RIFTEK
Sensors & Instruments

DISC BRAKES PROFILE GAUGE

IKD Series

User's manual

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Contents

1. Safety precautions and measurement conditions

- Prior to mounting the profilometer onto the wheel/disk, areas of contact of the side supports with the wheel/disk surface should be thoroughly cleaned from dirt.
- When mounting the module on the wheel/disk, do not allow heavy shocks of its support against the wheel/disk.
- The output window of the profilometer and profilometer supports must be carefully inspected and cleaned.
- Do not use laser module in locations close to powerful light sources.

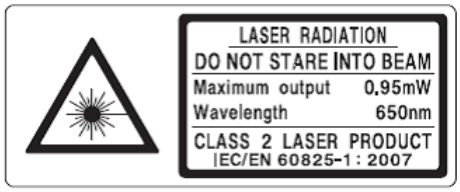
2. Electromagnetic compatibility

The profilometer have been developed for use in industry and meet the requirements of the following standards:

- EN 55022:2006 Information Technology Equipment. Radio disturbance characteristics. Limits and methods of measurement.
- EN 61000-6-2:2005 Electromagnetic compatibility (EMC). Generic standards. Immunity for industrial environments.
- EN 61326-1:2006 Electrical Equipment for Measurement, Control, and Laboratory Use. EMC Requirements. General requirements.

3. Laser safety

The profilometer make use of an c.w. 660 (or 405) nm wavelength semiconductor laser. Maximum output power is 1 mW. The device belongs to the 2 laser safety class according IEC 60825-1:2007. The following warning label is placed on the profilometer body:



The following safety measures should be taken while operating the profilometer:

- Do not target laser beam to humans;
- Do not disassemble the sensor;
- Avoid staring into the laser beam.

4. General information

Laser disc brakes profilometer IKD Series is designed for:

- measuring the disc brake thickness;
- measuring the disc brake wear;
- measuring the overall thickness of disc brakes;
- full profile scanning and analysis of the working surface of disc brakes;
- support of the electronic database of profiles.

There are two configurations available:

- for measuring parameters of the disc brakes installed on the wheel (Type 1);
- for measuring parameters of the disc brakes installed on the wheelset axle (Type 2).

5. Basic technical data

Name of parameter	Value
Measurement range	30
Profile measurement range, mm	150
Measurement error	± 0,03
Discreteness of indication, mm	0,01
Discreteness of the profile formation, not worse than, mm	0,1
Digital readout device (PDA) dimensions, mm	see Fig. 3
Dimensions of laser scanning module, mm	see Fig. 5
Power supply (laser scanning module Type 1)	4,8V, 4 AA rechargeable batteries, 1,2V
Power supply (laser scanning module Type 2)	4,8V, 4 AAA rechargeable batteries, 1,2V
Power supply (PDA)	3,7V Li-polymer battery 3300 mAh
The number of measurements that can be taken before battery recharge is not less than	1000
PDA memory capacity	100 000 measurements
Interface between laser scanning module and PDA	Bluetooth
Working temperature range, °C	-15…+35
Enclosure rating	IP42

6. Example of designation when ordering

IKD-Wheel Mounted – Profilometer for measuring parameters of the disc brakes installed on the wheel (Type 1).

IKD-Axle Mounted – Profilometer for measuring parameters of the disc brakes installed on the wheelset axle (Type 2).

7. Complete set to be supplied

Designation	Name	Quantity	Weight, kg
RF303M	Digital readout device (PDA)	1	0,3
RF506	Laser scanning module Type 1	1	2,5
	Laser scanning module Type 2	1	1,5
RF506.40	Charging device 9V 3.0A for PDA	1	0,2
RF506.41	Charging device 9V 3.0A for laser module	1	0,2
RF506.42	Data cable	1	
RF506.43	Bluetooth adapter	1	
RF506.30	Packing case	1	1,2
IKD_DB	Database management system (CD)	1	
RF506UM	User's manual	1	
	Calibration tools (option):		
RF506.11	Calibration block		4
RF506Calibr	Calibration software		

The profilometer comes in the special case that protects the device against any possible damage (Figures 1A, 1B).

Figure 1A. Type 1

Figure 1B. Type 2

8. Device structure

8.1. Basic components of the device and their functions

Basic components of the device (Figures 2A, 2B):

Figure 2A. Type 1

Figure 2B. Type 2

(1) Digital readout device (personal digital assistant, PDA)
(2) Laser scanning module
(3) Calibration block
(4) Charging device
(5) Data cable

8.1.1. Digital readout device

Digital readout device (PDA) is designed for control of the laser scanning module, data reception from the scanning module, indication of measurement results, parameter input, and data storage.

Figure 3

Figure 3 indicates:
(1) Turn-on button
(2) Charging indication, red/blue LED
(3) Connector to PC USB-port or charging device
(4) Flash memory card connector
(5) Stylus
(6) Bluetooth antenna
Overall dimensions of PDA are shown in Figure 4:

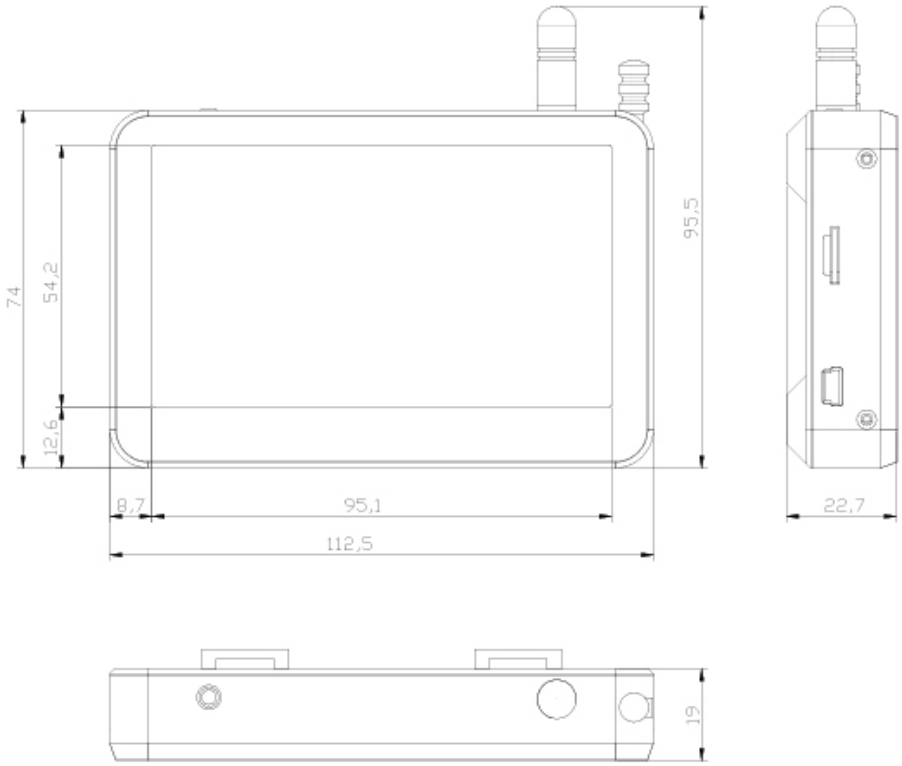


Figure 4

8.1.2. Laser scanning module

The module is intended for laser scanning of the brake disk surface.
Figure 5A and Figure 5B indicate:
(1) Turn ON button
(2) Indicator of turn ON (red LED)
(3) Indicator of Bluetooth connection (blue LED)
(4) Charging device connector
(5) Charging indication, red/green LED
(6) Magnetic support for mounting on the wheel side surface
(7) Output window

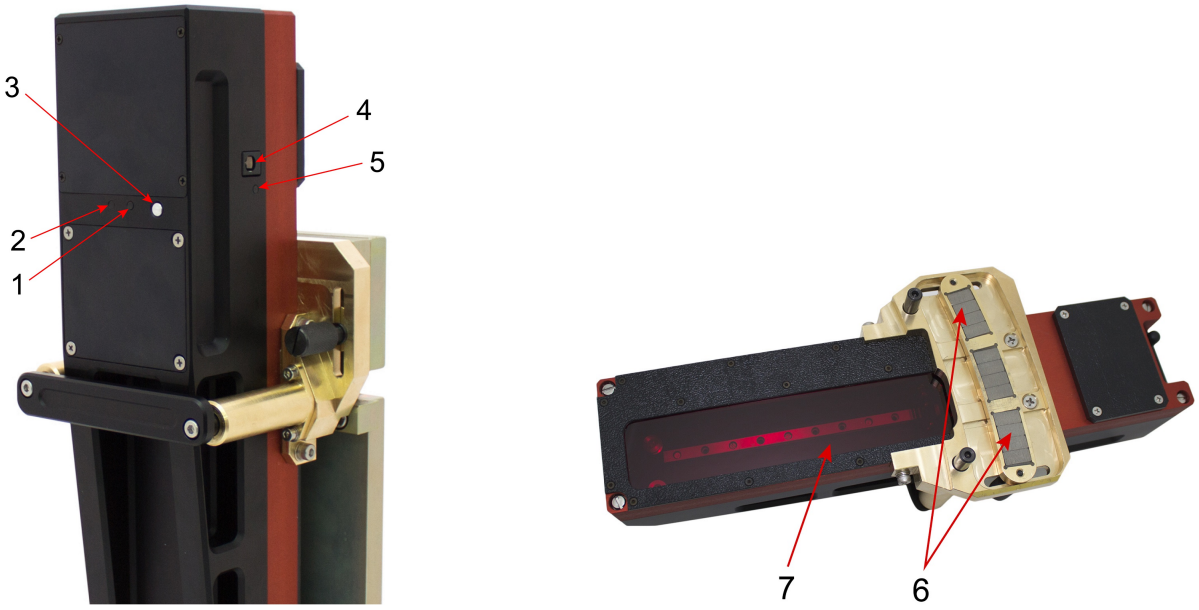


Figure 5A. Type 1

Figure 5B. Type 2

Overall dimensions of the scanning module for the break disk on wheel are shown in Figure 6:

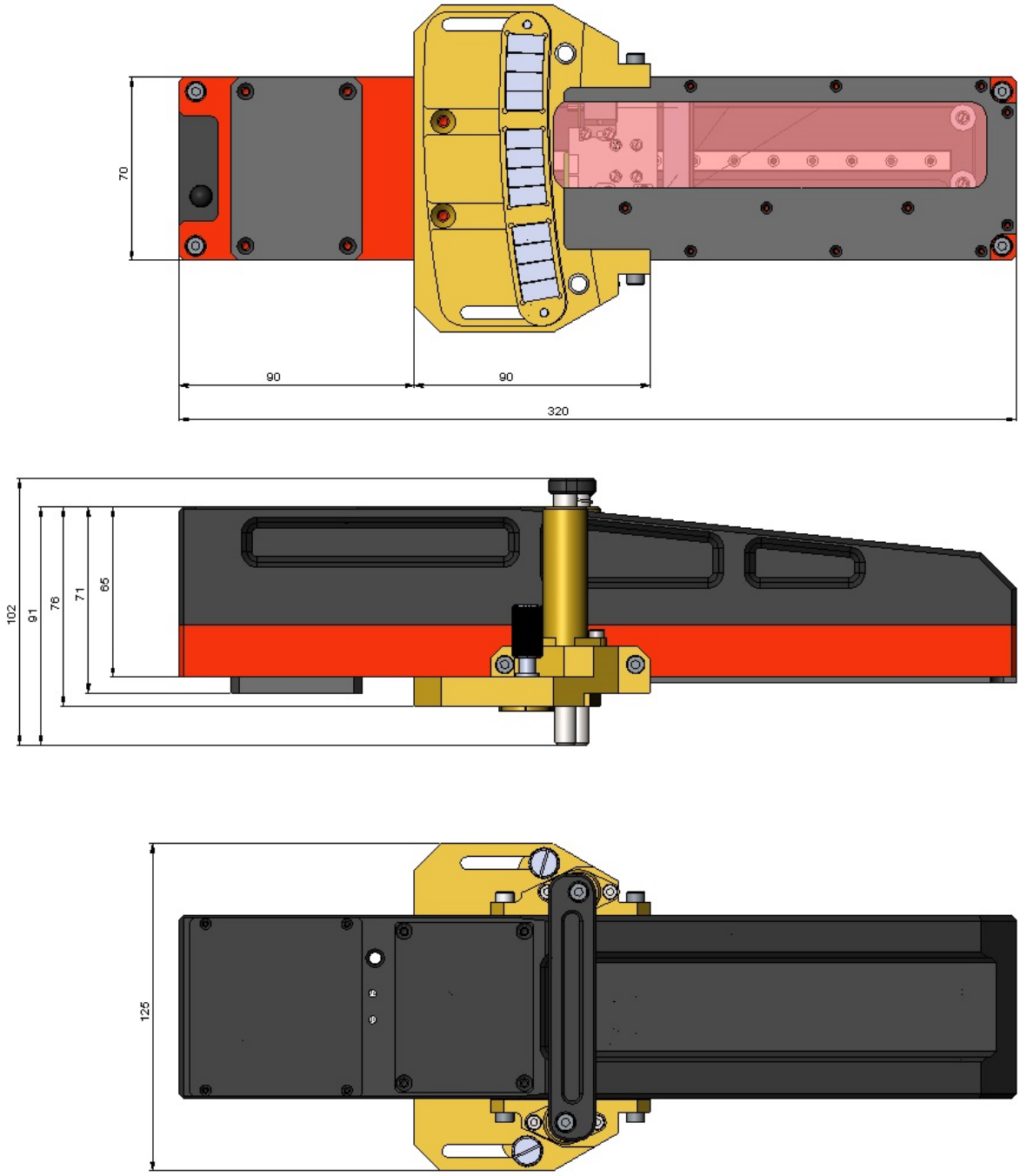


Figure 6

Example of mounting the IKD onto the break disc (Figure 7):

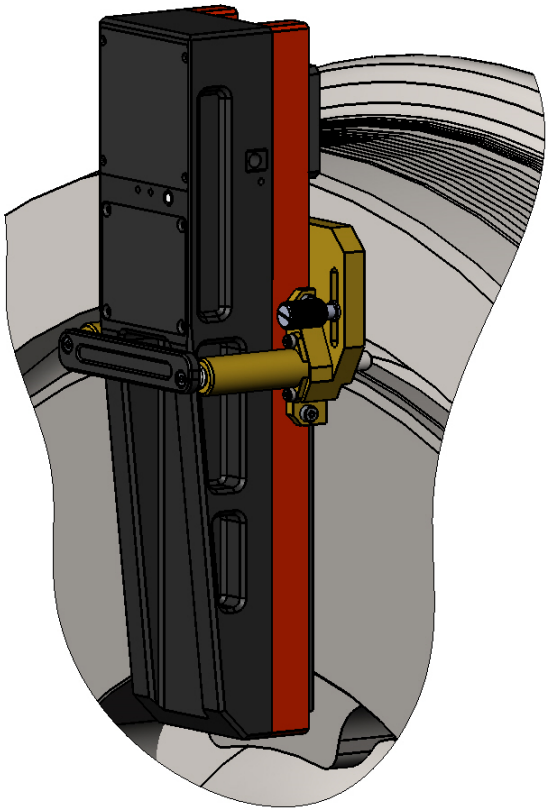


Figure 7

Overall dimensions of the scanning module for the break disk on wheel are shown in Figure 8:

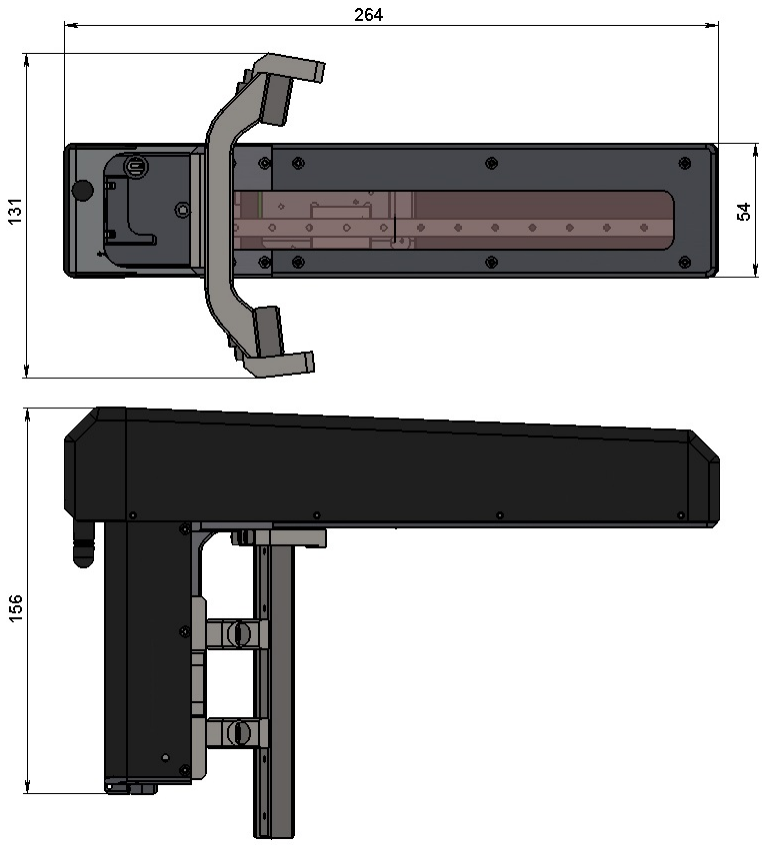


Figure 8

Example of mounting the IKD onto the break disc on the wheelset axle (Figure 9):

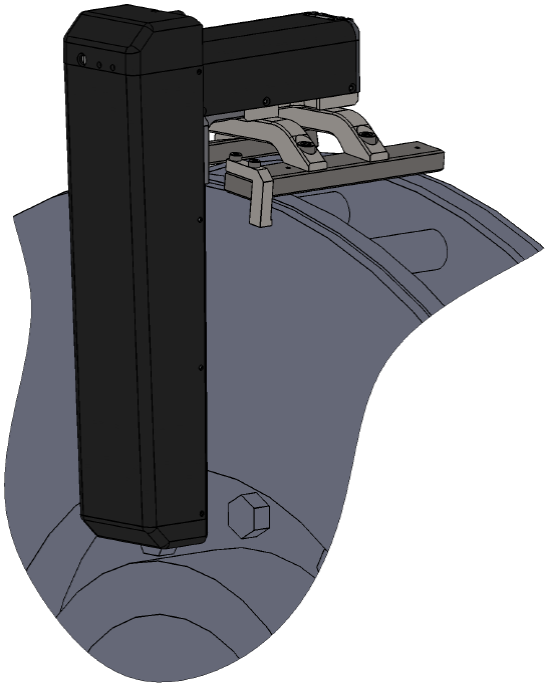


Figure 9

8.1.3. Calibration block

Calibration block is intended for calibration and tests of the profilometer. Calibration block is a metal imitator of the part of disk with a definite profile.

Overall dimensions of calibration block are shown in figure 1A of paragraph 27.2. Also possible is supply of a unit with a profile made to the customer's drawings.

9. Operation principle

Operator mounts the laser scanning module onto the disk to be measured. Having received a command from PDA or PC, the laser module performs non-contact scanning of the disk surface. Measurement results (geometric parameters and profile of the surface) are displayed on PDA, can be saved in the PDA memory, and transferred to the PC database. Simultaneously, additional parameters can be saved: operator number, side identifier (left or right wheel), axis number, locomotive (carriage) number, etc.

10. Geometric parameters of the brake disk under control

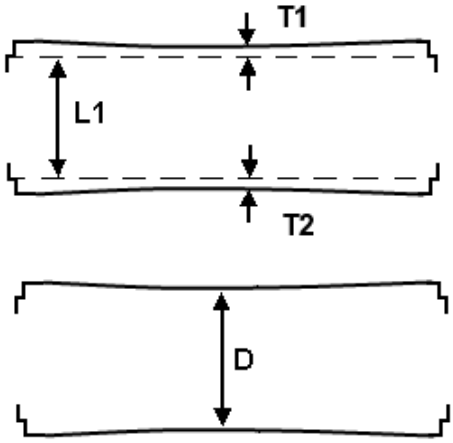
Brake disk parameters are calculated automatically after laser scanning. Parameter L1 is used to calculate the overall thickness of the brake disc. The default value of parameter L1, set in the PDA, is given in p. 13.3. and can be changed by the user.

10.1. Overall break discs thickness

Calculation of the break disc thickness.

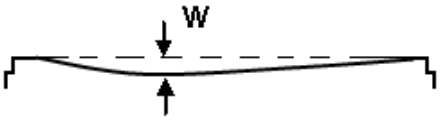
Calculation of the minimum value of the break disc thickness for both sides. Two profiles must be measured:

D = T1+T2+L1



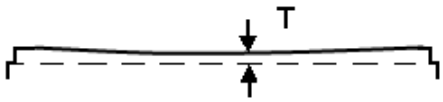
10.2. Break disc wear

Calculation of the break disc wear in relation to the reference profile.



10.3. Break disc thickness

Calculation of the break disc thickness.

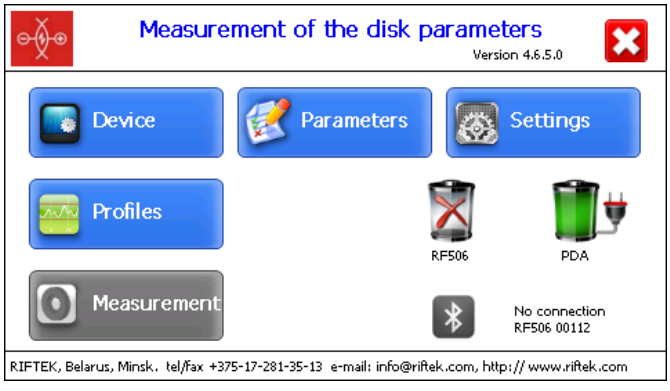


11. First activation and measurement procedure

Charge accumulators of the laser module and indication device by connecting them to charging devices (see par. 25).

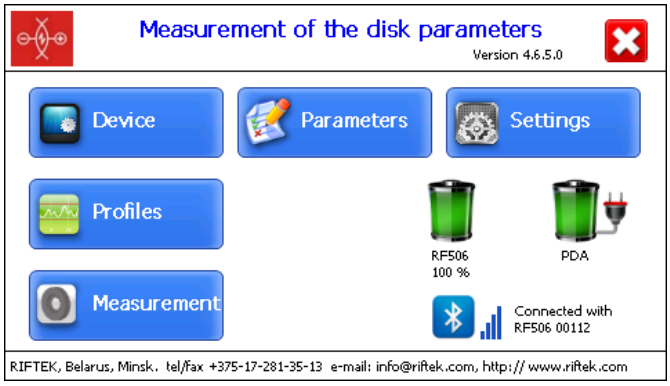
11.1. Activation

- Turn the PDA on by pressing the button (1), Figure 2. The PDA screen will show the main program window containing: main menu; indicators of PDA and laser module charging degree; indicator of Bluetooth connection.



Button	Assignment
Device	Setting the PDA basic parameters (p.12)
Parameters	Setting the measurement parameters (p.13)
Settings	Setting parameters of database, tolerances, and others (p.14)
Profiles	View the disk profile (p.18)
Measurement	Run the measurement process (p.11.2)

- Switch the laser module on by pressing and holding button 1 (Fig. 4) for several seconds. When connecting the laser module, a red LED blinks (2).
- After the laser module is switched on, some time will pass until automatic wireless communication is set between the profilometer and the PDA, which is accompanied by blinking of a blue LED (3) on the laser module. The LED goes out when the link is established.
- The main program window will be updated.



The **Measurement** button, indicator of Bluetooth connection, serial number of the laser scanning module, and indicators of the charging degree will be active.

11.2. Measurement

There are two types of measurements:

1. Rapid measurements without saving the results.
2. Measurements by using the selected scheme with saving results to database.

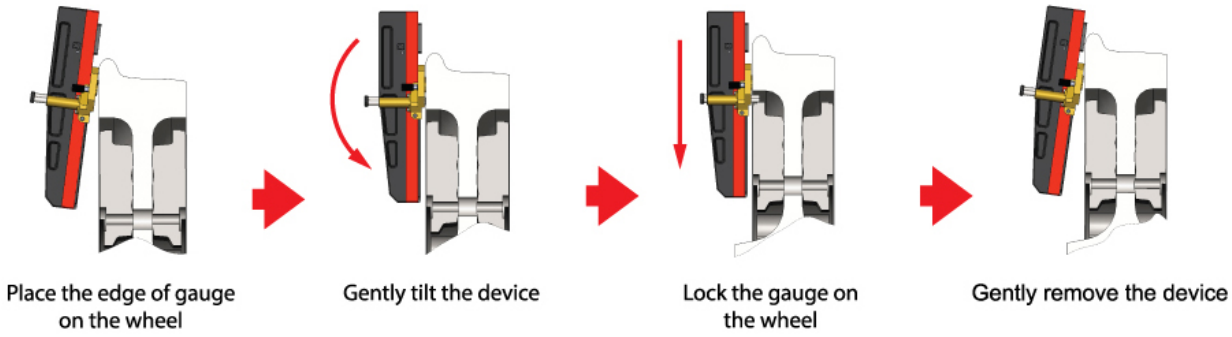
The measurement procedure by using type 2 is described in par. 17. How to select the measurement type see in par. 12.1.

Measurement by using the scheme (type 2) is used for full-featured work with the profilometer with maintaining the database of measurements.

Attention!
Before installing the scanning module onto the disk you need to clean of dirt the areas, where the basic supports of the laser scanning module contact with the disk surface.
When installing the laser scanning module onto the disk avoid of strong impacts of its supports on the disk, because it can lead to incorrect operation of the profilometer.

WARNING!

To avoid device shock on the wheel refer to the following installation procedure:



You need to inspect periodically the output window and basic supports of the laser scanning module and clean them of dirt.
Do not clean the glass by using abrasive materials and aggressive cleaning agents.

To perform single measurement, it is necessary to:

- Fix the laser module on the calibration unit or disk.

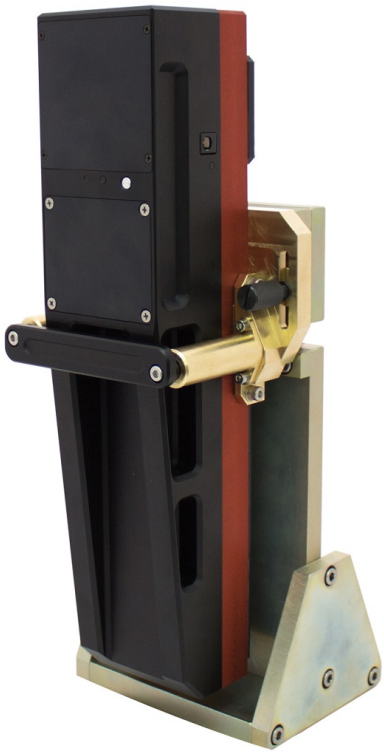
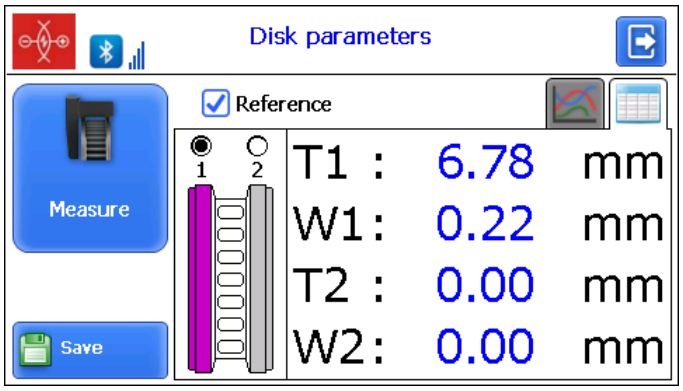


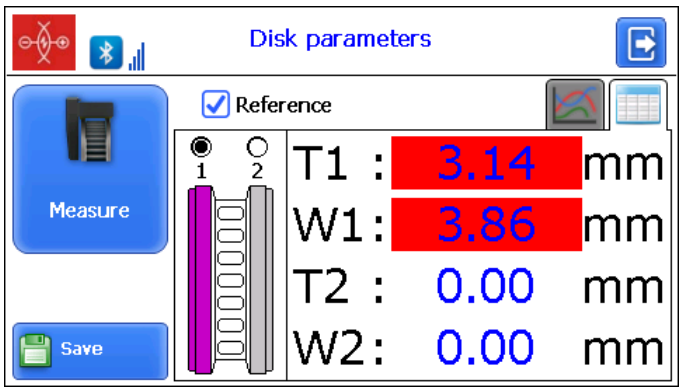
Figure 10A. Type 1

Figure 10B. Type 2

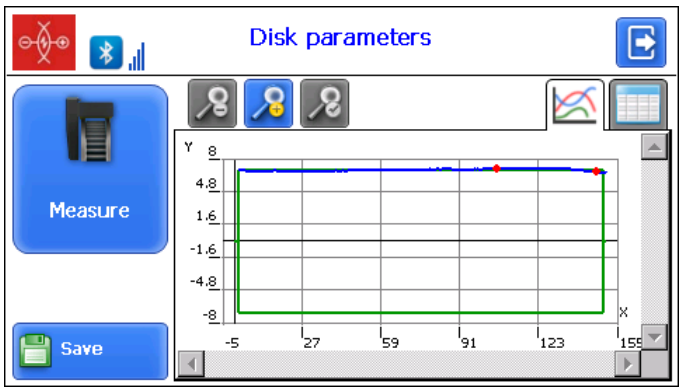
- Make sure that the module is mounted correctly without any misalignment and gaps.
- Press the **Measurement** button on the PDA display.
- With the **Measurement** button pressed, the laser module will scan the disk surface. During scanning time of about 3-4 seconds a red LED (2) is lit.
- When scanning is competed, the PDA will show values of measured parameters selected for presentation (see par.13.2.).



When the parameter goes beyond set limits its value is highlighted with red color:



- To view the disk profile click the **Profile** button:

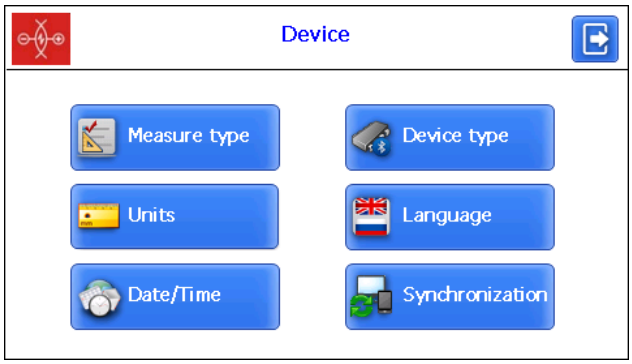


- If you scan the calibration block or the reference disk and scanning results differ from the reference values by nor more than 0.1 mm, the device is ready to work, otherwise it must be calibrated in accordance with par. 24.1.2. or 27.2.

12. PDA basic parameters setting

Prior to starting work with the profilometer, PDA program setting must be performed.

The window of basic parameters setting is called by clicking the **Device** button in the main program window (par. 11.1.):

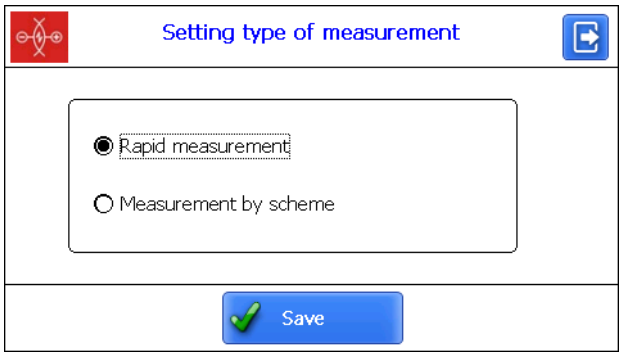


Button	Assignment
Measure type	Rapid measurements/measurements with saving results to database
Units of measurement	Millimeters/inches
Date/time	Date/time setting
Device type	Device selection
Language	Language selection
Synchronization	Synchronization with PC

12.1. Measurement type

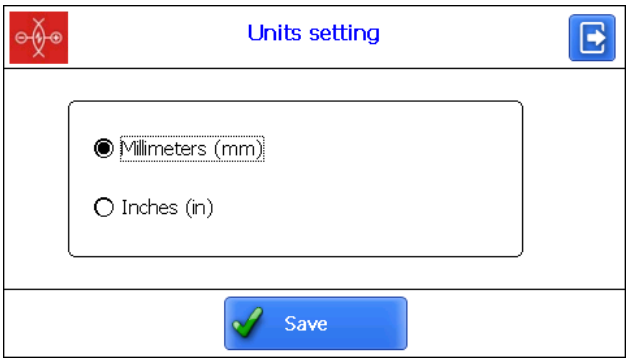
There are two types of measurements:
1. Rapid measurements without saving the results.
2. Measurements by using the selected scheme with saving results to database.

To set the measure type, click the **Measure type** button. Then select the measure type: **Rapid measurement** or **Measurement by scheme**. Click the **Save** button.



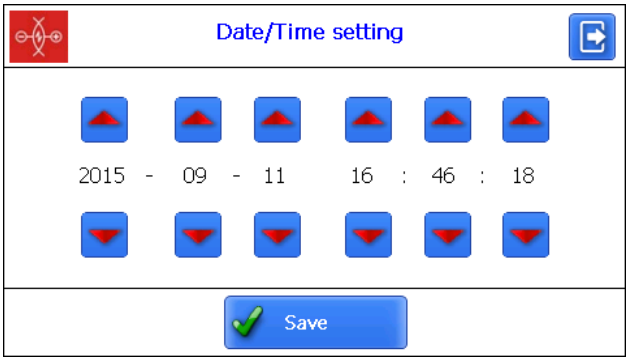
12.2. Units of measurement

All parameters and measurement results can be in the Metric system (millimeters), or in the English system (inches). To set the units of measurement, click the **Units** button. Next, select **Millimeters (mm)** or **Inches (in)**, and click **Save**.



12.3. Date/time setting

To set date and time, click the **Date/Time** button. Next, by using the buttons , , set the date and time values, and click the **Save** button.

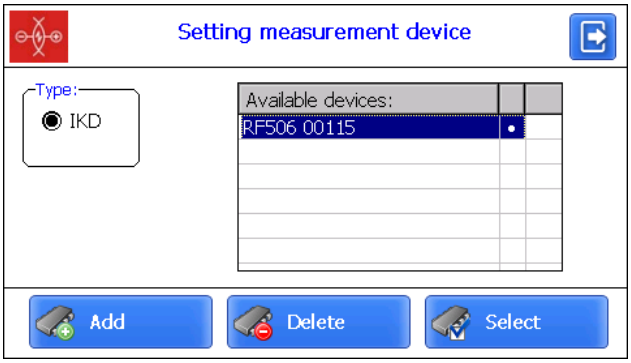


12.4. Device selection

PDA Bluetooth-connection is automatically configured to work with the laser scanning module, which comes bundled with the PDA.

To **Select/Add** other device click the **Device type** button.

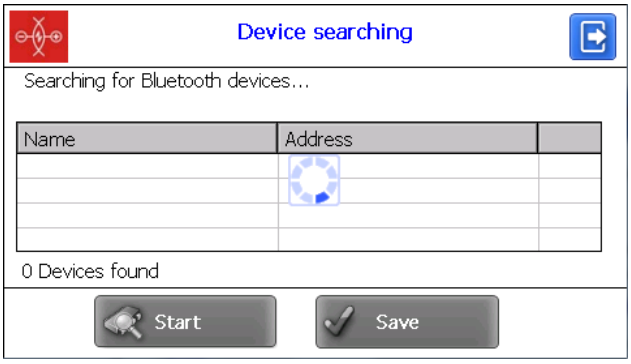
The device selection window contains a list of available devices (devices, with which connection has been established earlier, and which have been saved in the PDA memory).



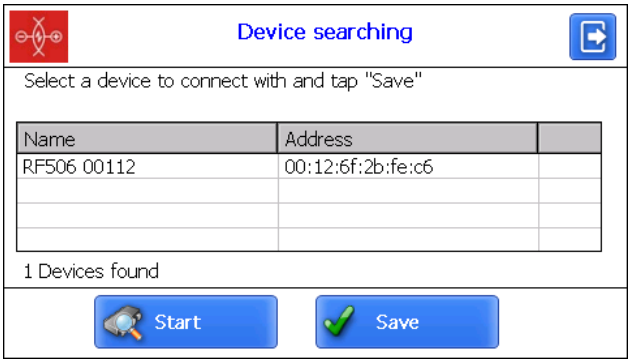
If the device that you need is included in the list, you can select it and click the **Select** button. After that the PDA will attempt to connect with the selected device by default.

If the device number is absent in the list, you can add it. In order to do it you need to click the **Add** button and pass to the window for searching Bluetooth devices.

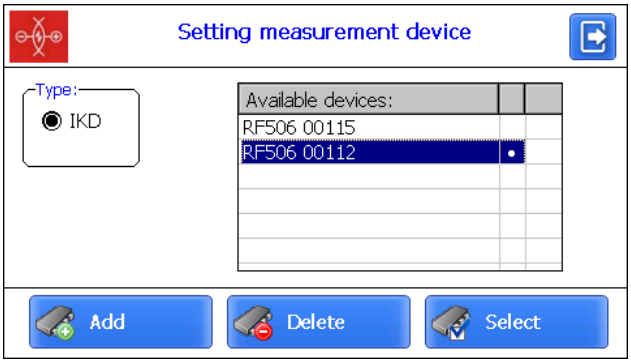
To search the available devices, you need to click the **Start** button and wait for completing the search:



Detected devices (with serial numbers) will appear on the screen:



Next, select the device and click the **Save** button to save the address of a new device.

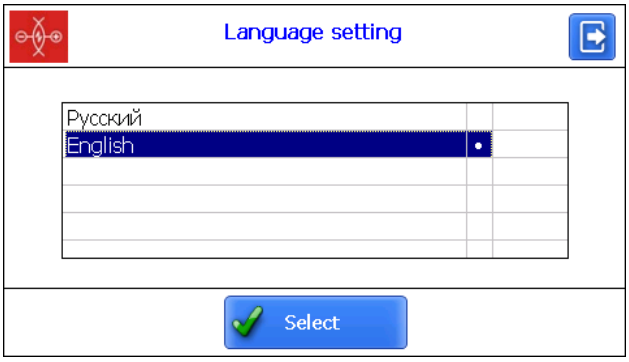


You can delete the device that you do not use anymore by clicking the **Delete** button.

12.5. Language setting

It is possible for the user to change the program language, form his own language support files as well as change/edit the terminology used.

To select the language, click the **Language** button. Next, select the required language support file and click the **Select** button.



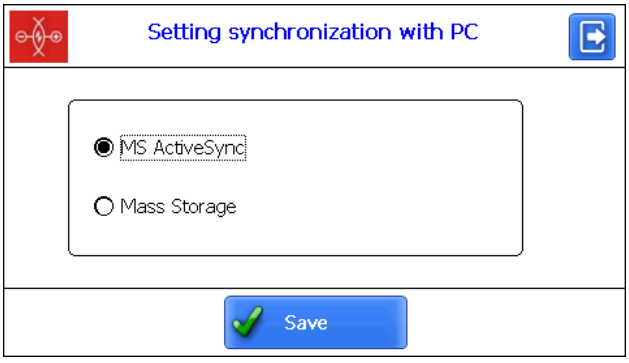
If no such file is available, it is necessary to use the new files preparation procedure, which is described in par. 20.2.4.1., and then load a new language file from PC to PDA as it is shown in par. 21.1.3.

12.6. Synchronization with PC

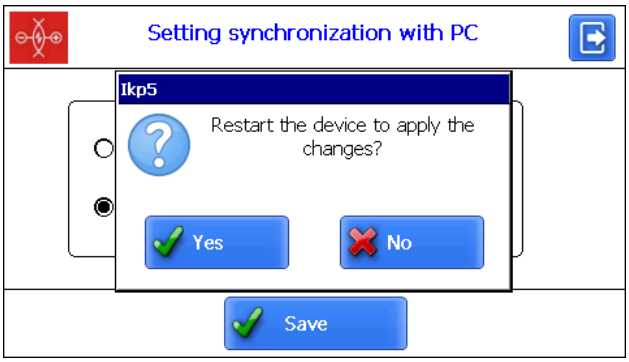
To transfer data between PDA and PC, it is necessary to synchronize them. There are two ways of synchronization via USB cable.

When you select **MS ActiveSync**, synchronization with PC is performed via the **ActiveSync** software (Windows XP), or via **Windows Mobile Device Center** (Windows 7). When you select **Mass Storage**, the device is detected in Windows as an external storage device.

To select the type of synchronization, click the **Synchronization** button in the **Device** window. Next, select the required type and click **Save**.

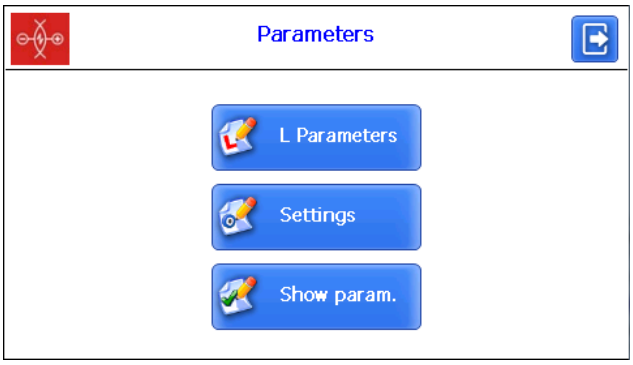


To apply the changes, PDA will prompt you to restart. If you do not need to sync the PDA with PC currently, you can restart the PDA later.



13. Measurement parameters setting

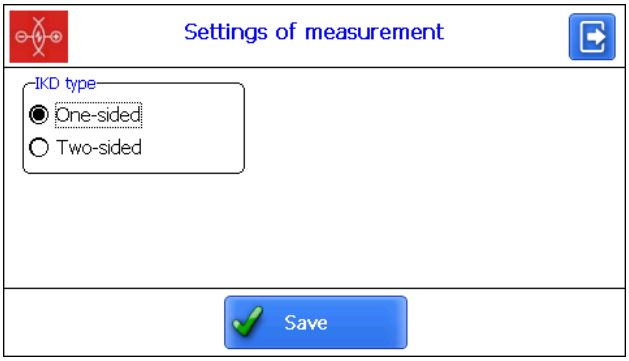
The **Parameters** window, which is called from the main program window, is intended for calculation settings of controlled parameters of the disk.



Button	Assignment
Settings	Calculation methods setting
Show param.	Selection of displayed parameters
L Parameters	L Parameters setting

13.1. Calculation methods setting

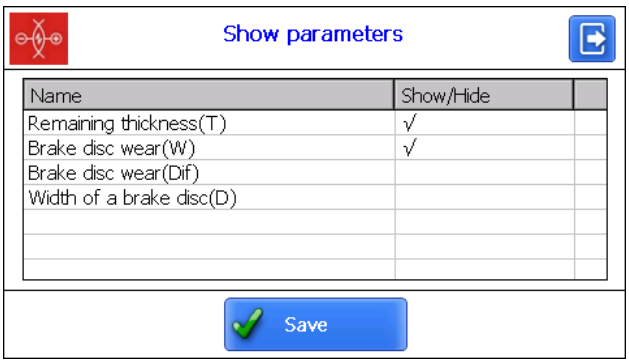
To select the method of the measurement, click the **Settings** button. The window of measurement settings will appear:



After selecting the required parameters, click the **Save** button to save the settings.

13.2. Selection of displayed parameters

To enable the mode, click the **Show param.** button.

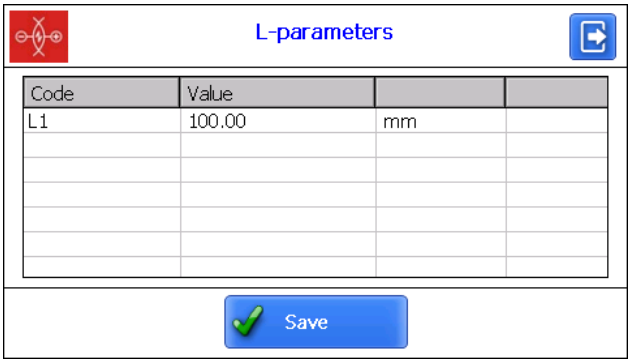


To select/deselect the parameter to display, double-click in the column **Show/Hide** opposite to the required parameter. After selecting you need to click **Save**.

13.3. L Parameters setting

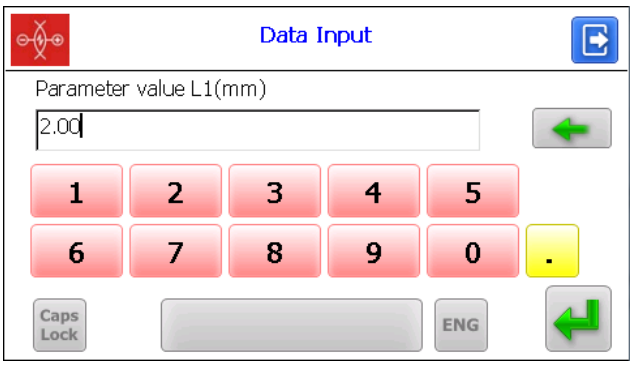
To set L-parameters, click the **L Parameters** button.

In the table will be displayed only those parameters, which are necessary to calculate the selected geometrical parameters of the disk.



L-parameter	Default value	Assignment
L1	100 mm	Used for calculation of the disk width (par. 10)

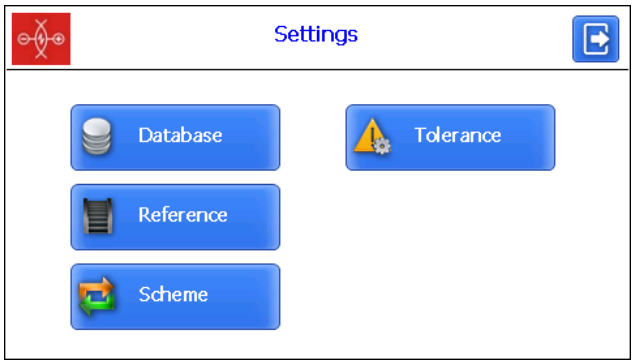
To correct the parameters, double-click in the **Value column** opposite to the required parameter, and enter a new value in the **Data Input** window. After that click the **Enter** button -  .



When you have completed the parameters setting, click the **Save** button to save them.

14. Setting the database parameters, tolerances and measurements schemes

The **Settings** window is intended for setting the database parameters, tolerances, measurements schemes, etc.

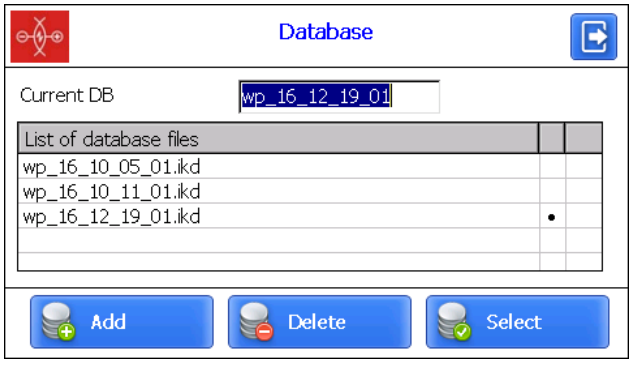


Button	Assignment
Database	Selection of the current database
Reference	Reference profile selection
Scheme	Measurement scheme setting
Tolerance	Tolerances setting

14.1. Selection of the current database

You can save the measurement results to the PDA database, when it is necessary. The program allows to create and to store several database files, related to a specific date of measurements.

To select a database file, click the **Database** button.

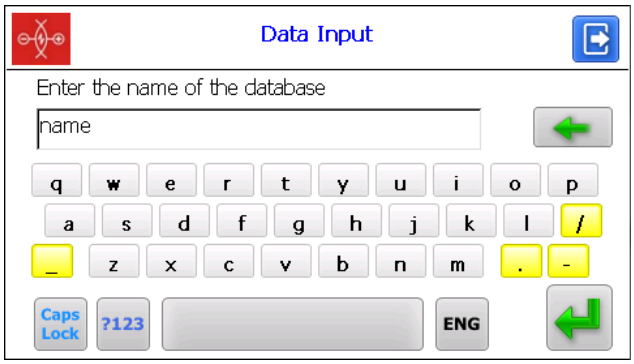


To create a new database, click the **Add** button. On the screen will appear the window with another window for entering a name of a new database.

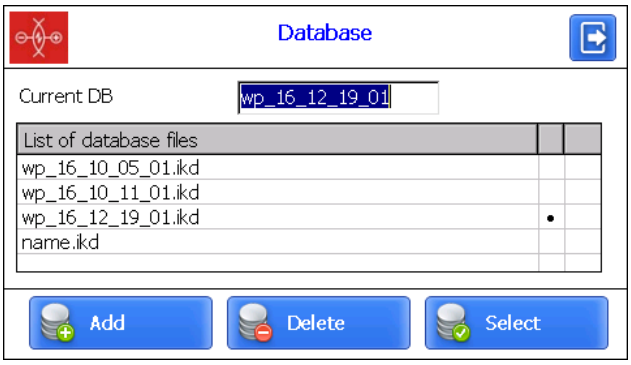
By default will be prompted to form the database file with the name **wp_yy_mm_dd.ikd**, where **yy_mm_dd** is the current date:

yy – the last two digits of the year;
mm – month;
dd – day.

You can agree with the proposed name, or enter another:



Then click the **Enter** button -  .

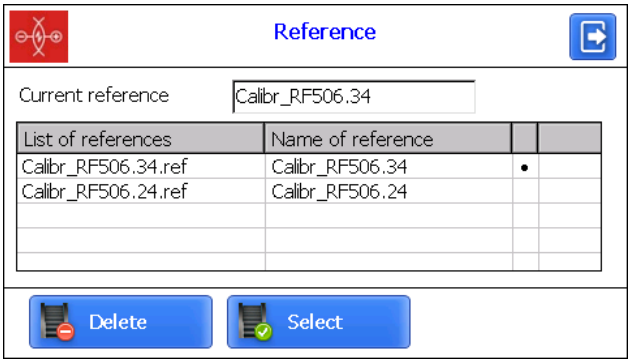


To select a database from a list of previously created, activate the respective line and click **Select**. The selected file will be marked with the symbol "•".

To delete the database file, activate the respective line and click **Delete**. In a case of deleting the current database, the error message will appear.

14.2. Reference profile selection and installation

The program allows to compare the scanned profile of the disk with the reference profile. To select the reference profile click the **Reference** button.



To select the reference file, activate the respective line and click **Select**. The selected file will be marked with the symbol "•".

To delete the reference file, activate the respective line and click **Delete**. In a case of deleting the current reference, the error message will appear.

14.2.1. Writing reference profile to database

Reference profiles are stored in the PDA database as profile description files with extension **.ref**. PDA is supplied with several pre-installed profiles.

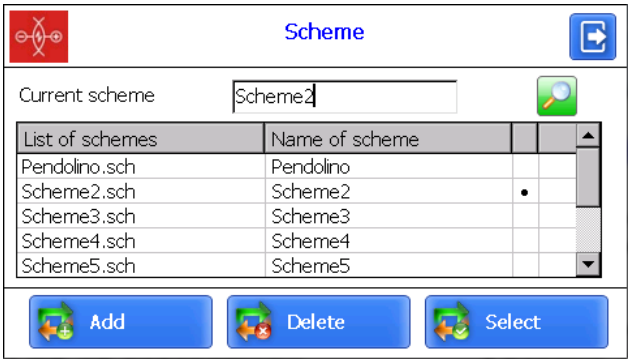
If there is no required reference profile in the database, the user can request the lacking profile from **RIFTEK** (free service), and then to transfer the received profile to the PDA as it is shown in par. 21.1.4.

14.3. Selection and formation of the measurement scheme

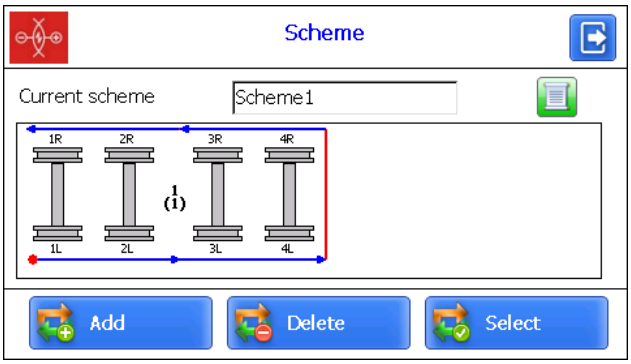
Measurement scheme is meant as a sequence of making measurements/processing of wheels in the rolling stock with specified parameters of each wheelset (wheelset numbers, car numbers, series, etc.). The program automatically offers operator to perform measurement on a concrete wheel in accordance with selected scheme of wheel processing. The program contains several preset schemes. Besides, the user can form his own measurement scheme.

14.3.1. Selection or removal of the measurement scheme

To select the measurement scheme file click the **Scheme** button.



To view the scheme you need to activate the line containing the scheme file name and click the **View** button .



Arrows in the figure show direction of processing of brake disks as well as the names assigned to disk (1L-first axis, left side; 2L-second axis, left side; 1R-first axis, right side, etc.).

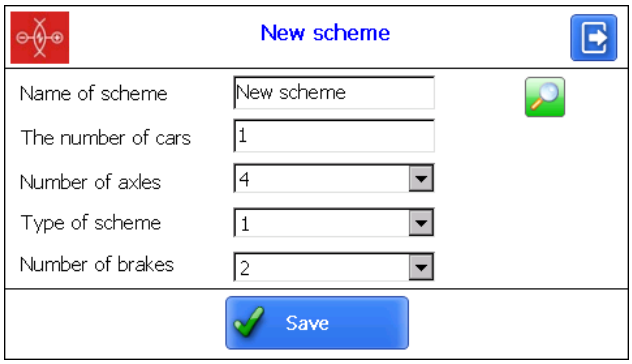
To select the scheme file activate the respective line and click **Select**. The selected file will be marked with the symbol "•".

To delete the scheme file, activate the respective line and click **Delete**. In a case of deleting the current scheme, the error message will appear.

14.3.2. Formation of a new measurement scheme

To form a new measurement scheme, click **Add**. On the screen will appear the window with another window for entering a name of the measurement scheme.

By using on-screen keyboard type the scheme name, or agree with the proposed name. Then click the **Enter** button - . On the screen appears the window for formation of a new scheme.



Next:

- select the number of axles;
- select the number of coaches in the rolling stock;
- select the disk processing scheme out of the options suggested;
- select the number of disk brakes;
- click **Save**.

During the selection of parameters **Number of axles** and **Type of scheme** you can look at the formed scheme by using the **View** button -  .

This method of creating the measurement scheme allows to create only simple schemes without specifying the numbers of wheelsets, coaches, series, etc. To form a complete scheme, see par. 26.

14.3.3. Loading of a new measurement scheme

If you can not create a new scheme as it described in the previous paragraph, you can use the special program for PC (see par. 26), and then upload that scheme to the PDA as it described in par. 21.1.5.

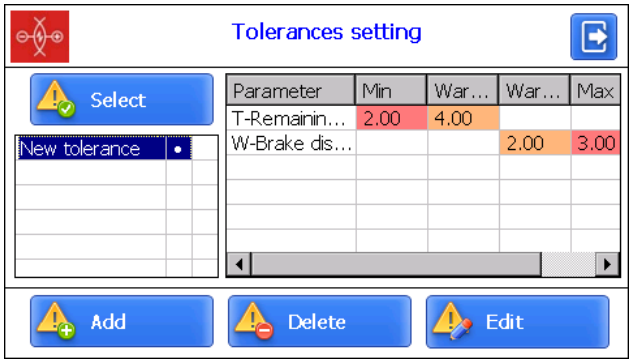
14.4. Tolerances setting

The program automatically controls measured geometric parameters for going out beyond the tolerances set. It is possible for the user to create groups of tolerances. Control of parameters will be performed for a selected group.

To select the current group of tolerances, click the **Tolerance** button.

The table will show tolerances only for the selected geometric parameters of the disk.

A red color indicates the maximum/minimum critical values of parameters. An orange color indicates the maximum/minimum values, which are close to critical values.

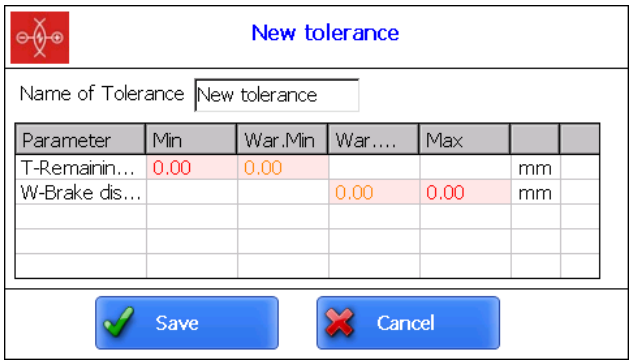


To select the group of tolerances, activate the respective line and click **Select**. The selected file will be marked with the symbol "•".

To delete the tolerance, activate the respective line and click **Delete**. In a case of deleting the current tolerance, the error message will appear.

To correct the tolerance, activate the respective line and click **Edit**.

To add a new tolerance, activate the line with the type name and click **Add**. On the screen:



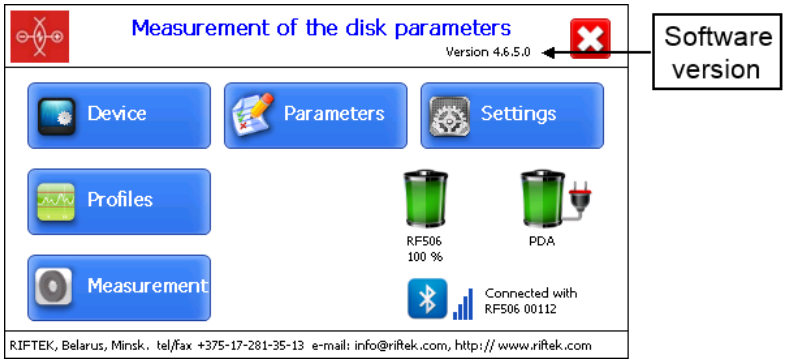
To change the name of type it is necessary to set cursor on the **Name of Tolerance** field, and enter a new value in the appeared window. Then click the **Enter** button - .

Next, to correct the value it is necessary to double-click on the column opposite to the parameter name, and in the emerged window enter a new value. Then click the **Enter** button. If any parameter has a zero value, the tolerance will not be used.

After setting the tolerances, click **Save**.

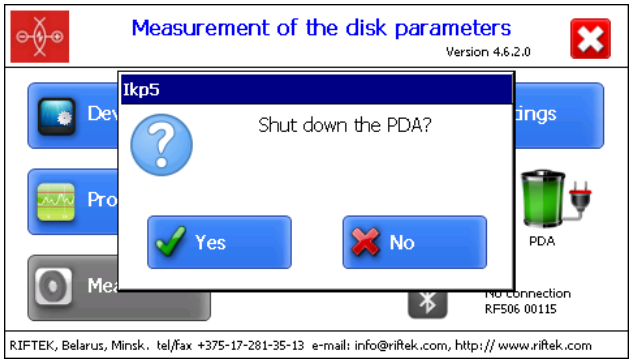
15. Version of PDA software

The software version is shown in the main program window:



16. Shutdown

To shutdown the PDA, click the **Shutdown** button - , and confirm the action:



17. Measurements with database maintenance

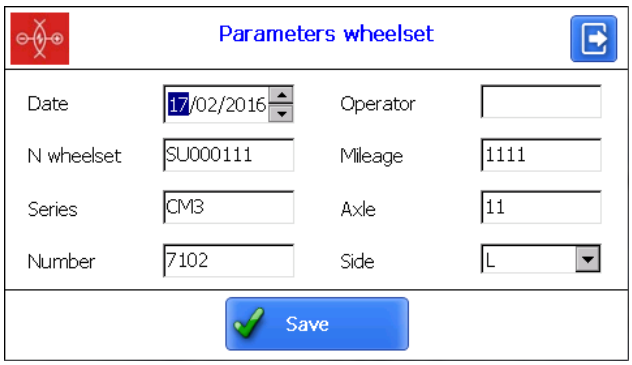
There are two types of measurements:

1. Rapid measurements without saving the results.
2. Measurements by using the selected scheme with saving results to the database.

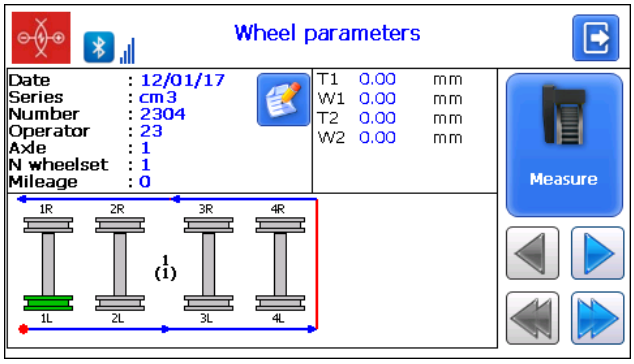
Procedure of rapid measurements is described in par. 11.1. How to select the measurement type, see par. 12.1

The second type is used for a fully functional work with the profilometer with maintenance of the measurements database.

When Bluetooth-connection is established, you can pass to measurement by clicking the **Measurement** button in the main program window. The window for entering wheelset parameters will appear on the screen:



Parameters fields will be filled in accordance with the selected measurement scheme. If needed, you can fill/edit the required fields, and click the **Save** button to save changes. The selected scheme will be displayed on the screen:

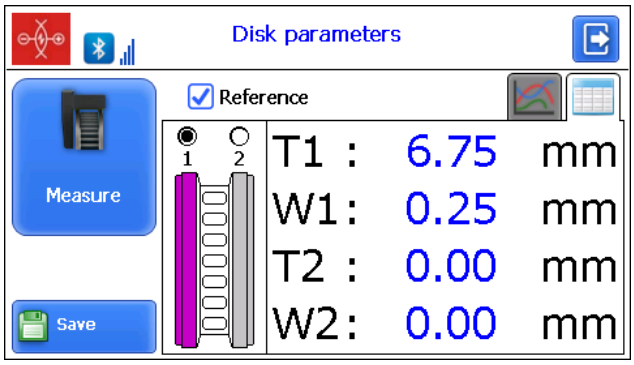


Designations and buttons:

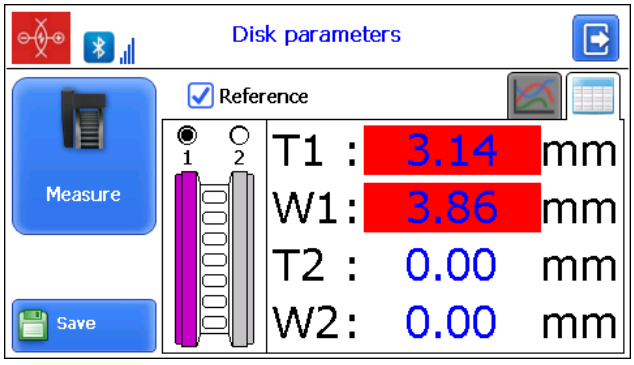
1 (6)	order number of the car to be measured (number of cars in the train)
	editing of the inputted wheelset parameters
	pass to a previous/subsequent disk
	pass to a previous/subsequent car
	a measured disk
	a disk to be measured next time
	a non-measured disk
	a measured disk to be measured again
	measurement

17.1. Measurement

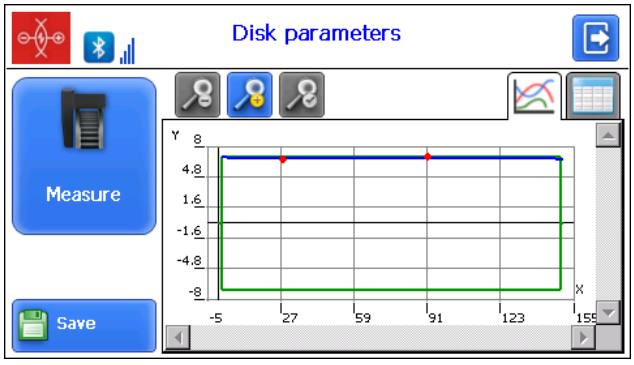
- Measure the brake disk offered by program (highlighted in green). To do this, click the **Measure** button. The laser module will scan the selected side of the brake disc.
- Upon completing the scanning process the measured values of geometrical parameters, selected for displaying, will appear on the PDA screen.



Measured values, which are beyond the tolerances, will be highlighted in red:

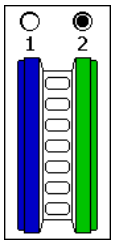


- To view the disk profile, click the **View** button -  . The scanned disk profile and the selected reference profile will be displayed on the PDA screen.

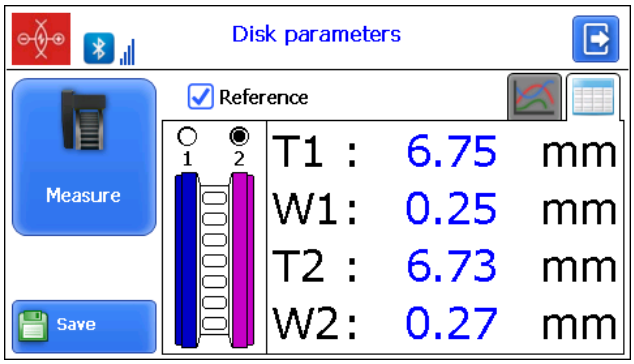


For more information about working with profiles see par. 18.2.

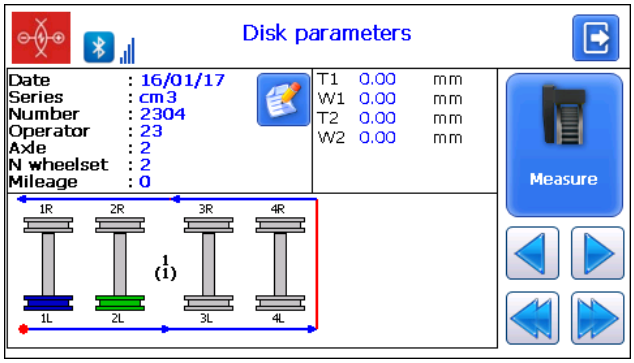
- To perform the measurement again, click the **Measure** button.
- Next, it is necessary to perform the measurement of the second side of the brake disc. For this:
  - Install IKD on the second side of the brake disc
  - Select the disc you need



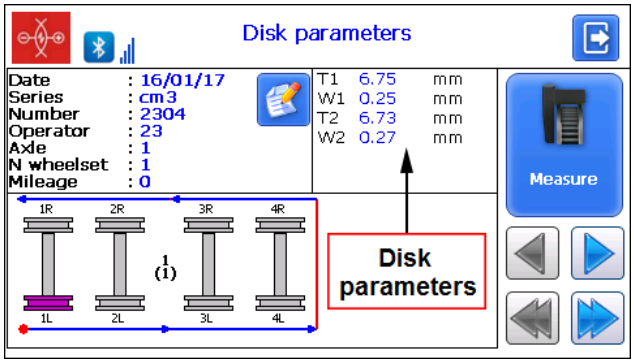
- Perform the measurement



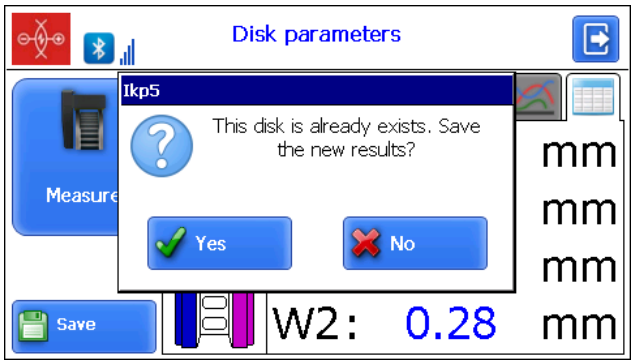
- When a satisfactory result is obtained, click the **Save** button to save it.
- The program will offer to pass to measurement of the next brake disk in accordance with selected scheme of measurement.



- To view the results of previous measurements, you can use the arrows. If you select the measured disk, the saved disk parameters will be displayed on the PDA screen.

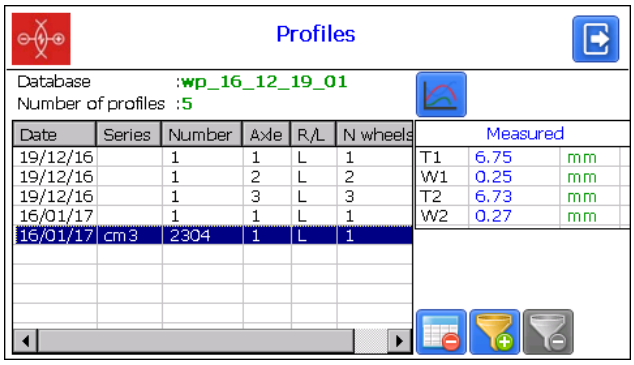


- When you measure the brake disk that was previously measured, the program prompts you to replace the existed database file with a new one.



18. Browsing the database

To browse the saved data, click the Profiles button in the main window. On the screen will be displayed information about the current database, quantity of saved profiles, table with saved profiles, and measured values of selected parameters.



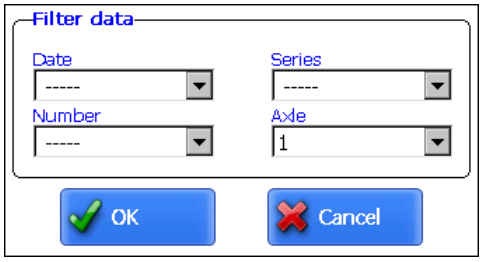
Buttons:

	Pass to browsing the profile of selected disk
	Delete the selected disk
	Add a filter when browsing the database
	Delete a filter
	Save the reference file

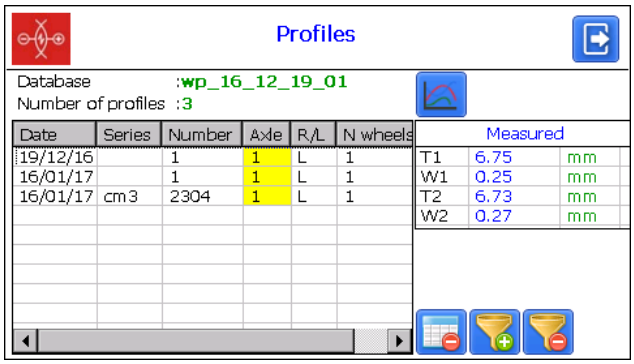
18.1. Data filtering

To add a filter you need to click the **Filter** button, and set filter parameters in the appeared window.

An example of filtering by the **Axle** parameter:



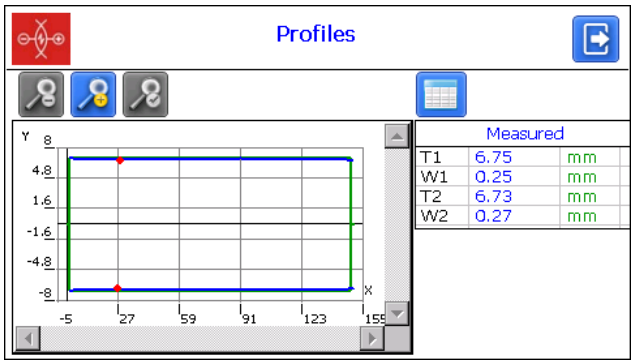
The filtered field will be highlighted in yellow:



To delete a current filter you need to click  .

18.2. Visualization of the disk profile

To browse the disk profile you need to click the Profile button -  . The scanned disk profile and the profile of selected reference will be displayed on the PDA screen.



Buttons for operating with profiles:

	Zoom in
	Zoom out
	Standard image scale

19. Installation of software on PC and startup

19.1. Installation of database support software

The **ikd_DB** software is intended for maintaining brake disk database on a personal computer (the updated version of the program can be downloaded by the following link https://riftek.com/media/documents/ikd/Install_Ikd.exe).

To install the software, insert a compact disk to the PC CD drive, select and start the **Install_Ikd.exe** file in the software folder. Follow the guidelines of the installation wizard. The program is installed in the following folder **C:\Program Files (x86)\Riftek, LLC\Ikd_db**

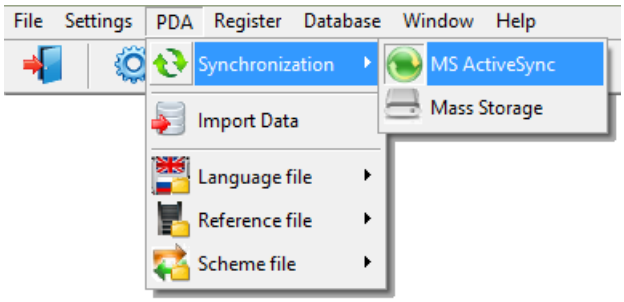
19.2. Synchronization of PDA and PC

There are two ways of synchronization via USB cable to transfer data between PDA and PC:

- MS ActiveSync
- Mass Storage

When you select **MS ActiveSync**, synchronization with PC is performed via the **ActiveSync** software (Windows XP), or via **Windows Mobile Device Center** (Windows 7), which need to be installed on PC. Installation files are on the supplied disk with software.

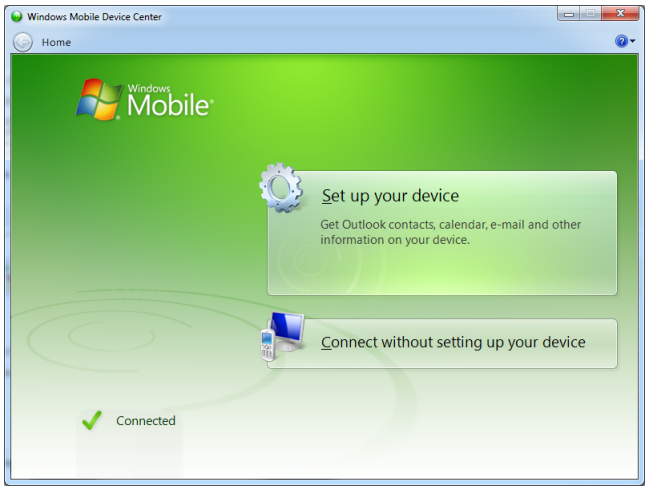
In the PDA parameters should be selected **ActiveSync** as the synchronization type (see par. 12.6.).



When you select **Mass Storage**, the device will be detected in Windows as an external storage device.

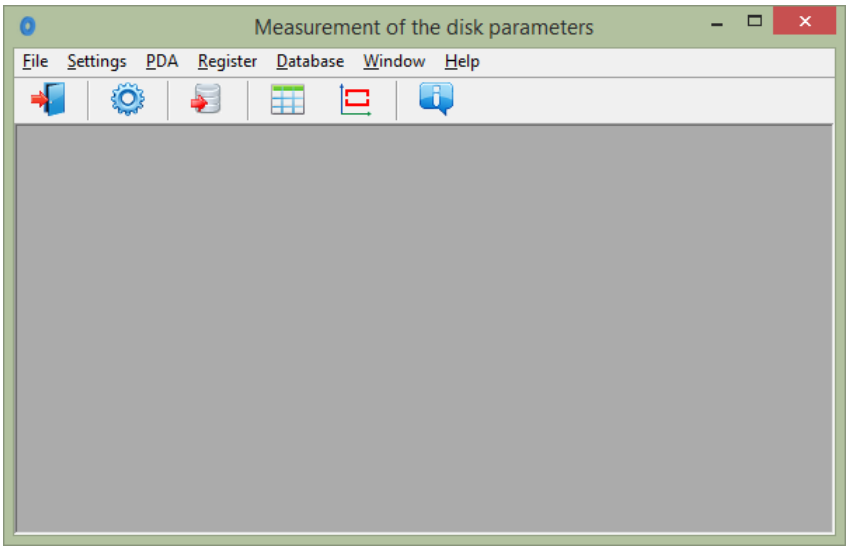
In the PDA parameters should be selected **Mass Storage** as the synchronization type (see par. 12.6.).

To check the correctness of synchronization via **ActiveSync**, switch on the PDA and connect it to the UDP port of the PC by a supplied cable. If the connection is successful, a message about it will appear on the screen:



19.3. Program startup

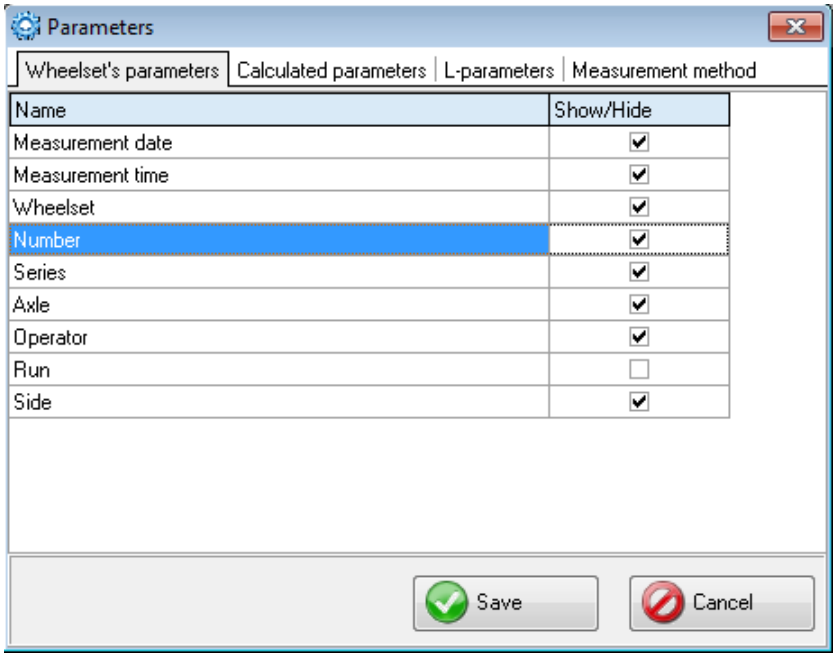
To start the program click **Start > All programs > Riftek, LLC > IKD_DB > Ikp5_DB.exe**. View of the main program window is shown below.



20. User settings of the program

20.1. Parameters setting

To pass to the window of program parameters setting, click **Settings > Parameters** in the main window menu, or click  .

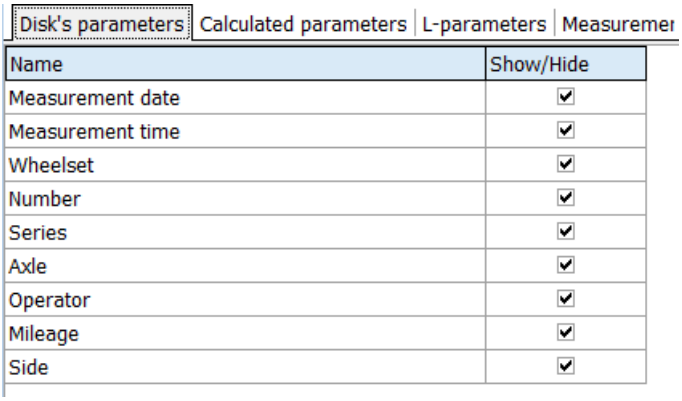


The window of settings includes 4 tabs:

- Disk's parameters
- Calculated parameters
- L parameters
- Measurement method

20.1.1. "Wheelset's parameters" tab

In this tab you can select parameters, which will be displayed on the screen when viewing the database.

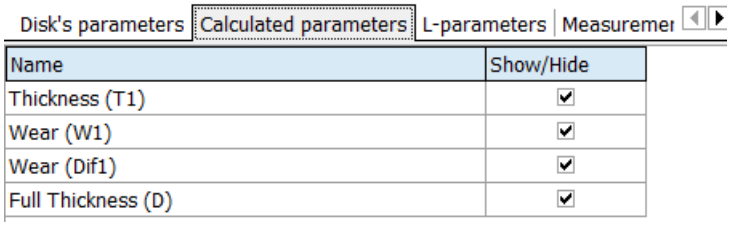


Name	Show/Hide
Measurement date	☑
Measurement time	☑
Wheelset	☑
Number	☑
Series	☑
Axle	☑
Operator	☑
Mileage	☑
Side	☑

If the parameter is ticked, its value will be shown in the table of results and in the table of profiles.

20.1.2. "Calculated parameters" tab

In this tab the user can select the disk geometrical parameters, which will be calculated and displayed on the screen when viewing the database.

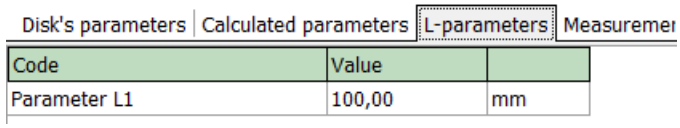


Name	Show/Hide
Thickness (T1)	☑
Wear (W1)	☑
Wear (Dif1)	☑
Full Thickness (D)	☑

Descriptions and functions of parameters are the same as in the PDA software (see par. 10.).

20.1.3. "L parameters" tab

In this tab the user can set values of the support points for calculated geometrical parameters of the disk.



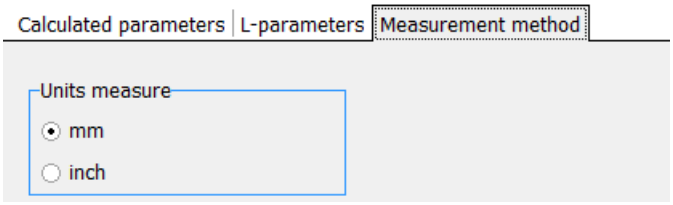
Code	Value	
Parameter L1	100,00	mm

Descriptions and functions of the support points are the same as in the PDA software (see par. 10.).

20.1.4. Selection of measurement units

All parameters and measurement results can be in the Metric system (millimeters), or in the English system (inches).

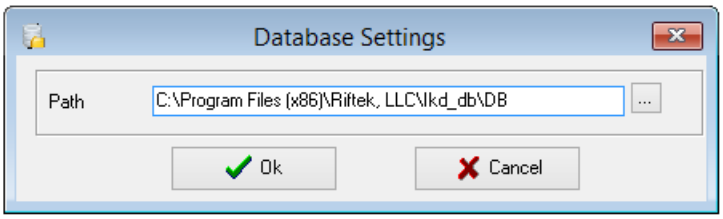
To set the units of measurement you need to select **mm** or **inches** in the **Units of measurement** field. After saving the changes all information will be displayed in the selected units of measurement.



20.2. Database settings

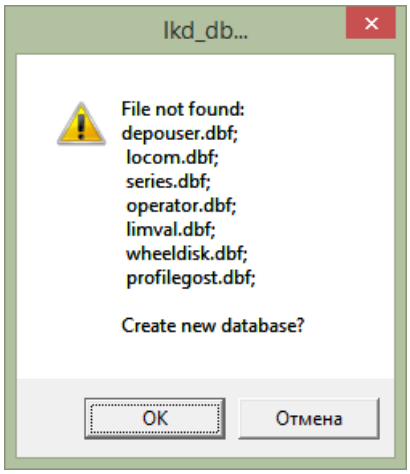
20.2.1. Setting the path to database

The program allows the user to change the drive and the directory of the profiles database storage. To do it, select **File > Path to DB...** in the main menu window.

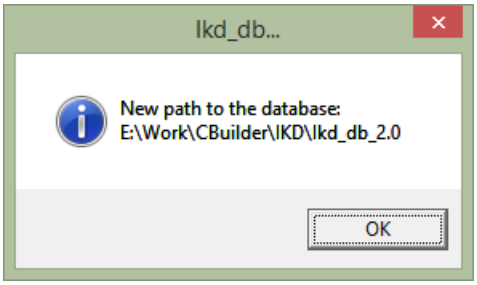


Next:

- click the select button
- specify a new path to the database
- confirm the creation of a new database

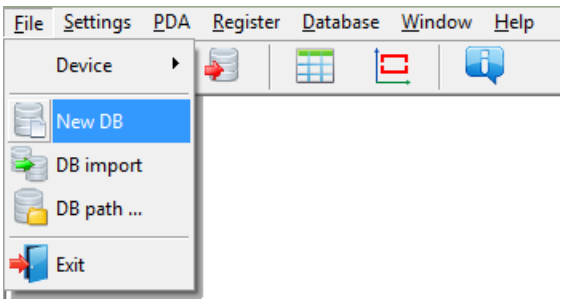


After that, all database files will be copied to the specified path.



20.2.2. Creation of empty database

To create an empty database, select **File > New DB** in the main menu.

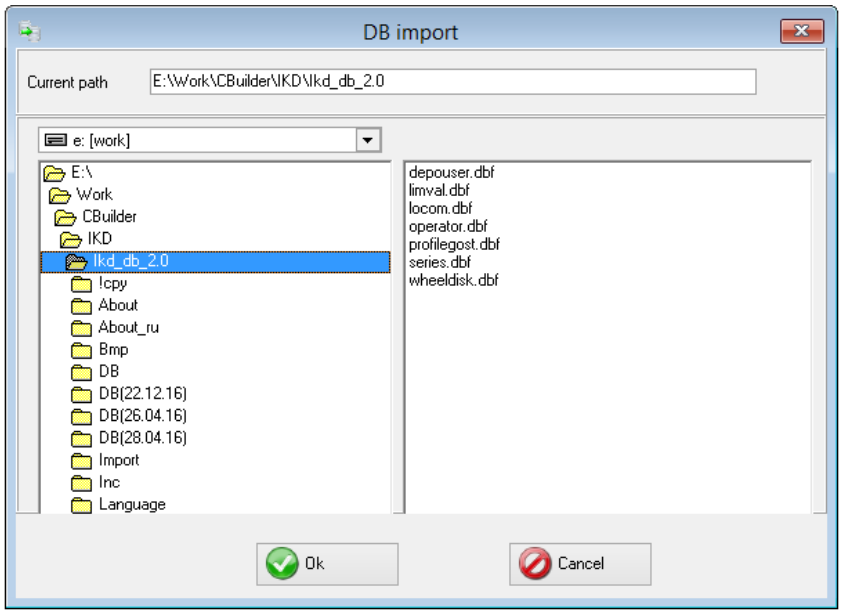


All data, excepting the reference files, will be deleted from the database. At the same time, catalog **DB(dd.mm.yy)** will be created in the installation directory whereto all deleted data (**dd.mm.yy** – current date) will be copied. Subsequently, these data can be restored (see par. 20.2.3).

20.2.3. Import of database

To import data to the database from the other database (previously saved) you need to:

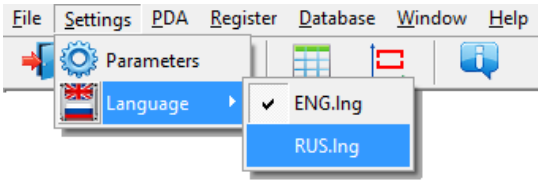
- Select **File > Import Data** in the menu.
- Select the folder with DB files in the left-hand window. All files will appear in the right-hand window:



- Click **OK** to import data.

20.2.4. Selection of software language

To choose the software language, select **Settings > Language** in the main window menu and set the required language support file.



20.2.4.1. Preparation and installation of the language support file

The user can change the language, form his own language support files as well as change/edit the terminology used. Language support files are located in the directory used in the process of installation. By default the following directory is used: **C:\Program Files (x86)\Riftek, LLC\Ikd_db\Language**.

The directory contains two files, **RUS.lng** and **ENG.lng**, to support Russian and English languages respectively.

To create the support file for any other language, it is necessary to:

- copy one of the existing files. For example, **ENG.lng** under the other name, for example, **DEU.lng**;
- edit the renamed file by using any text processor, namely, change all terms and phrases to analogous ones from the required language;
- save the edited ***.lng** file in the **Language** folder.

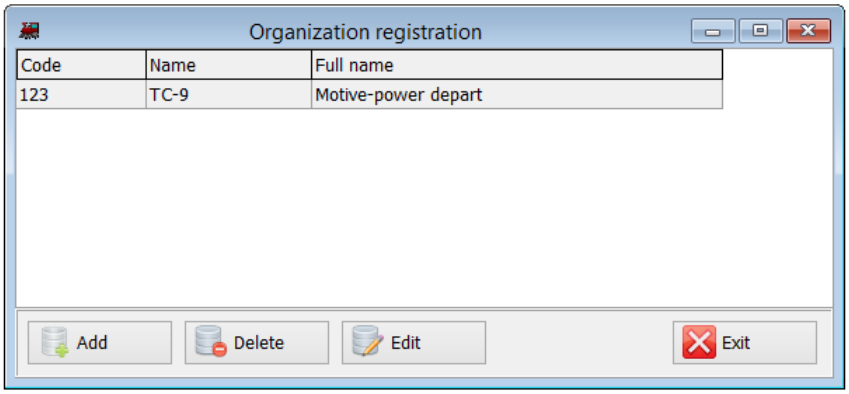
To change and edit terminology, it is necessary to:

- edit the corresponding language file by using any text processor;
- save the edited ***.lng** file in the **Language** folder.

20.3. Registration data

20.3.1. Selection of the organization

To add/select the user organization, select in the main window menu Registration > Organization. Subsequently, this information will be used for obtaining data from the selected depot and for generating reports.

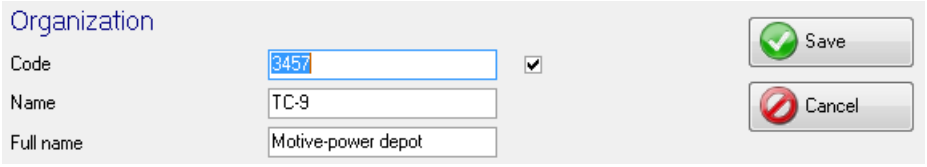


Buttons functions:

Add	Add a new organization
Delete	Delete the selected organization
Edit	Edit the selected organization
Exit	Exit the organization registration mode

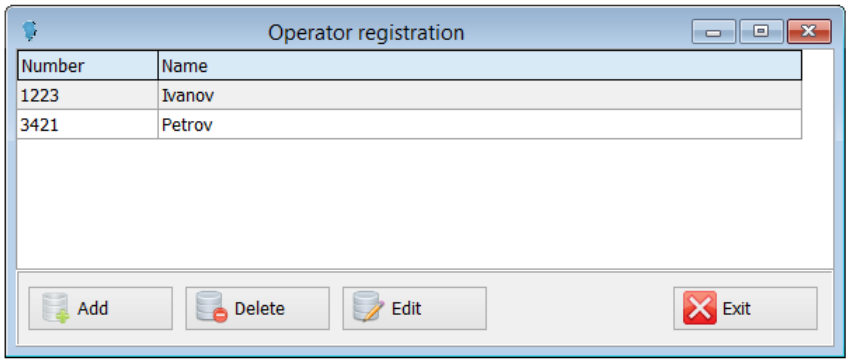
To select a current organization:

- Click **Edit**
- Tick the depot
- Click **Save**



20.3.2. Registration of operators

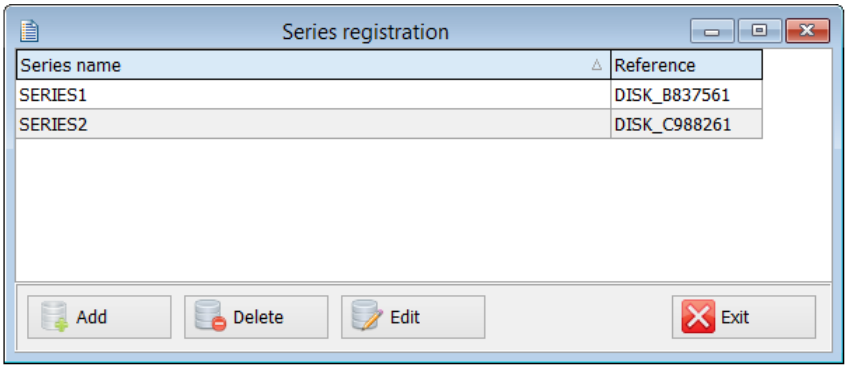
Steps to follow: menu **Registration > Operator**. Operators data are used for identifying operators by **Number**.



Functions of buttons are similar to those in par. 20.3.1.

20.3.3. Registration of series

Steps to follow: menu **Registration > Series**. Registered series of cars or locomotives are displayed in the emerged window.



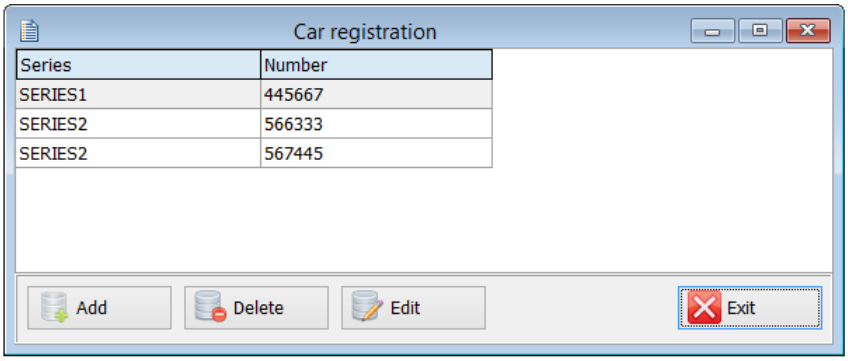
When registering a new series, a new entry for this series will be added in the table of tolerances automatically (see par. 20.3.5).

Functions of buttons are similar to those in par. 20.3.1.

When adding a new series it is necessary to enter the name of the series and select the reference profile for it. Flange parameters values of the selected profile will be calculated and added to the table of tolerances automatically after saving the series (see par. 20.3.6).

20.3.4. Registration of car/locomotive numbers

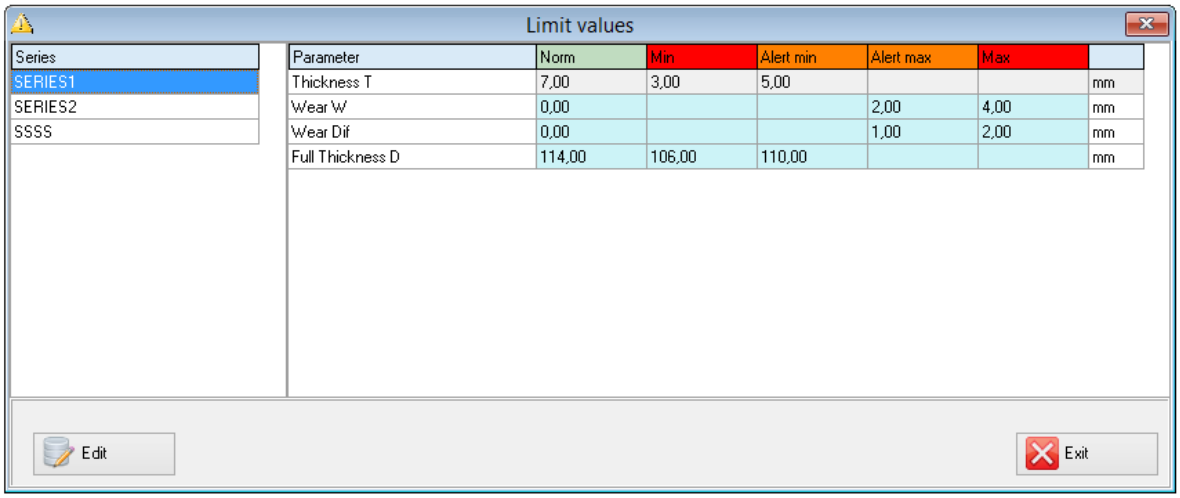
Steps to follow: menu **Registration > Number**. Registered numbers of cars/locomotives are displayed in the emerged window.



Functions of buttons are similar to those in par. 20.3.1.

20.3.5. Registration of tolerances

Steps to follow: menu **Registration > Tolerance**. Registered series of cars/locomotives with boundary values of calculated geometric parameters of the disk are displayed in the emerged window.



Only parameters, which were selected in the list of parameters, are available for editing (see par. 20.1.2.).

Maximum/minimum critical values of parameters are indicated with a red color. An orange color indicates maximum/minimum values of parameters, which are close to critical.

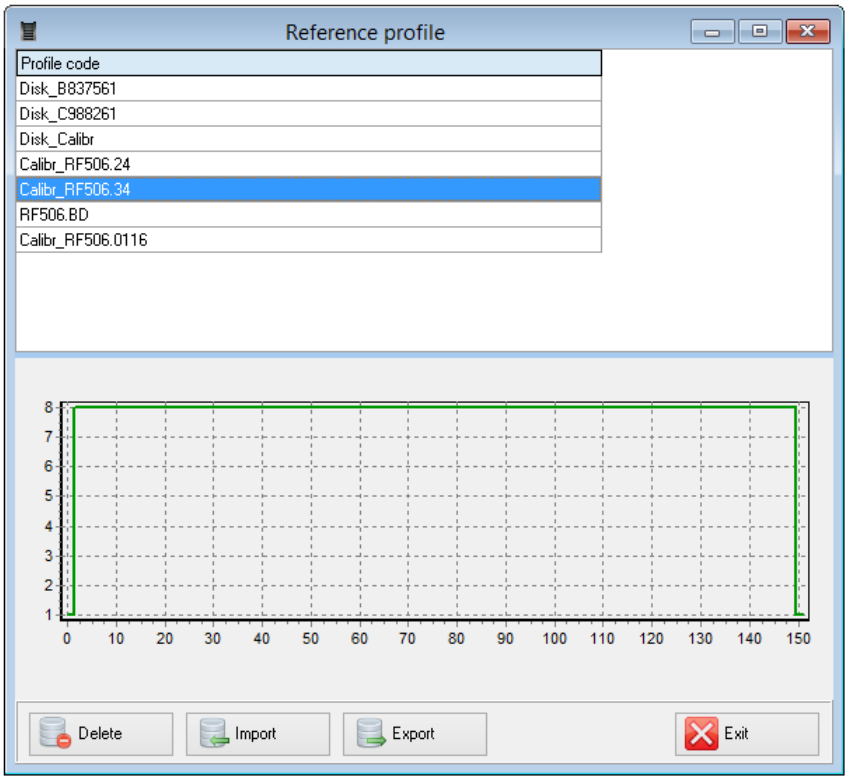
The **Norm** value is calculated and added to the table automatically when adding/editing the series of the selected reference (see par. 20.3.3).

20.3.6. Registration of reference profiles

The program comes with several preset profiles. In addition, the supplied disc with software contains the base of reference profiles. Profiles are in the **Reference Profiles** directory and divided into separate folders for each country.

In addition, the user can form a description of the required profile himself or request it from RIFTEK (free service).

To browse available profiles, select menu **Registration > Reference**:



The window of profiles displays the table with the list of reference profiles, saved to database, and a graphical view of the selected profile.

Buttons functions:

Delete	Delete the reference profile
Import	Import the reference profile from ***.ref** file
Export	Export the reference profile to ***.ref** file
Exit	Exit the organization registration mode

20.3.6.1. Request and registration of the profile file

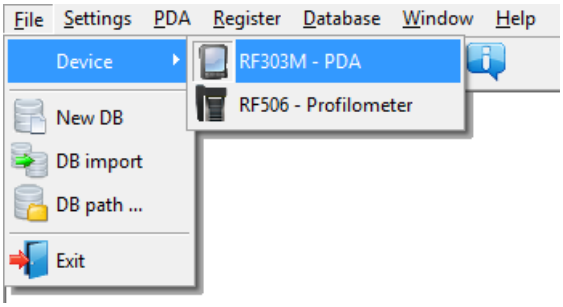
To get **.ref**-file of reference profile send the drawing of profile to RIFTEK (info@riftek.com). Register the received **.ref**-file as follows:

- click **Import**
- in the window appeared indicate the way to the **.ref**-file
- click **Open**

The profile will be added to the base of reference profiles.

21. Data exchange between PDA and PC

To exchange data between PC and PDA you need to select the device: **File > Device > RF303M-PDA**.



Data exchange between PC and PDA is performed by means of direct cable connection of PDA to PC USB-port (special **RF506.42** cable is supplied).

There are two ways of synchronization via USB cable:

- ActiveSync
- Mass Storage

For more details see par. 19.2.

21.1. ActiveSync synchronization

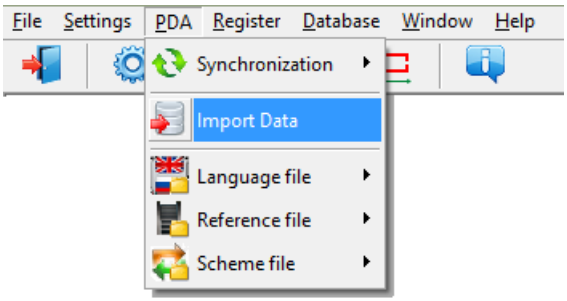
When you select this type of synchronization, additional features of data exchange with PDA will be available:

- Transfer of database files to PC
- Transfer of language files
- Transfer of reference profile files
- Transfer of processing scheme files

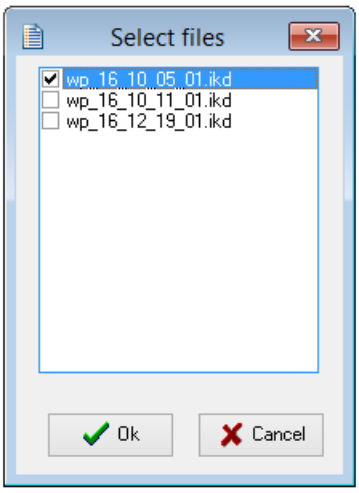
21.1.1. Transfer of database file to PC

To transfer the database file from PDA to PC, it is necessary to:

- select **PDA > Import Data**



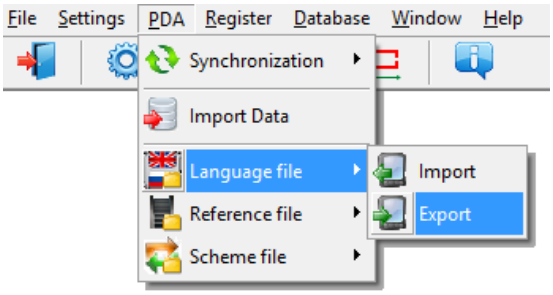
- mark the required files in the emerged window and click **OK**



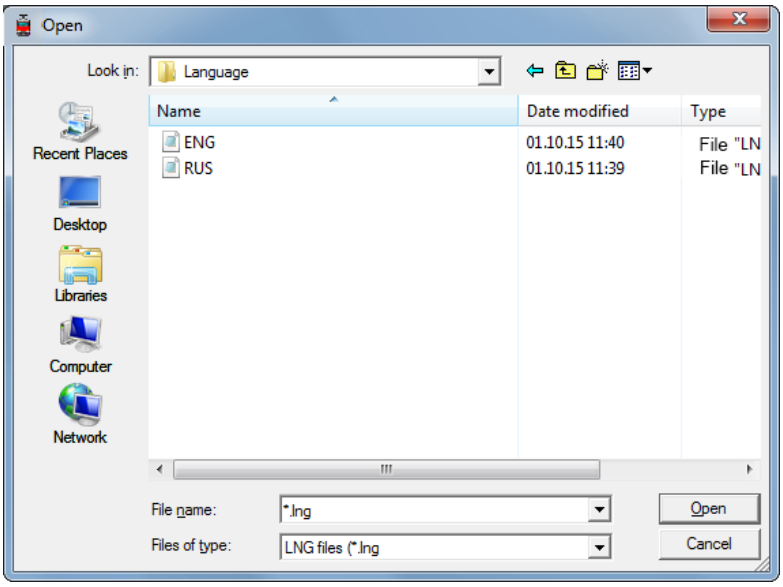
21.1.2. Transfer of language file from PC to PDA

To transfer the language file from PC to PDA, it is necessary to:

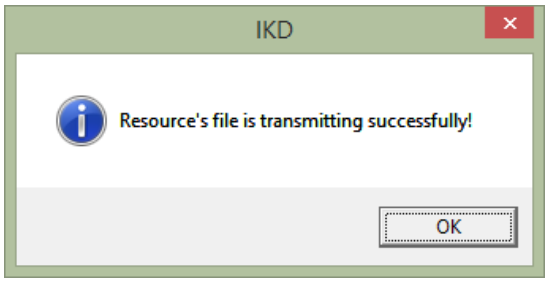
- select **PDA > Language file > Export**



- select the required file



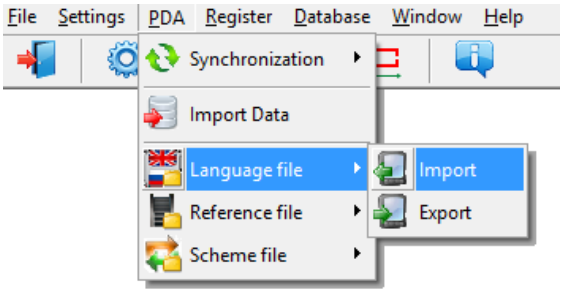
If transfer is successful, the screen will show:



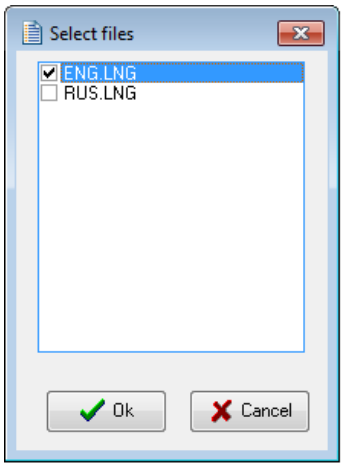
21.1.3. Transfer of language file from PDA to PC

To transfer the language file from PDA to PC, it is necessary to:

- select **PDA > Language file > Import**



- select the required file

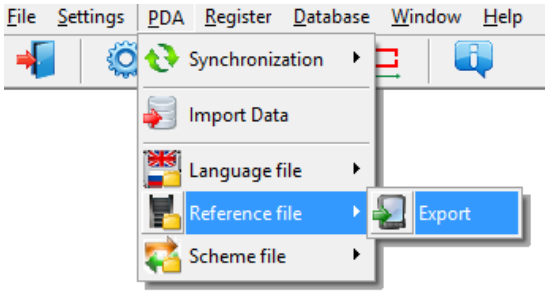


If transfer is successful, the selected files will be saved in the specified path.

21.1.4. Transfer of reference profile files from PC to PDA

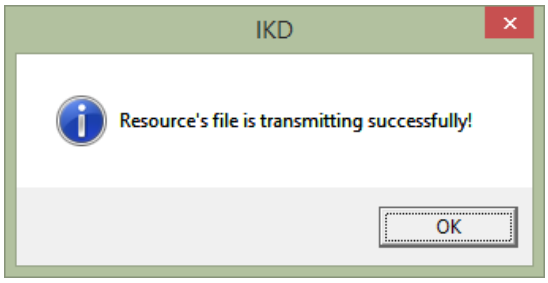
To transfer the reference profile file from PC to PDA, it is necessary to:

- select **PDA > Reference file > Export**



- select the required **.ref** file

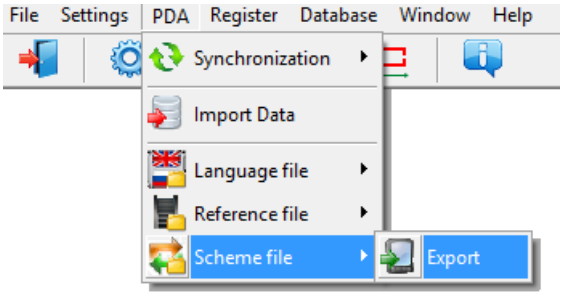
If transfer is successful, the screen will show:



21.1.5. Transfer of processing scheme file from PC to PDA

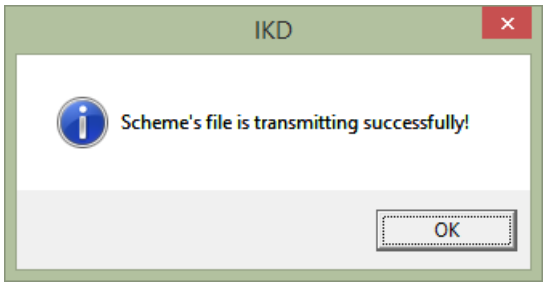
To transfer the processing scheme file from PC to PDA, it is necessary to:

- select **PDA > Scheme file > Export**



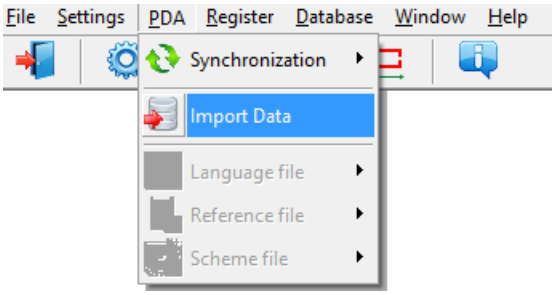
- select the required **.sch** file

If transfer is successful, the screen will show:



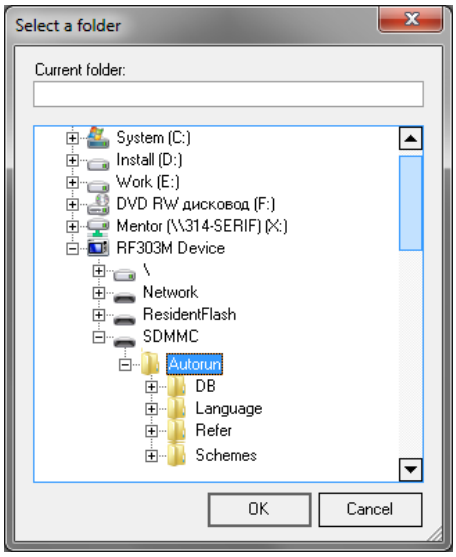
21.2. Mass Storage synchronization

When you select this type of synchronization, PDA is detected as an external storage device. Therefore, the only **Import Data** item is active. Transfer of language/scheme/reference files from PDA to PC and back can be performed by simple copying.

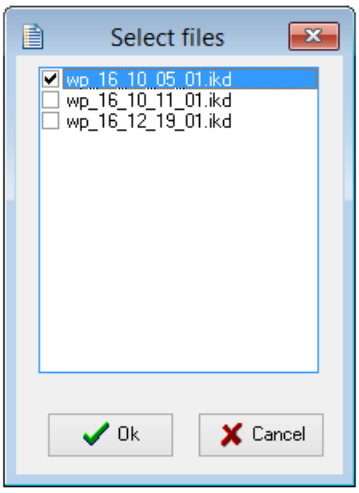


To transfer database files from PDA to PC, it is necessary to:

- select **PDA > Import Data**
- specify the path to the database on PDA (by default, **SDMMC\Autorun\DB**)



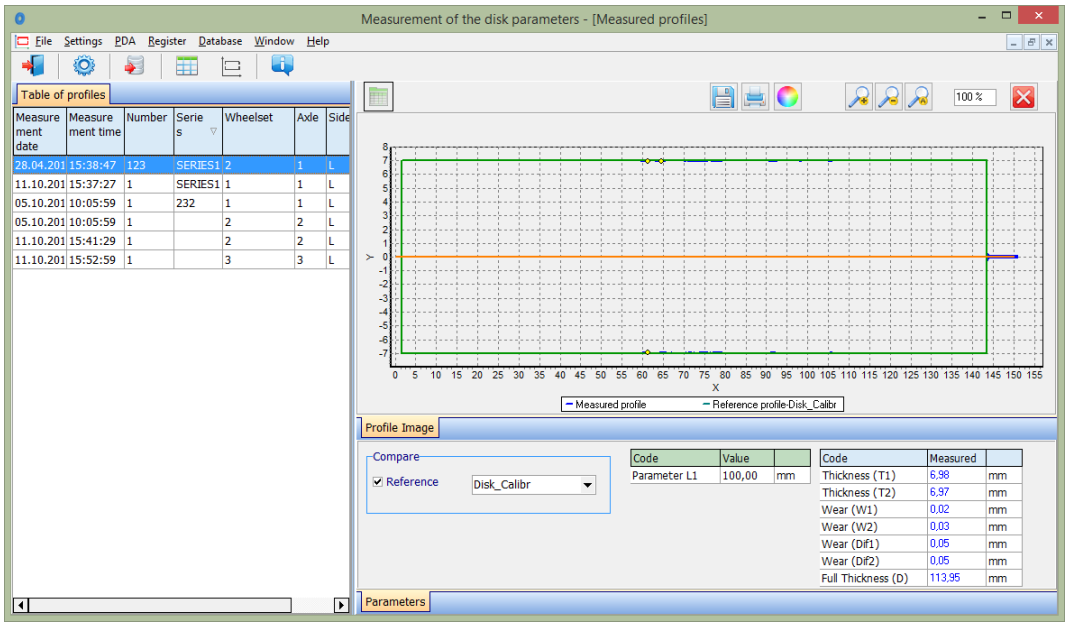
- mark the required files in the emerged window and click **OK**



22. Working with profilograms

22.1. Browsing the graph and the profile coordinates

To browse the saved profiles of the rolling surface, select **Database > Profiles**, or click the **Profiles** button -  .



At the left side of the window you can see the **Table of profiles** tab, which contains a list of saved profiles. The table displays only the identification parameters of the disk, which were selected in the parameters window (see par. 20.1.).

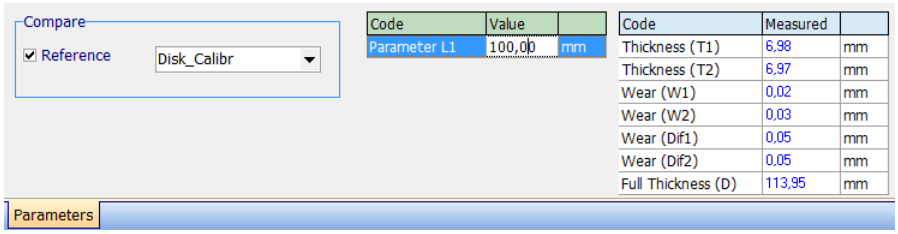
When selecting a profile, it is possible to browse a graphical image and geometric parameters of the measured disk. To browse the coordinates of the selected profile you need to click the **Profile Values** button. After that an additional tab with the measured coordinates will appear.

Buttons functions:

	Show/hide the Profile Values tab
	Save the profile image to file (**.bmp** file)
	Print the profile image
	Change the background color of the graph
	Zoom in/out the profile graph

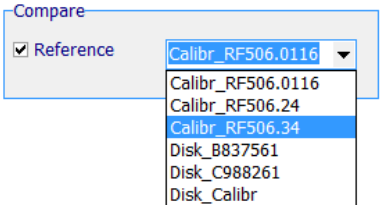
22.2. Parameters tab

Calculated geometric parameters of the profile as well as L-parameters values are displayed on the **Parameters** tab, which is at the bottom of the window.



22.2.1. Selection of comparison profile

To compare a profile with a reference, it is necessary to tick the **Compare** field and select the required reference profile in the drop-down list.



22.2.2. Geometric parameters of the profile

The table of measured geometric parameters displays only parameters, which were selected in the parameters window (see par. 20.1.2).

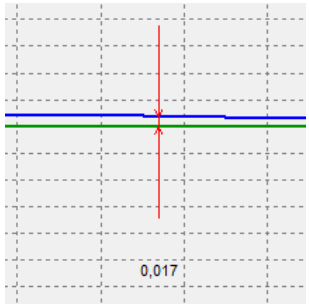
Code	Measured	
Thickness (T1)	3,92	mm
Thickness (T2)	5,69	mm
Wear (W1)	1,78	mm
Wear (W2)	0,01	mm
Wear (Dif1)	0,52	mm
Wear (Dif2)	2,08	mm
Full Thickness (D)	109,97	mm

Parameters, which are beyond the set tolerances, are highlighted in red/orange (see par. 20.3.5).

22.3. Wear calculation

22.3.1. Fast wear calculation

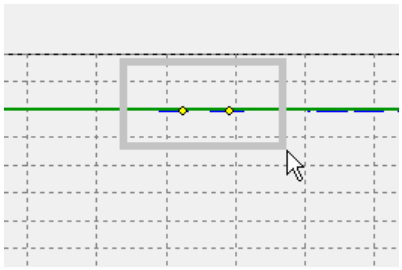
To obtain fast calculation of the profile wear at a certain point relative to the reference, put cursor bar to any of the profiles, and when a cross-like (+) mouse cursor appears press the left mouse key. The resulting screen will show the value of the coordinate difference between profiles taken along X- and Y-axes, as shown by arrows:

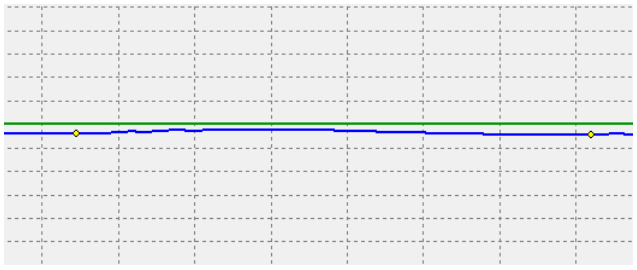


To remove size indication from the screen, it is necessary to put cursor to any of the profiles and press the right mouse key.

22.4. Rescaling

To change the image scale, mark a part of the image with the left mouse key, move the image by holding it with the right mouse key pressed, or with buttons **Increase** - , **Decrease** - and **Show all** - .

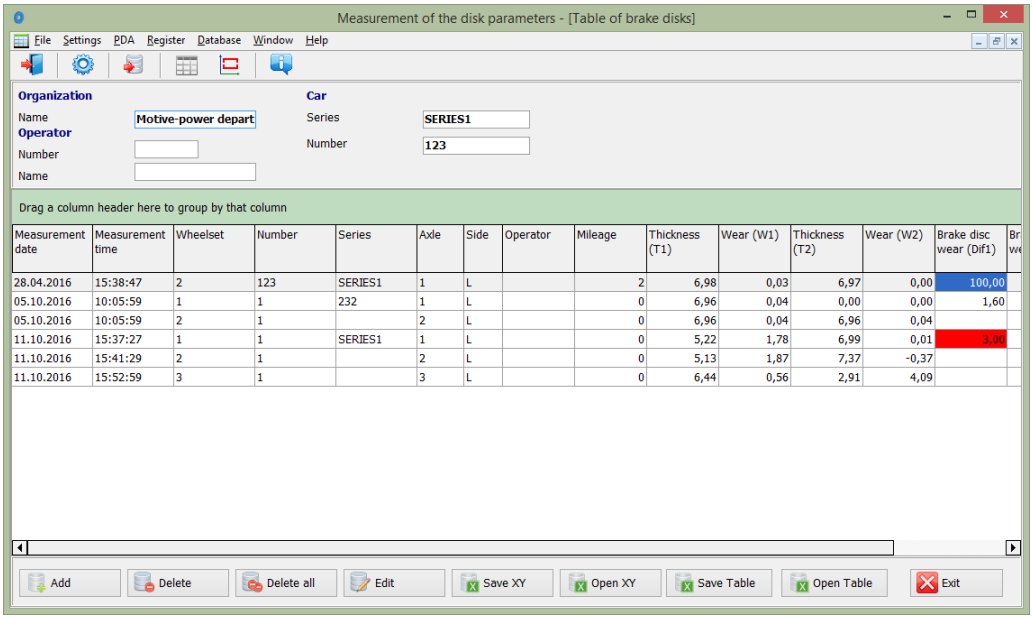




23. Scanning and editing of data

23.1. Scanning and filtering of data

To scan data, select **Database > Table** in the menu or click the **Table** button - . The form with results will be as follows:



- ***Hide/show the field***

The table displays the identification and geometric parameters of the wheelset, which are marked for displaying in the parameters settings (see par. 20.1.1 and 20.1.2).

- ***Sorting of data***

To sort data for any of the fields, click left mouse key on the header of the field column:

Measurement date	Measurement time	Wheelset
03.12.2015	13:56:49	1
03.12.2015	13:57:33	2
03.12.2015	16:19:34	1
03.12.2015	17:05:10	1

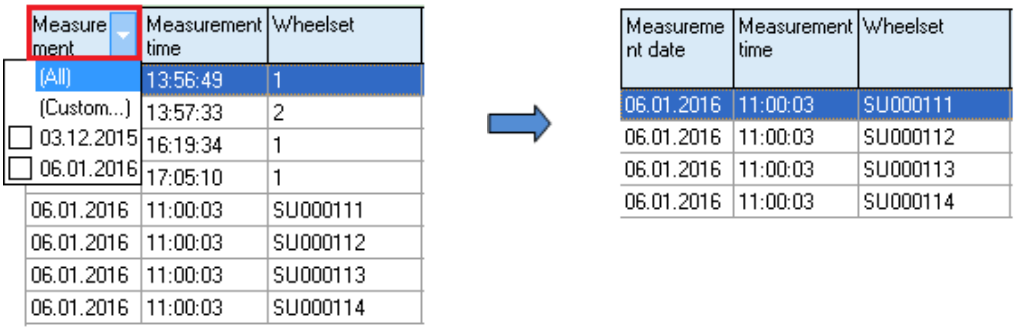
→

Measurement date	Measurement time	Wheelset
03.12.2015	13:56:49	1
03.12.2015	16:19:34	1
03.12.2015	17:05:10	1
03.12.2015	13:57:33	2

To cancel data sorting, press the **Ctrl** key and click left mouse key on the header of the field column.

- ***Filtering of data***

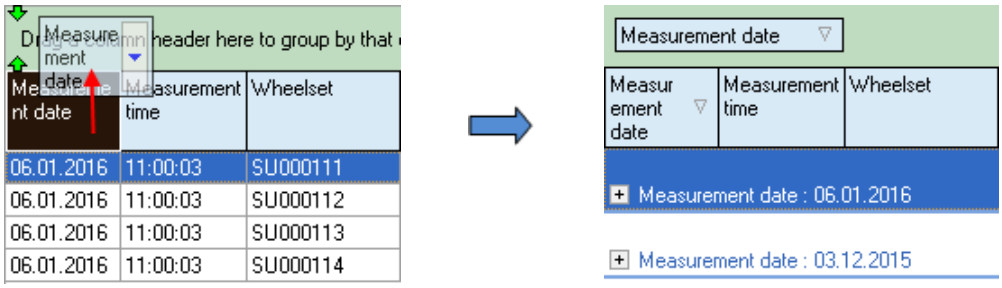
In order to filter data in any of the fields, click left mouse key on the header of the field grouping, and select required value in the emerged drop-down list:



To cancel filtering, all steps should be taken in the reverse order.

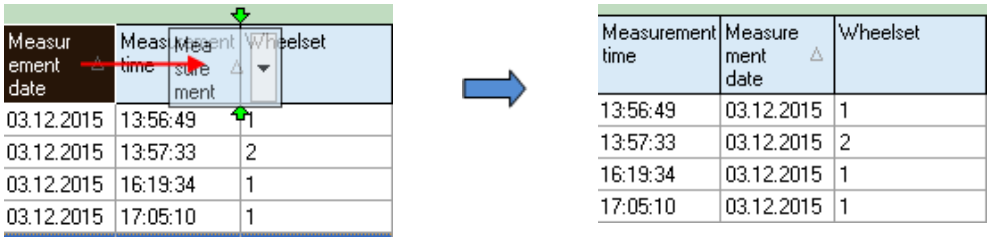
- ***Data grouping***

To group data for any of the fields, click left mouse key on the header of the field column, and, with the mouse key pressed, drag it onto the table header:



- ***Changing of the field position order***

To change the field position, click left mouse key on the header of the field column and, with the mouse key pressed, drag it to the required position:



Buttons functions:

Add	Add the disk
Delete	Delete the selected brake disk
Delete all	Delete all brake disks
Edit	Edit the selected brake disk
Excel	Export the coordinates of brake disks to the Excel format

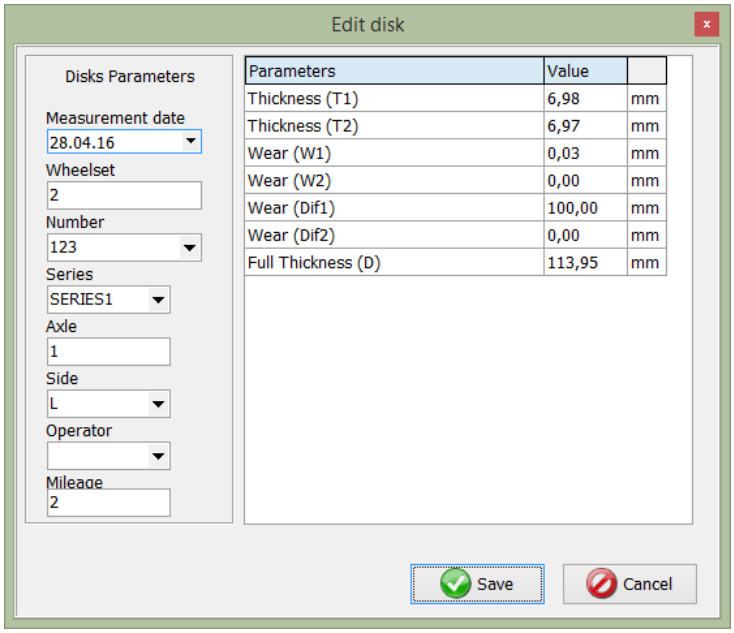
23.2. Editing data

You can edit, add and remove data in/from the database.

- ***Editing data***

To edit the current entry, click the 

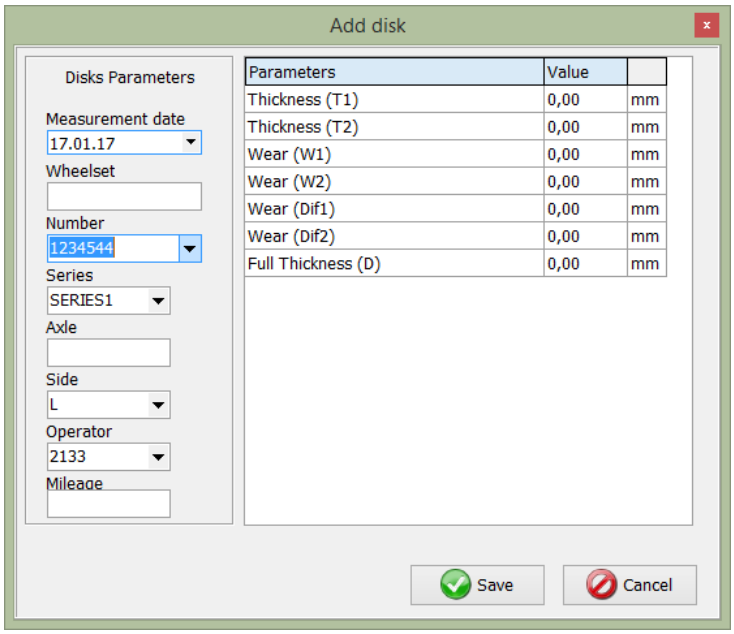
button and input/change required values of parameters, after the editing is complete click the **Save** button.



- ***Adding data***

To add a new data entry, click the 

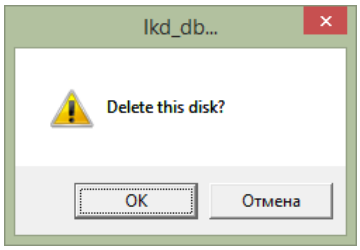
button and type required parameter values, after the editing is complete click the **Save** button.



- ***Deleting data***

To delete the current entry, click the 

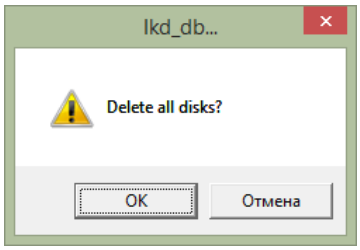
button and confirm the deletion.



- ***Deleting all selected data***

If it is necessary to delete not only one entry but several entries combined by some condition, filter the data according to the corresponding attribute (see par. 23.1.), click the 

button and confirm the deletion.



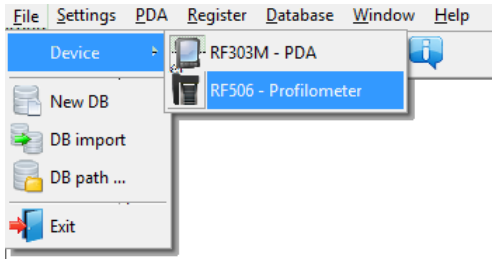
23.3. Excel-format report

You can save data in the Excel format.

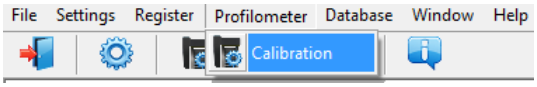
Save XY	Save coordinates X, Y to a file (Excel)
Open XY	Open a file with coordinates of profiles
Save Table	Save a table with parameters of profiles to a file (Excel)
Open Table	Open a table with parameters of profiles

24. Taking measurements under PC control (without PDA)

The laser scanning module (RF505) can work under direct control of PC without PDA. To work under direct control of PC, it is necessary to select **File > Device > RF505-Profilometer** in the main menu.



After that in the main menu of the program the **PDA** item will be replaced with the **Profilometer** item.



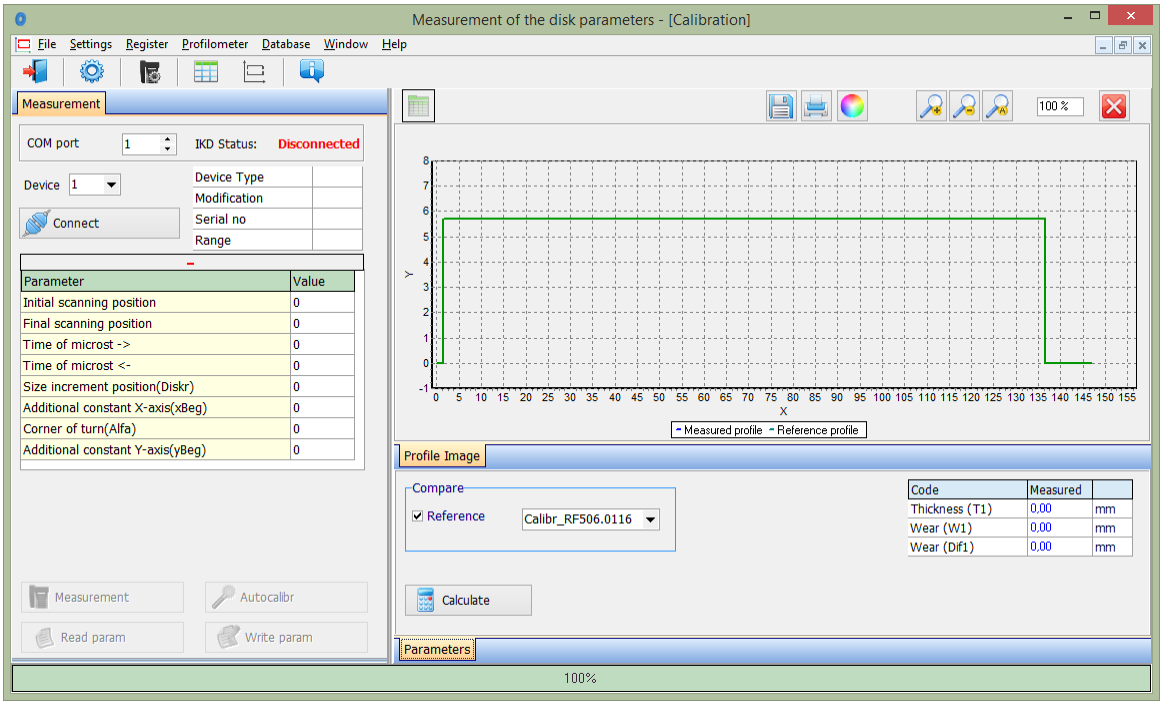
The menu contains two available items:

- Calibration

Before start to work with the profilometer, it is necessary to set the COM-port for Bluetooth-connection between the laser scanning module and PDA. The procedure is described in the user manual that comes with the Bluetooth-adapter.

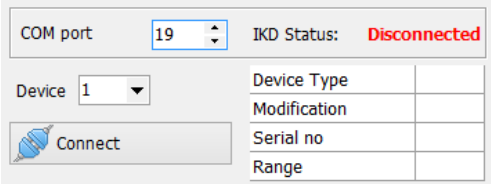
24.1. Calibration

For the calibration, select **Profilometer > Calibration**, or click the button  .

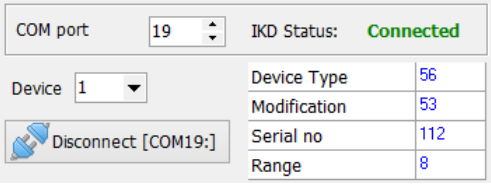


24.1.1. Installation of Bluetooth-connection

To connect, select the COM-port and click the Connect button.



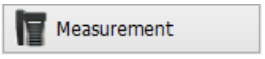
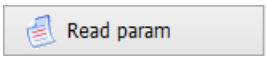
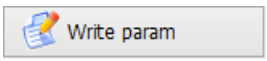
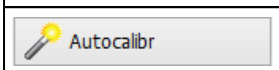
If the connection is successful, the device will be identified, and calibration parameters will be obtained. The status will be changed to Connected.



The table of calibration parameters:

Parameter	Value
Initial scanning position	12
Final scanning position	3060
Time of microst ->	10
Time of microst <-	5
Size increment position(Diskr)	495
Additional constant X-axis(xBeg)	6000
Corner of turn(Alfa)	341
Additional constant Y-axis(yBeg)	4338

Buttons:

	Measurement
	Reading calibration parameters
	Writing calibration parameters
	Automatic setting of calibration parameters

The **Auto calibration** button will be active, if at least one measurement of the profile is performed as well as the reference profile is selected.

24.1.2. Calibration of the profilometer

- Place the profilometer on the calibration block.
- Select the reference profile from the list (**Compare > Reference**).
- Perform the measurement (the **Measurement** button)
- Perform the calibration (the **Auto calibration** button)
- Save calibration parameters (the **Write param.** buton).

Calibration parameters can be set manually. To do it, click left mouse key on the field of the required parameter value, and enter the new one.

Attention! Writing incorrect values of some parameters can lead to the incorrect work of the device

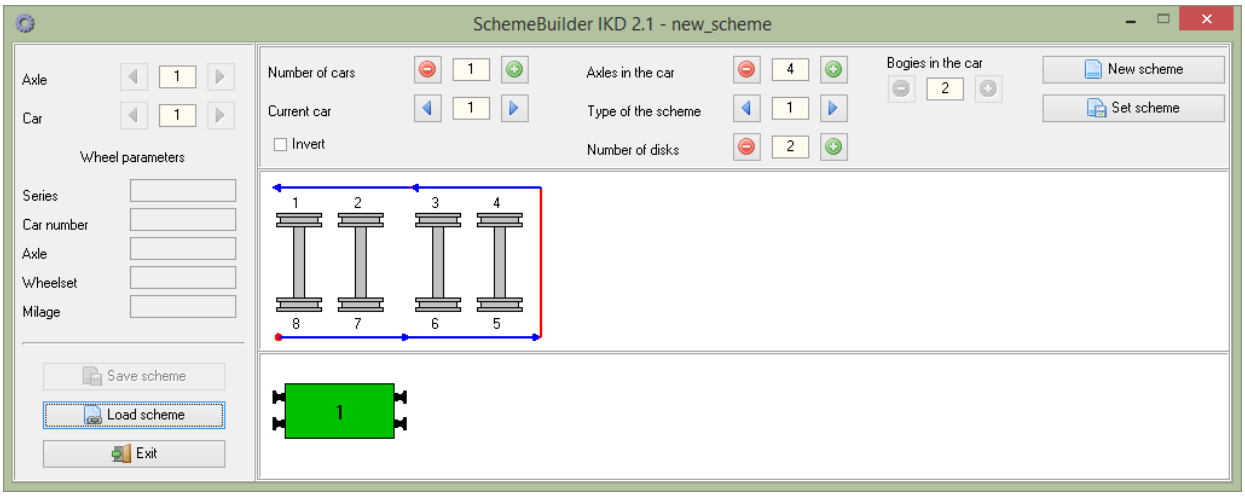
Buttons functions, opportunities of the work with profiles, and the calculation of required parameters are described in par. 20.

25. Annex 1. Charging procedure

- Switch off the PDA (laser module).
- Connect the charging device and PDA (laser module).
- Connect the charging device and 220V.
- Time of charging – 4 hours, until blue LED is lit.
- Disconnect the charging device and 220V.
- Disconnect the charging device and PDA (laser module).

26. Annex 2. Program for making measurement schemes

To create measurement schemes, the user can use the special program **SchemeBuilder.exe**. When the program is started, the main window appears on the screen:



To form the scheme:

- Enter the number of cars

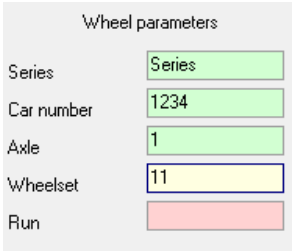
- Enter the number of axles in every car

- If the measurement of the car is performed in the reverse order, tick the box

- Select the type of the scheme

- Click the button to accept

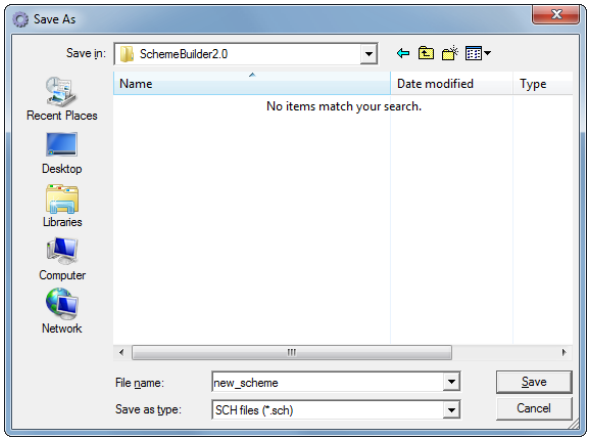
- Next, enter parameters of all wheelsets sequentially for each car



- The fields **Axle** and **Car** are used to navigate through the scheme

- Click the **Save scheme** button

- Enter the name of the scheme in the dialog box window

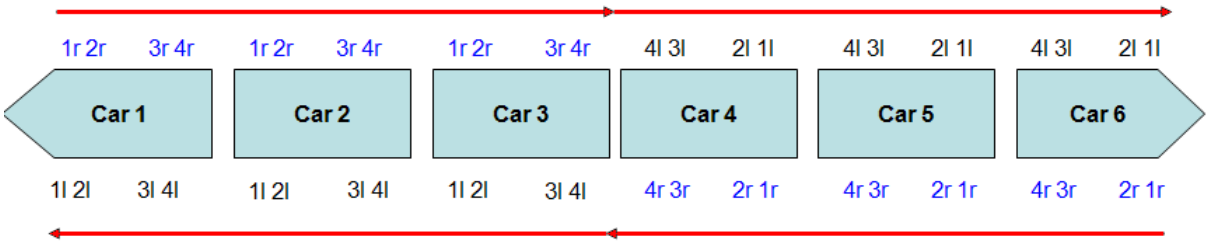


The program allows to edit the existing scheme. To edit the scheme, click the **Load scheme** button and select the **.sch** file. After loading, you can edit and save the wheelset parameters.

To transfer the scheme file to PDA, use the procedure described in par. 21.1.5.

Clarification. The measurement scheme is a text file with extension **.sch**. User can create and edit such file by using any text processor.

Example:




```
Scheme_EXAMPLE
{
1d-|SM 3|7102|1l|11|SU11|111|1r|11|SU11|111|2l|12|SU12|112|2r|12|SU12|112|3l|13|SU13|113|3r|13|SU13|113|4l|14|SU14|114|4r|14|SU14|114|;
2d-|SM 3|7202|1l|21|SU21|211|1r|21|SU21|211|2l|22|SU22|212|2r|22|SU22|212|3l|23|SU23|213|3r|23|SU23|213|4l|24|SU24|214|4r|24|SU24|214|;
3d-|SM 3|7302|1l|31|SU31|311|1r|31|SU31|311|2l|32|SU32|312|2r|32|SU32|312|3l|33|SU33|313|3r|33|SU33|313|4l|34|SU34|314|4r|34|SU34|314|;
4i-|SM 3|7402|4r|44|SU044|414|4l|44|SU44|414|3r|43|SU43|413|3l|43|SU43|413|2r|42|SU42|412|2l|42|SU42|412|1r|41|SU41|411|1l|41|SU41|411|;
5i-|SM 3|7502|4r|54|SU54|514|4l|54|SU54|514|3r|53|SU53|513|3l|53|SU53|513|2r|52|SU52|512|2l|52|SU52|512|1r|51|SU51|511|1l|51|SU51|511|;
6i-|SM 3|7602|4r|64|SU064|614|4l|64|SU64|614|3r|63|SU63|613|3l|63|SU63|613|2r|62|SU62|612|2l|62|SU62|612|1r|61|SU61|611|1l|61|SU61|611|;
}
```

Where:

1d – coaches arranged in direct order (1 – sequence number)

1i – coached arranged in the reverse order (1 – sequence order)

SM3 – coach series

7102 -number

1l – sequence number of wheel pair and the side (l- left/r-right)

11 – axle number

SU11 – name of wheel set

111 – running distance of wheel set

27. Annex 3. Testing and calibration

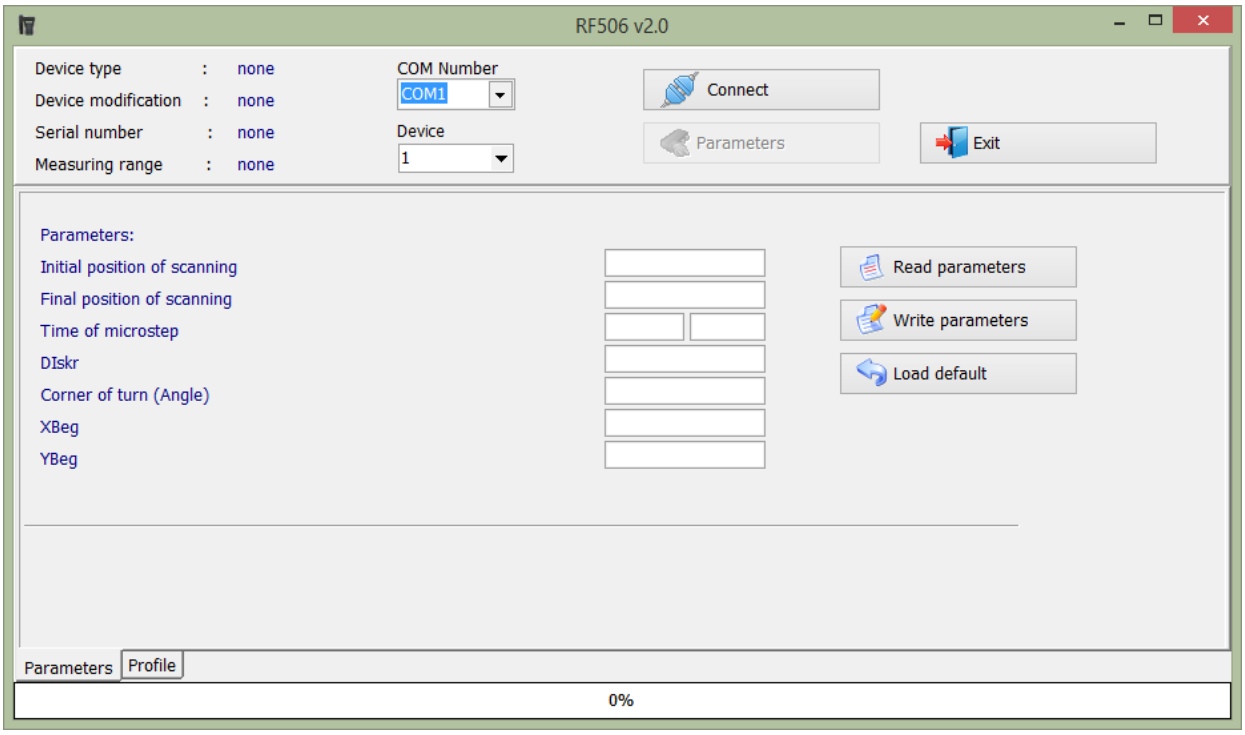
We can supply the IKD complete with a calibration-disk simulation unit (Fig. 1A) and **RF506Calibr** calibration program that are designed for periodic testing and self-calibration of the IKD.

Instead of the calibration unit use can be made of the disk with known profile entered to the database (see par. 20.3.6).

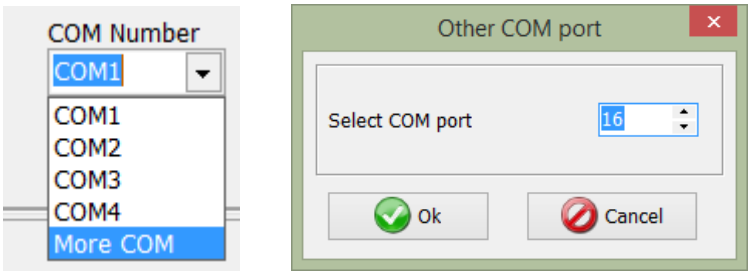
Before start the testing and calibration process, it is necessary to set the COM-port for Bluetooth-connection between the laser scanning module and PC. The procedure is described in the user manual that comes with the Bluetooth-adapter.

27.1. Preparation for testing/calibration

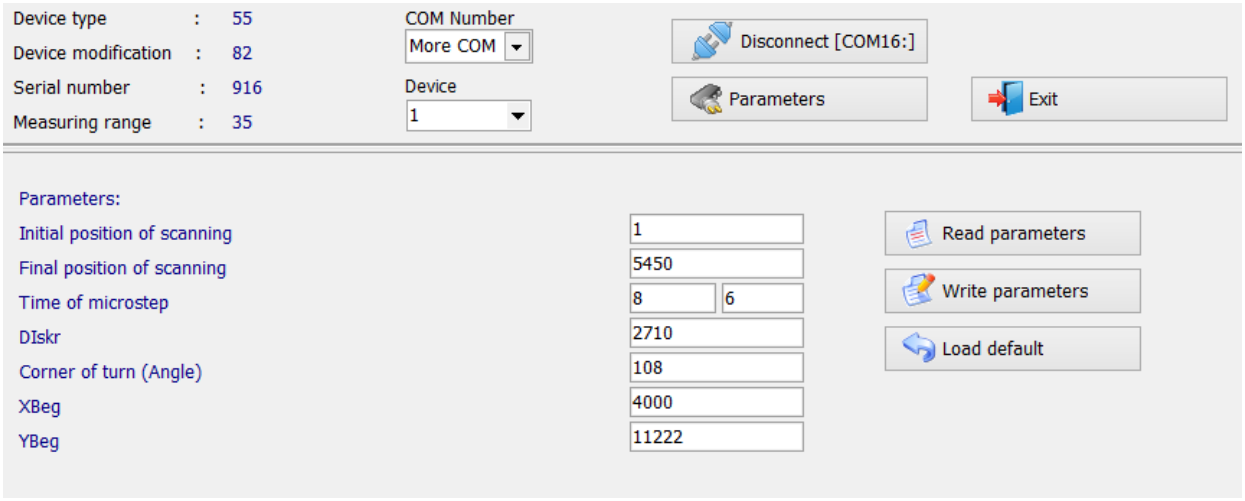
- Install the **RF506Calibr** program on the PC
- Install Bluetooth-connection between the scanning module and PC
- Place the profilometer on the calibration unit
- Run **RF506Calibr** program



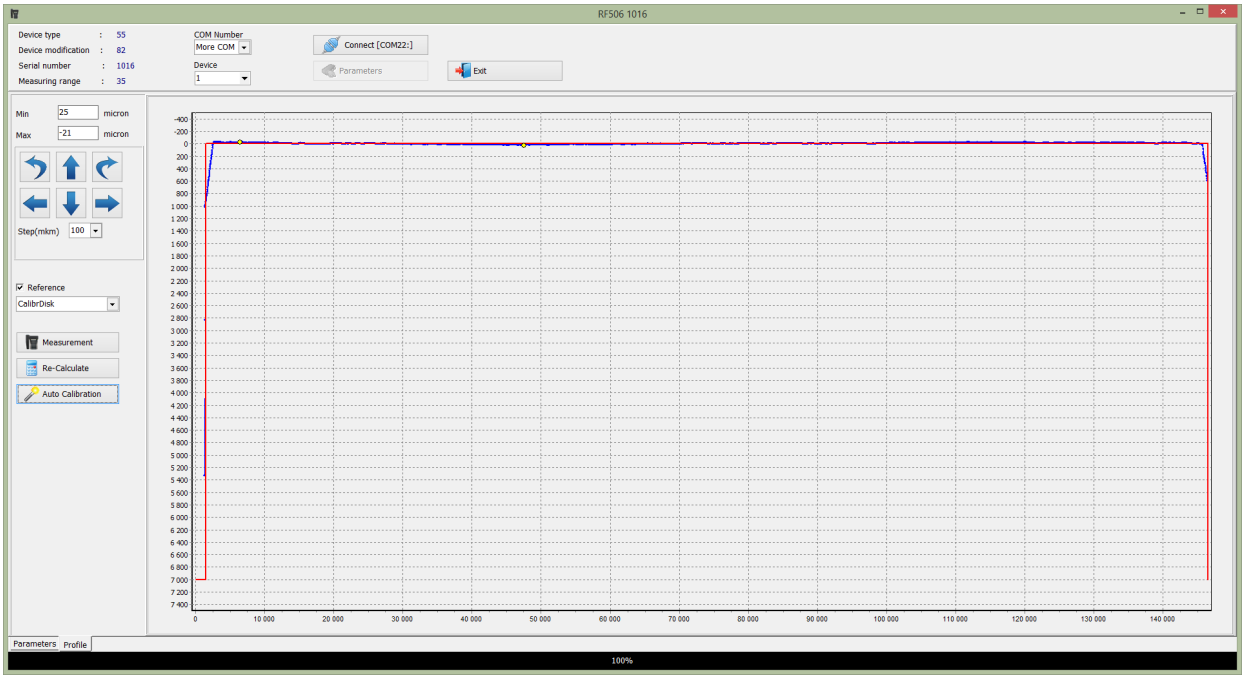
- To install Bluetooth-connection, select the required port



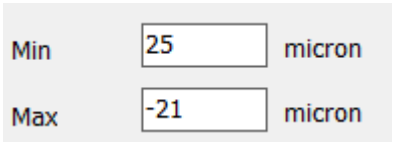
The device will be identified, and calibration parameters will be read.



- to measure the profile press **Measure** button. The display will show measured profiles after measurement has been taken



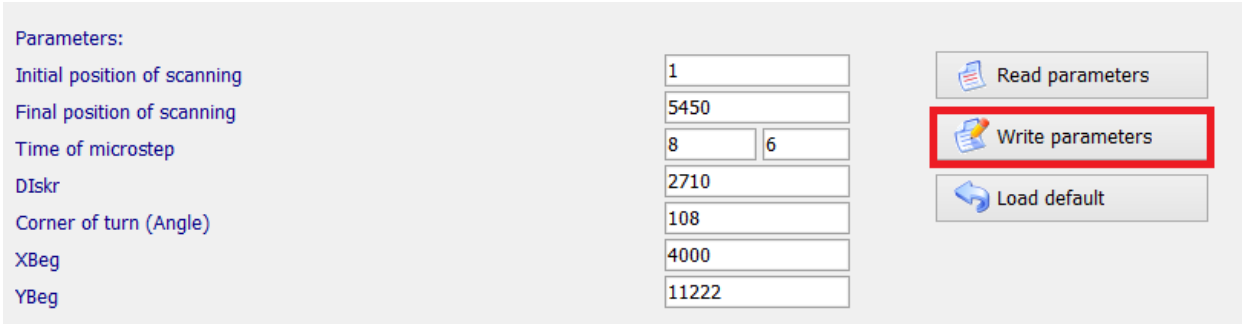
- To compare with the reference, tick the **Compare** box and select the required reference profile in the **Reference** drop-down list.
- The deviation of measurements from the reference will be automatically calculated:



27.2. Calibration

To carry out automatic calibration, do the following steps:

- Select the reference profile from the list
- Perform the measurement (the **Measuring** button)
- Perform the calibration (the **Auto calibration** button)
- Perform the testing measurement. In case of positive result, pass to the **Parameters** tab and save parameters (the **Write parameters** button)



- If parameters have incorrect values (negative or zero) for any reason, it is necessary to restore factory settings by pressing the **Load Default** button. After that, recalibrate the profilometer.

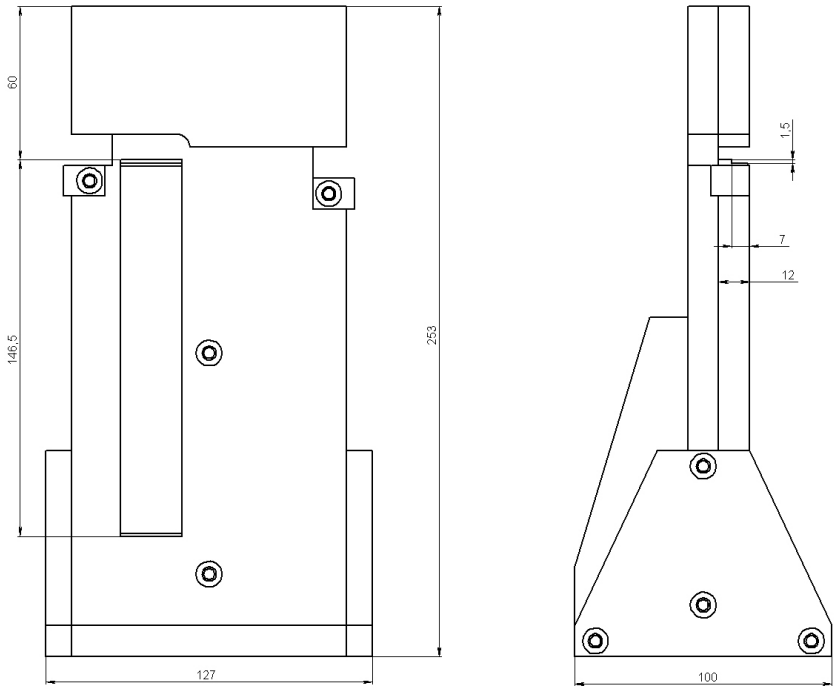


Figure 1A(RF506.51.002)

28. Warranty policy

Warranty assurance for the laser profilometer - 24 months from the date of putting in operation; warranty shelf-life - 12 months.

29. Distributors

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GERMANY **Disynet GmbH** Breyeller Str. 2 41379, Brueggen Tel: +49 2157 8799-0 Fax: +49 2157 8799-22 disynet@sensoren.de www.sensoren.de	GERMANY **BIP-Industrietechnik GmbH** **RAILWAY INSTRUMENTS ONLY** Am Elisabethhof 22, D-14772 Brandenburg D-41379 Brueggen, Germany Tel: +49 (0) 33 81 75 90 0 Fax: +49 (0) 33 81 75 90 11 info@bip-industrie.de www.bip-industrietechnik.de	GERMANY **Finger GmbH & Co. KG** **OPTICAL MICROMETERS ONLY** Sapelloh 172, 31606 Warmsen, Germany Tel: +49 5767 96020 Fax: +49 5767 93004 finger@finger-kg.de www.finger-kg.de

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30. RIFTEK's measurement devices for railway transport

Laser wheel profilometer. IKP Series

A laser profilometer is designed for the measuring of:

- wheel flange height;
- wheel flange thickness;
- wheel flange slope;
- full profile scanning and analyze of wheel rolling surface;
- maintaining of electronic wear data base;
- control of tolerances and sorting in the course of checkup, examination, repair and formation of railway wheel sets.

Measurements are made directly on rolling stock without wheel set roll-out.

Portable laser rail profilometer. PRP Series

The main functions of PRP are:

- obtaining the information on the cross-section profile of the working railhead surface;
- full profile scanning and analyze of the railhead acting face;
- visualization of the combined graphical images of actual and new cross-section railhead profiles on the display of system unit.

Wheel diameter measuring gauge. IDK Series

Electronic gauge is designed for measuring wheel rolling circle diameter of railway, metro and tram wheel sets.

Measurements are made directly on rolling stock without wheel set roll-out.

Back-to-back distance measuring gauge. IMR Series

Gauge is designed for contactless measuring of back-to-back distance of railway, metro and tram wheels in the course of checkup, examination, repair and formation of wheel sets.
Measurements are made directly on rolling stock without wheel set roll-out.

Back-to-back distance measuring gauge. IMR-L Series

Gauge is designed for contactless measuring of back-to-back distance of railway, metro and tram wheels in the course of checkup, examination, repair and formation of wheel sets.
Measurements are made directly on rolling stock without wheel set roll-out.

Disc brakes profile gauge, IKD Series

Laser disc brakes profilometer IKD Series is designed for disc brakes profile measuring.
The main functions of IKD are:

- obtaining the information on the profile parameters of the working disc brakes surface;
- full profile scanning and analyze of the disc brakes acting face;
- visualization of the combined graphical images of actual and new disc brakes profiles on the display of system unit.

Automatic real-time system for measurement of wheelsets geometrical parameters

The system is designed for contactless automatic measurement of geometrical parameters of railway wheels and uses a combination of 2D laser scanners, mounted wayside in the track area.

The system can be easily installed at any type of rail infrastructure.