes occurs by repeated pressing the **ECG Recording** button on the panel of operating modes or by double-clicking on the **Electrocardiogram** chart.

Deleting Examination

Go to the **Analytics** page, select an examination in the **Functional State** diagram, and click the **Delete** button in the diagram or in the main parameters panel under the diagram.

If you want to delete several examinations, then use the **Delete** button on the **Reports** page.

Connecting the Database

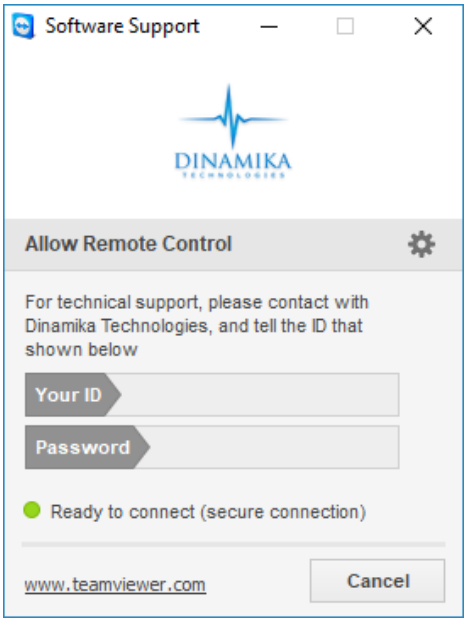
On the panel of operating modes, click **Advanced**, then select **Add Database**. In the window that opens, specify the path to the folder with the database and click the **Finish** button.

TECHNICAL SUPPORT

In some cases, a remote connection to your computer may be required to solve the problem.

The technical support carried out using a special application that is part of the software. Using this application, a technical specialist can connect to your PC and fix the problem. This is absolutely safe, since we use a specialized version of the remote control application from the well-known company **TeamViewer**.

Please note that if the **standard TeamViewer** application is already running on your computer, you will need to exit it. We use a **specialized version of TeamViewer**, so the technical specialist will not be able to connect to the standard **TeamViewer** application.



How to get the remote assistance:

1. Make sure your computer connected to the **Internet**.
2. Connect the **Cardio Recorder** to the computer.
3. Launch the **remote control application** from the software menu of your diagnostic complex or download from the **Dinamika Technologies** website: https://dyn.ru/distrib/TVQSen.exe.
4. After starting the remote control program, a window will appear on the screen, in which the identification number **Your ID** is indicated. Tell this number to a technical support specialist.

5. Now that everything is ready, contact a technical support specialist.

Important!
The launched remote control application cannot be closed until the technical support specialist completes the work. After connecting a technical support specialist to your computer, please do not use the keyboard and mouse until the connection is completed.

MAINTENANCE

Performing Maintenance of the Diagnostic Complex

Maintenance of computer equipment and network equipment included in the diagnostic complex carried out in accordance with the requirements of their manufacturer.

Additional equipment that is part of the complex requires maintenance in accordance with the instruction manual that is included with this equipment.

Cardio recorders manufactured by **Dinamika Technologies** do not require any maintenance during the entire life cycle.

Database

During the operation of the diagnostic complex, the database constantly increased by the patient examinations.

Recommended that you periodically clean up the expired data. This is necessary to speed up the software and to save space on the storage device.

Removing Unnecessary Data from the Database

1. In the **Reports** mode**,** select **Group Report**.
2. Open the report settings and enable **Include All Available Databases in the Report** and **Include Subfolders**.
3. The application will start searching for data across all databases, wait until the search ends.
4. Open the filter by the **Date** and select a period of time, for example, the previous year. Only the data for the selected period will remain in the table.
5. Click the **Delete** button. All data for the selected period will be deleted from the database.
6. Open the report settings and turn off **Include All Available Databases in the Report** and **Include Subfolders**.

Removing Unnecessary Data from the Archive

If automatic data archiving enabled, the archive directory will constantly increased and its cleaning will be required.

1. Select a database in the navigation bar.
2. Above the list in the drop-down menu, click **Restore from Archive...** and select the recovery depth.
3. Wait for the recovery process to complete. The database will contain only the data that needs to be saved.
4. In this way, restore data from the archive for all connected databases.
5. Open Windows Explorer, go to the archive folder, and delete its contents or move the contents to another location.
6. Restart the application. Only data that remains in the database will be moved to the archive.

EDUCATION FOR WORKING WITH DIAGNOSTIC COMPLEX

If necessary, the **Dinamika Technologies** conducts training courses on working with the diagnostic complex. Training can be done at the company's office in St. Petersburg or remotely using the **Skype** application.

Contact information on the official website of the company:

https://dyn.ru/en/callus

TERMS AND DEFINITIONS

AP – adaptation possibilities. The level of adaptation determines the body's ability to maintain a stable balance in the changing conditions of the external/internal environment, and is due to genetic factors, age and health.

Automatic data archiving – the process of finding and moving obsolete patient examinations from all connected databases to the archive. The depth of data storage in connected databases is set in the application settings. This process starts in the background when the application starts, provided that the data archiving function is enabled in the application settings.

BP – blood pressure.

Archive – a database in which the application automatically moves obsolete patient examinations from all connected databases. Not recommended to connect the folder with the archive database as a database in the application - use the function of restoring data from the archive instead.

Database – a directory in the file system containing subdirectories and encrypted files. The database has its own format developed by the Dinamika Technologies. The database stores patient data and their examinations.

Biological age – integral assessment of the state of the body, reflecting the stage of biological development and compliance with the average age characteristics. Calculated based on indicators of the functional state of the body, taking into account the calendar age and is relevant during the ECG measurement.

Bradycardia – reduced heart rate.

Common database – built-in application database that cannot be disconnected. All Dinamika Technologies software products installed on the computer have access to this database.

Restore from archive – the process of searching for data for a certain period of time in the archive and copying the detected data to connected databases in the application. This process started by the user. To restore data, select any directory or specific patient.

VFR – vegetative factor of the rhythm. Vegetative balance.

VR – vegetative regulation. It characterizes the state of the autonomic nervous system, which is responsible for the functioning of internal organs, glands of internal and external secretion, blood and lymph vessels.

VR (calculated parameter) – variation range. The difference in the duration of the largest and smallest RR intervals.

Hypertension – increased blood pressure.

RI – reliability index. A parameter that determines the quality of the measurement in the range from 0 to 100%.

Data reliability – see **RI**.

VBI – vegetative balance index. The ratio of sympathetic and parasympathetic regulation of cardiac activity.

TI – tension index. Reflects the degree of centralization of heart rate control.

SI – sport index. See **FSI**.

FSI – functional state index. A comprehensive indicator of the state of the body, calculated on the basis of indices of autonomic, neurohumoral regulation, psycho-emotional state and adaptive capabilities.

Cardio recorder – a device produced by the Dinamika Technologies for measuring and transmitting the patient's ECG to a computer.

Local database – a database located in the directory on the local computer or on removable media.

Local folder – a directory in the local database on the computer.

NR - neurohumoral regulation. In neurohumoral regulation, two mechanisms are distinguished: nervous and humoral. Nervous regulation - regulation of the vital activity of the body with the help of the nervous system. Humoral regulation carried out using chemicals through body fluids (blood, lymph, intercellular fluid). Neurohumoral regulation controls all the vital processes of the body, ensuring its integrity, as well as maintaining the relative constancy of the internal environment (homeostasis).

NS – nervous system.

Primary database – see **Common database**.

RPAP – regulation processes adequacy parameter. Reflects the correspondence between the level of functioning of the sinus node and sympathetic activity.

ECG polarity – the direction of the peaks of the electrocardiogram in the positive or negative direction on the diagram.

Application profile – profile selection changes some of the wording and functional features of the application in accordance with its scope.

PS – psycho-emotional state. Assessment of the level of the destructive effect of stress on the human body.

Network database - a database located in a remote directory on any computer on a local network or network storage.

Network folder – a directory in the network database.

RFID-card – a contactless plastic card with a unique employee identifier. Used to quickly search for an employee in all connected databases.

Sport index – see **FSI**.

T – body temperature.

Tachycardia – increased heart rate.

TL – training level. The ability to maintain a vegetative balance at rest with minimal effort.

FS – functional state. See **FSI**.

HR – heart rate.

ECG – electrocardiogram.

Energy balance - ratio between periods of expenditure and accumulation of physiological resources.

EL – energy level. The total amount of physiological resources of the body.

1k - correlation coefficient. It reflects the degree and nature of the influence of the central circuit on the autonomous (sinus node).

AMo – Amplitude of Mo. The percentage of RR intervals, which correspond to the value Mo.

Avg – average value.

CV – the coefficient of variation.

HF – high frequencies. Spectral power in the respiratory range.

HFnu - relative value of the power of high-frequency waves in normalized units.

HRVind – heart rate variability index. The ratio of the total number of RR intervals to the amplitude of the Mo.

LF/HF – vagosympathetic balance factor. Characterizes the balance of the effect on the heart of the parasympathetic and sympathetic divisions.

LF – low frequencies. Spectrum power in the vegetative range.

LFnu - relative value of the power of low-frequency waves in normalized units.

m0 - autocorrelation shift. The autocorrelation number at which the first negative value of 1k appears.

Mo – the duration of the RR interval, which occurs most often.

NN50 – the number of pairs of consecutive RR intervals differing by more than 50 ms.

pNN50 – the percentage of NN50 of the total number of RR intervals.

R-R – interval between R-peaks on the electrocardiogram.

RMSSD - standard deviation of differences of RR-intervals from their arithmetic mean.

RRNN – average duration of RR intervals.

SDNN – standard deviation of RR intervals.

TP - total power of spectrum. Reflects the summary effect of exposure on the cardiac rhythm.

VLF – very low frequencies. The power of spectrum in the vascular range.

Z – summary indicator of autocorrelation portrait on a color scale.