



A FBD Profile gauge series



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1. Safety precautions and measurement conditions

- Prior to mounting the profilometer onto the wheel, areas of contact of the side supports with the wheel surface should be thoroughly cleaned from dirt.
- When mounting the module on the wheel, do not allow heavy shocks of its support against the wheel.
- The output windows 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 nm wavelength semiconductor laser. Maximum output power is 1 mW. The device belongs to the 2 laser safety class. 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

The Laser disc brakes profilometer FBD Profile gauge is designed for disc brakes profile measuring.

The main functions of the FBD Profile gauge 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;

4.1. Parameters under control

- Maximum wear of brake disk (Wmax)
- Minimum wear of brake disk (Wmin)

5. Basic data and performance characteristics

Name of parameter	Value
Disc brakes wear,mm	-5,0...+5,0
Measurement range, mm	160
Inaccuracy, not more than, mm	±0.01
Scanning time, sec	6
Digital readout device dimensions (PDA), mm	see Fig.5
Dimensions of laser scanning, mm	see Fig.3
Power supply, laser module	4,8V, 8 rechargeable Batteries, typeAA, 1,2V
Power supply, PDA	3,7V Lithium-polymer batteries, 3300mAh
The number of measurements that can be taken before battery recharge is not less than	500
PDA memory capacity, no less	100 000 measurements
Interface between laser module and PDA	Bluetooth

6. Complete set to be supplied

Designation	Name	Quantity	Weight kg
PDA		1	0,4
Laser scanning module		1	1,8
Charging device 5V 3.0A for PDA		1	0,2
Charging device 9V 3.0A for laser module		1	0,2
Universal cable (USB-port + PDA charge)		1	
Bluetooth/USB - adapter		1	
Packing case		1	1,5
Database management system (CD)		1	
User's manual		1	

7. Structure and operation principle

7.1. Basic components of the device and their functions

Fig. 1 shows basic components of the device.

- (1) PDA.
- (2) Laser scanning module.
- (3) Charging device
- (4) Data cable

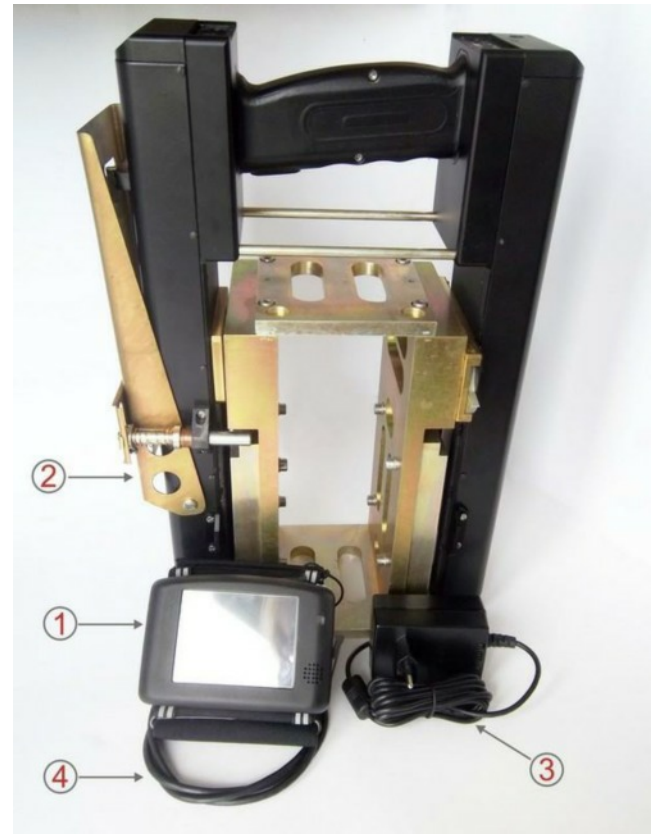


Figure 1

7.1.1. Laser scanning module

The module is intended for laser scanning of disc brakes surface.

Fig. 2 indicates:

- (1) Indicator of Bluetooth connection (blue LED)
- (2) Indicator of turn ON (red LED)
- (3) Turn ON button
- (4) Charging device connector
- (5) Charging indication, red/green LED
- (6) Magnetic support for mounting on the wheel side surface
- (7) Input window

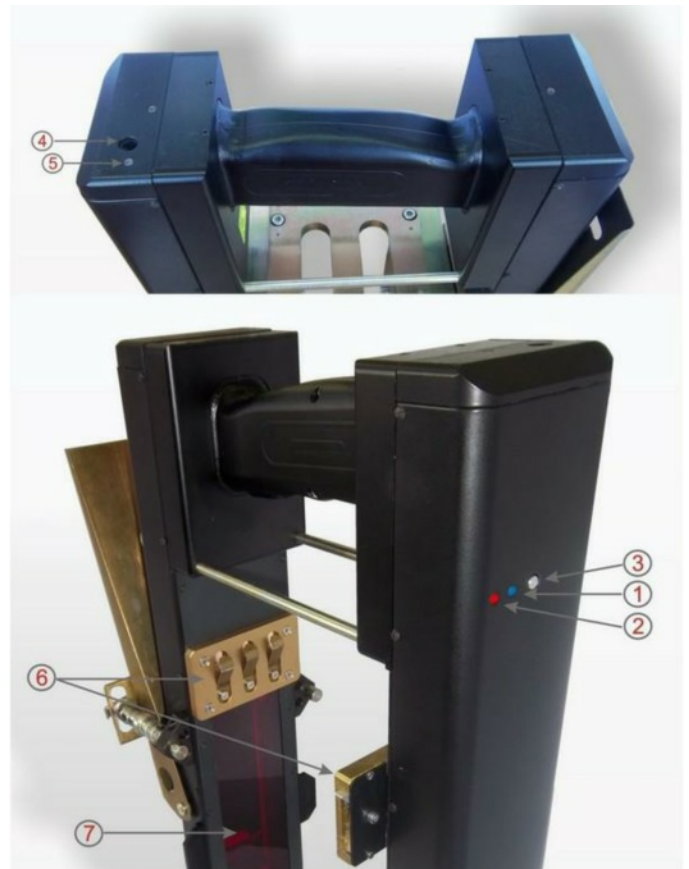


Figure 2

Overall dimensions of scanning module are shown in figure 3.

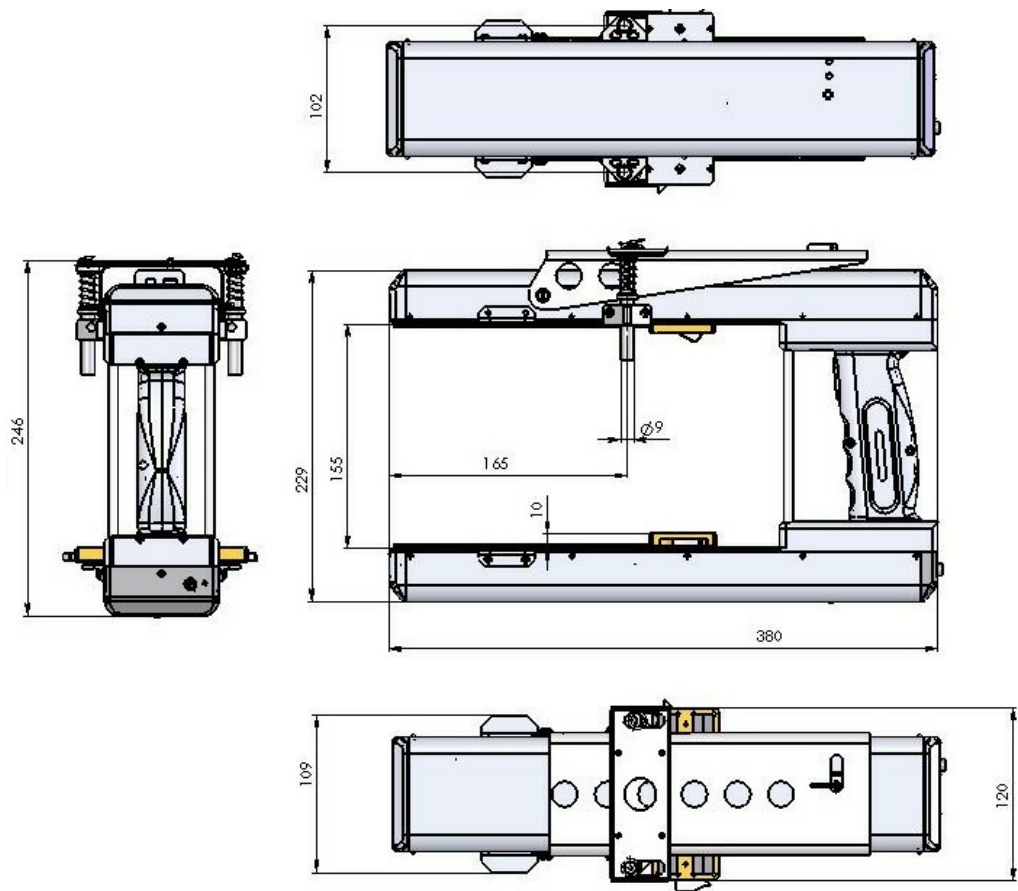


Figure 3

7.1.2. PDA

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 4

Fig. 4 indicates:

- (1) Turn-on button
- (2) Charging indication, red/green LED
- (3) Charging device connector
- (4) Connector to PC USB-port or charging device
- (5) Flash memory card connector
- (6) Stylus
- (7) Bluetooth antenna
- (8) Battery case

Overall dimensions of PDA are shown in figure 5.

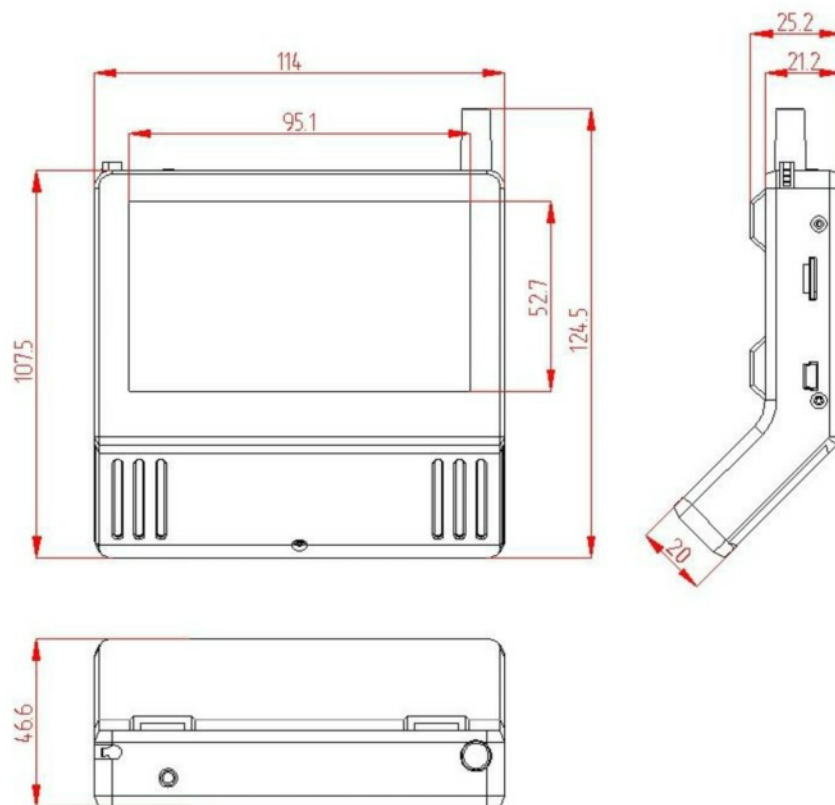


Figure 5

7.2. Operation principle

Operator mounts the laser scanning module onto the wheel. Having received a command from PDA or PC, the laser module performs non-contact scanning of the disc 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.

8. Measurement procedure

8.1. Activation

- Turn the PDA on by pressing the button (1), Fig. 4. Activation indication (2) will show a green LED lit.

- Switch the laser module on by pressing ON/OFF (5) button and holding it until red LED is lit
- 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 (1) on the laser module. The LED goes out when the link is established.
- The PDA screen will show the main program window containing: main menu; indicators of PDA and laser module charging degree; indicator of Bluetooth connection showing serial number of the laser module with which connection is established; information panels of the selected working parameters and tolerances and the Measurement button:

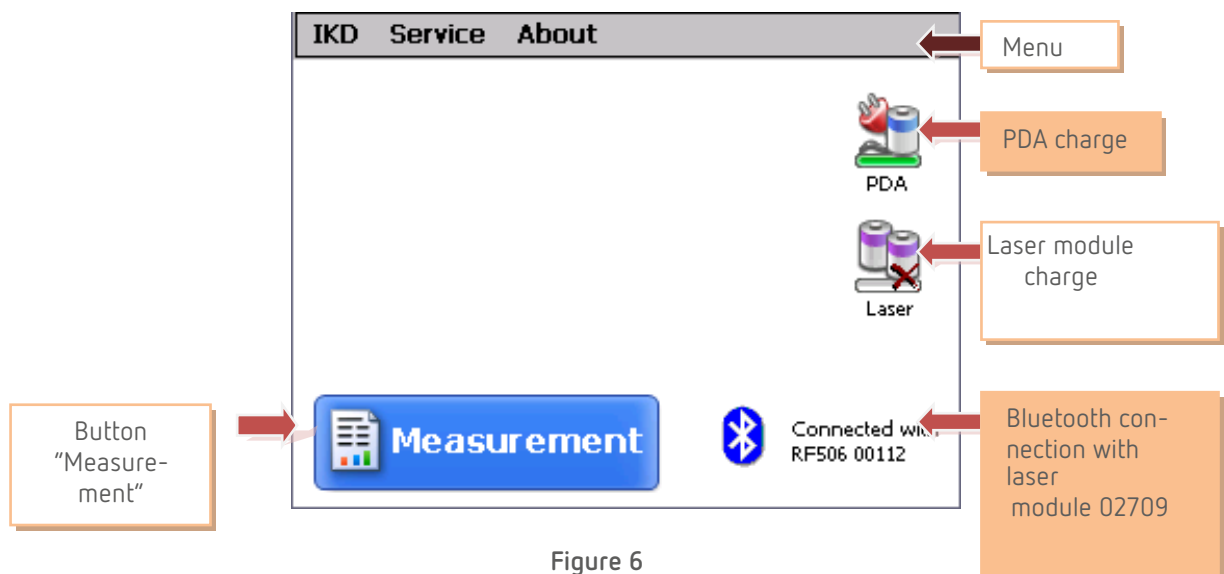
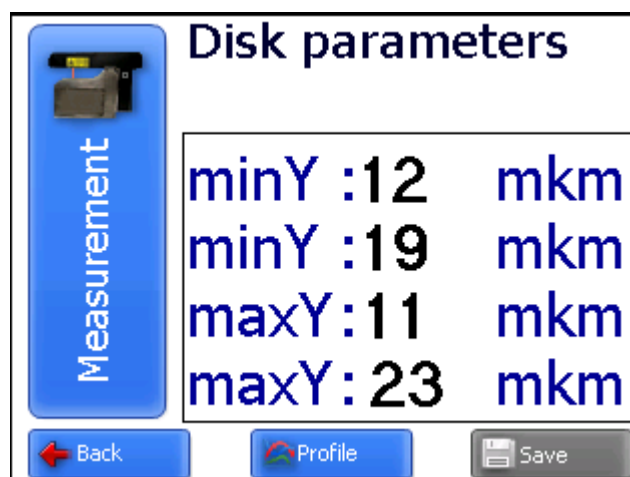


Figure 6

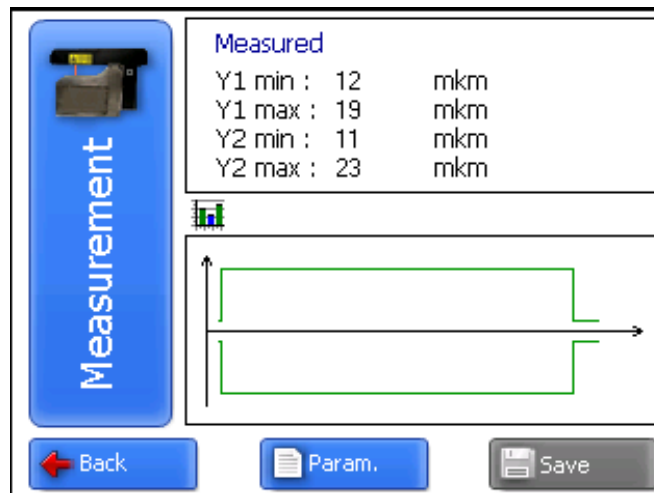
8.2. Measurement

To perform measurement, it is necessary to:

- Fix the laser module on the wheel;
- Press Measurement button on the PDA display;
- With the Measurement button pressed, the laser module will scan the disc brakes surface. During scanning time of about 5-6 seconds red LED (2) is lit.
- When scanning is completed, the PDA will show values of measured parameters selected for presentation (see par. 10.3.).



- To look at disc brakes profile, press the Profile button, and the scanned disk brakes profile will be displayed as well as measured parameters:



9. Wheel parameters under control. Terms and definitions

Geometric parameters of the disc are calculated automatically after laser scanning of the wheel is completed. To calculate geometric parameters, base points at the edges of brake disks and new disk parameters are used.

The parameters under control and respective calculation methods are given in Table 2.

Table 2.

Parameter	Designation	Calculation method
Maximum wear	Ymax	Maximum wear of brake disk
Minimum wear	Ymin	Minimum wear of brake disk

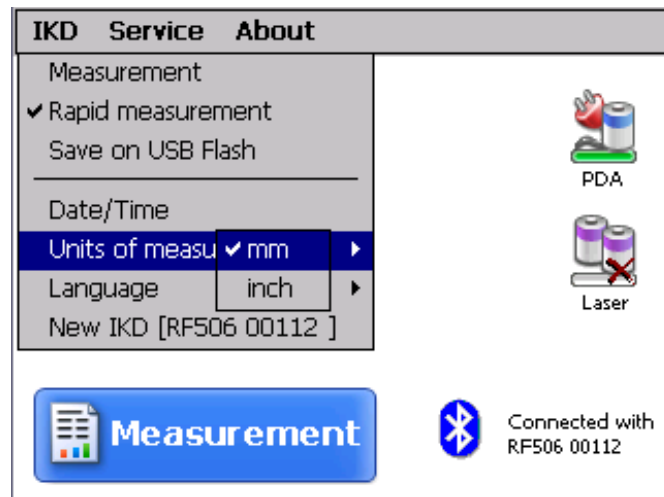
10. PDA program setting

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

10.1. Selection of measurement units

All parameters as well as measurement results can be presented in the metric system (millimeters) or in the English system of units (inches). To set measurement units, it is necessary to

- select IKD> Units of measuring > [mm/inch]

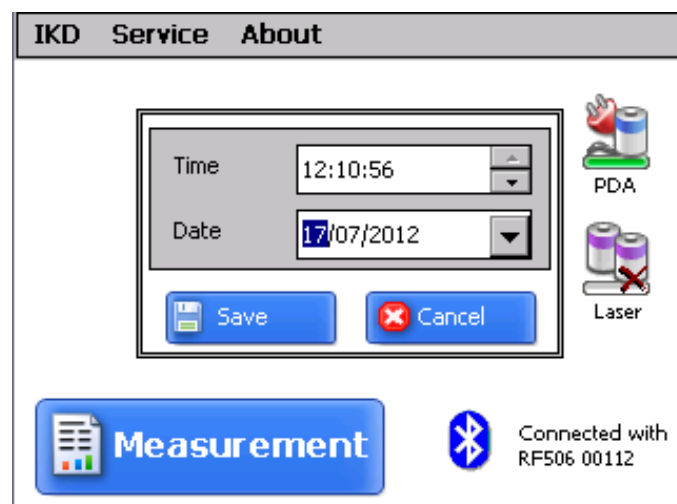


- select mm or inch options

10.2. Data and Time settings

To set data and time:

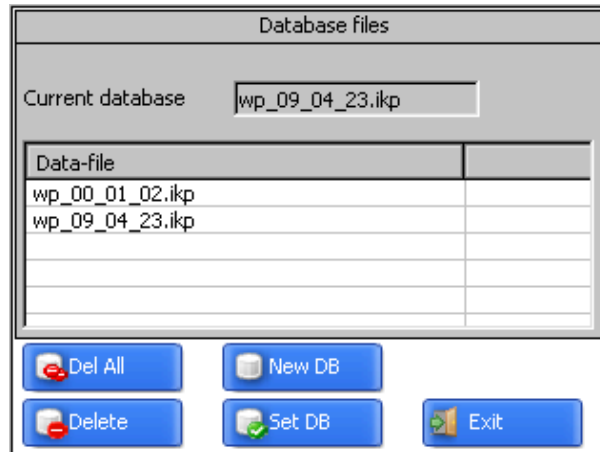
- select Profilometer > Data/Time in main window of the program.
- View on the PDA screen:



- write data and time
- press Save.

10.3. Database selection

If necessary, measurement results are saved in the PDA database. The program makes it possible to simultaneously create and store several database files connected with a concrete date of taking measurements. To select a database file, choose Service > DB files in the main window menu. The screen will show:

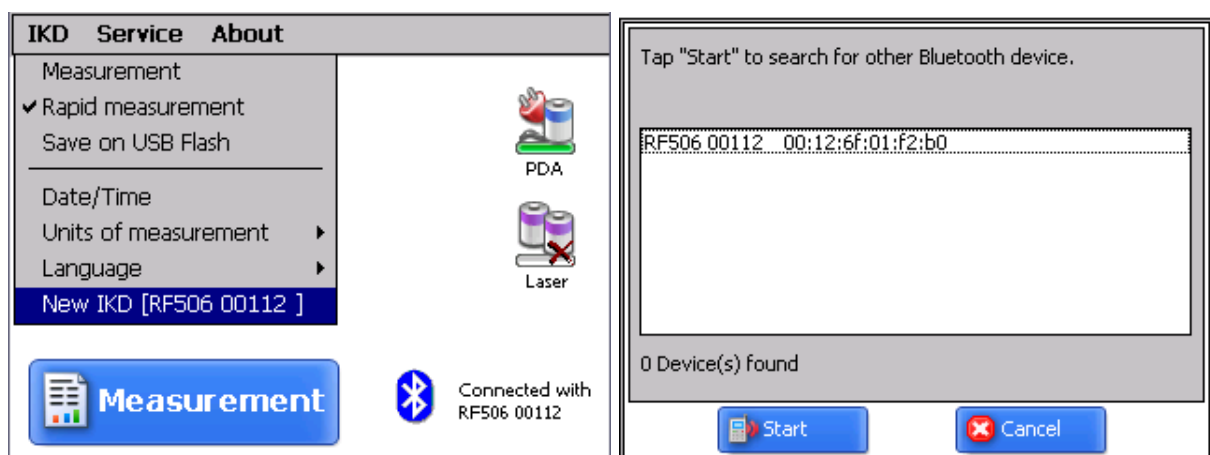


- To create a new database, press New DB. File with the name wp_yy_mm_dd.ikp will be formed automatically, where yy_mm_dd is the current date;
- to select the available database, activate the line with the file name and press Select DB;
- to delete the selected file press Delete;
- to delete all files press Delete all;
- to exit from the window press Exit.

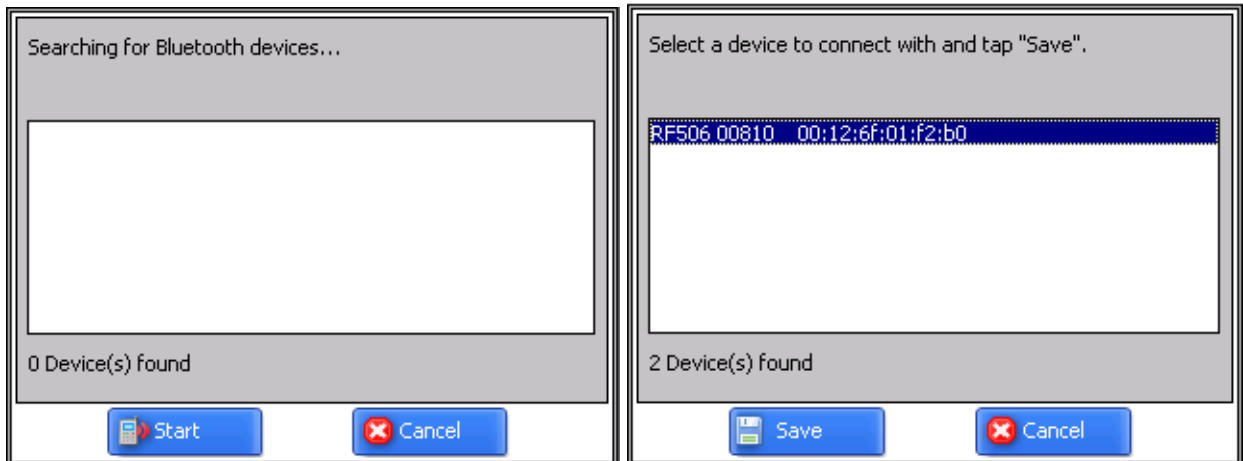
10.4. New laser module connection

Bluetooth-connection of PDA is adjusted for work with the laser scanning module supplied with PDA complete package. To connect other scanning module it is necessary to:

- select IKD > New IKD



- press Start and wait for new devices (with serial numbers) will appear on the screen



- select device and press Save to save new device address

10.5. Selection and changing of language and terminology

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 choose language in the main window menu, select IKD > Language. Select the required language support file.

10.6. Browsing and updating PDA software

To look at the software version in the main window menu, select About Program tab. The screen will show:



11. Working with the profilometer

11.1. Activation

Switch on the PDA and scanning module as shown in par. 8.1.

11.2. On-line measurements

Procedure of on-line measurements is described in par. 8.2.

11.3. Measurements with database maintenance

A fully functional work with the profilometer involves maintenance of the measurements database.

To take measurements:

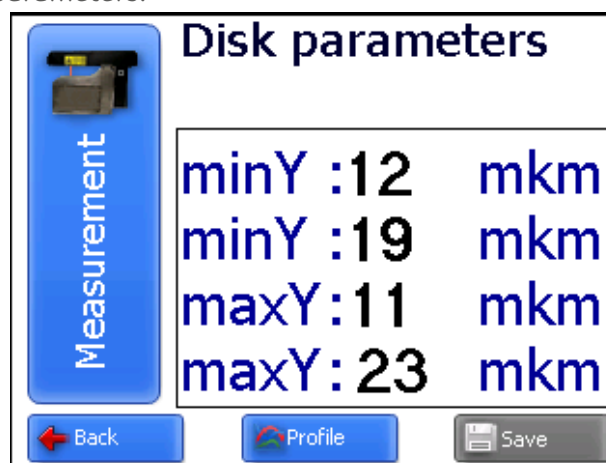
- Select in the main menu IKD > Measurement, the window of parameters input will appear

Enter parameters wheel pair

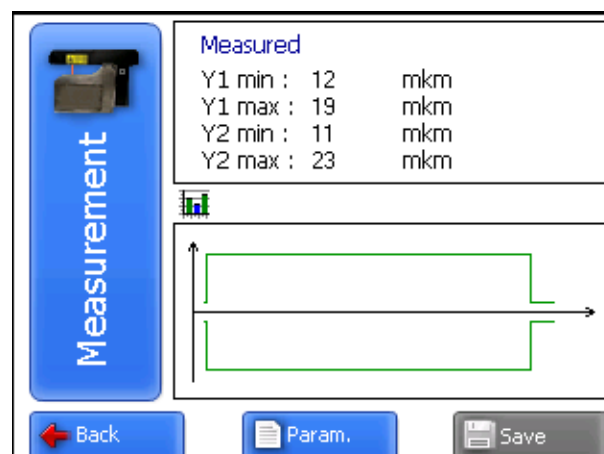
Date	01/01/06	Worker	22
Wheel pair	1	Run	1667
Series	TC23	Side	L
Locomotive	12564	Axle	1

Save Cancel

- If necessary, fill in/edit the required fields
- to save parameters, press the Save button
- to measure disc brakes;
- after the wheel surface is laser-scanned, the PDA will show the value of selected geometrical parameters.



- to look at the profile press Profile button:

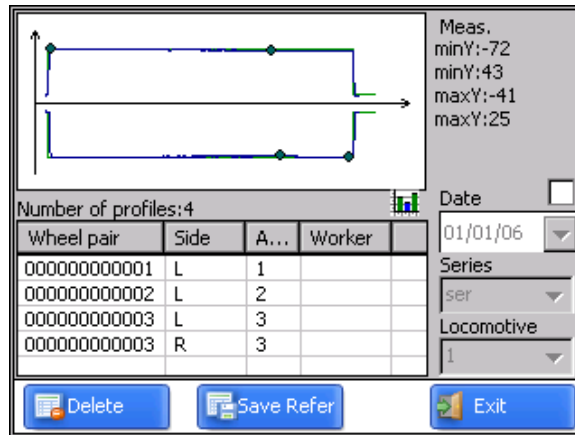


- when a satisfactory result is obtained, press Save on the display to save it

11.4. Browsing the database

To browse the database:

- select Service > Profiles in the main window. View on the screen:

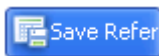


Buttons:



– delete selected profile;

- when in this mode, it is possible to save the selected profile as a reference profile by pressing Save button:



– create reference profile (profile_name.ref).



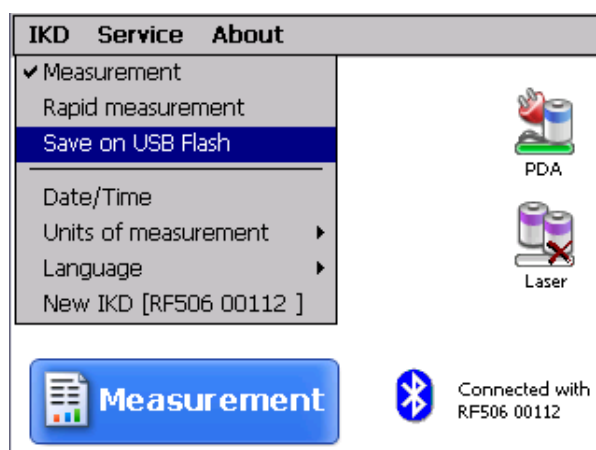
- Write profile name and press Save

11.5. Saving database on flash memory card

One of the ways to transfer database from PDA to PC is to use flash memory card.

To save database on the card, proceed as follows:

- connect cable FDRF505.42 to the PDA universal connector
- insert flash card to the respective cable connector
- select IKD > Save to USB flash in the main program window



- if saving is successful, the screen will show Data saved on USB Flash
- remove flash card from the cable.

11.6. Deactivation

To turn off the PDA, press power supply button and hold it down until the screen is blank. To turn off the laser module, press button 3, Fig. 2 and hold it down until red LED 2 goes out.

12. Database support software

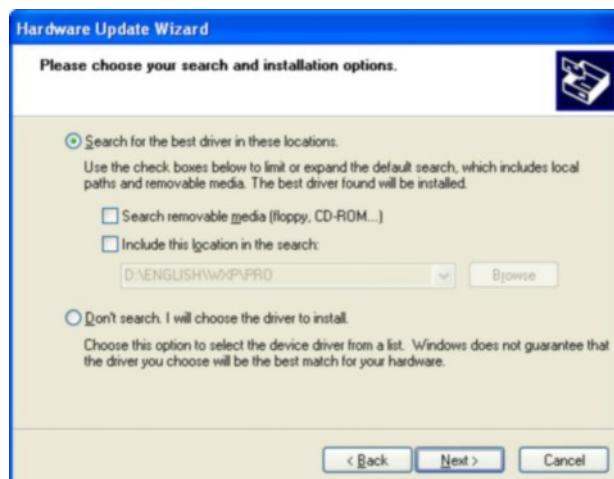
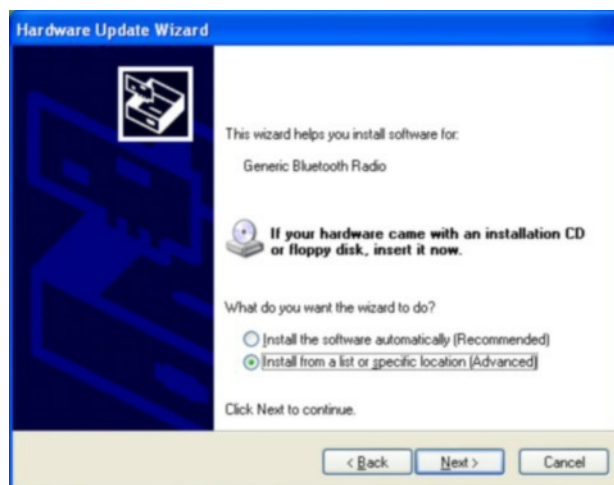
The PRP_DB software is intended for maintaining wheel sets wear database on a personal computer.

To install the software, insert compact disk to PC CD drive, select and start Install_PRP.exe. file in the Software folder. Follow instructions of the installation wizard. The program is installed in C:\Program Files\RIFTEK\ folder by default.

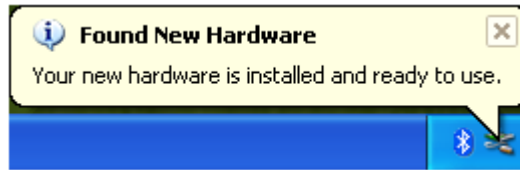
13. Installation of Bluetooth connection between scanning module and PC

To install Bluetooth-connection between the laser scanning module and PC, it is necessary to:

- insert USB/Bluetooth-module to PC USB-port..
- continue installation of the equipment following instructions of the wizard by selecting successively:



- when drivers are installed, the corresponding message and Bluetooth icon will appear in the screen:



- activate IKD.
- click right mouse key on the Bluetooth icon and select Add Bluetooth device



- Then Bluetooth installation wizard will start working:



- tick the Device is installed and ready for connection
- select Further for search
- when the search is completed, the wizard will show the devices found:



- select the required device, press Further and type access key (Pin). The key for each device consists of 4 symbols and is set based on the profilometer serial number. For example, if the profilometer number is 00810, then Pin=0080; 01309 - Pin=0139, etc.



- press Further and continue installation process.
- when required drivers are installed, the Bluetooth device will give a message with COM-port (outgoing) which should be opened for connection with profilometer during calibration or for controlling profilometer by PC. In this case, the port is COM20:

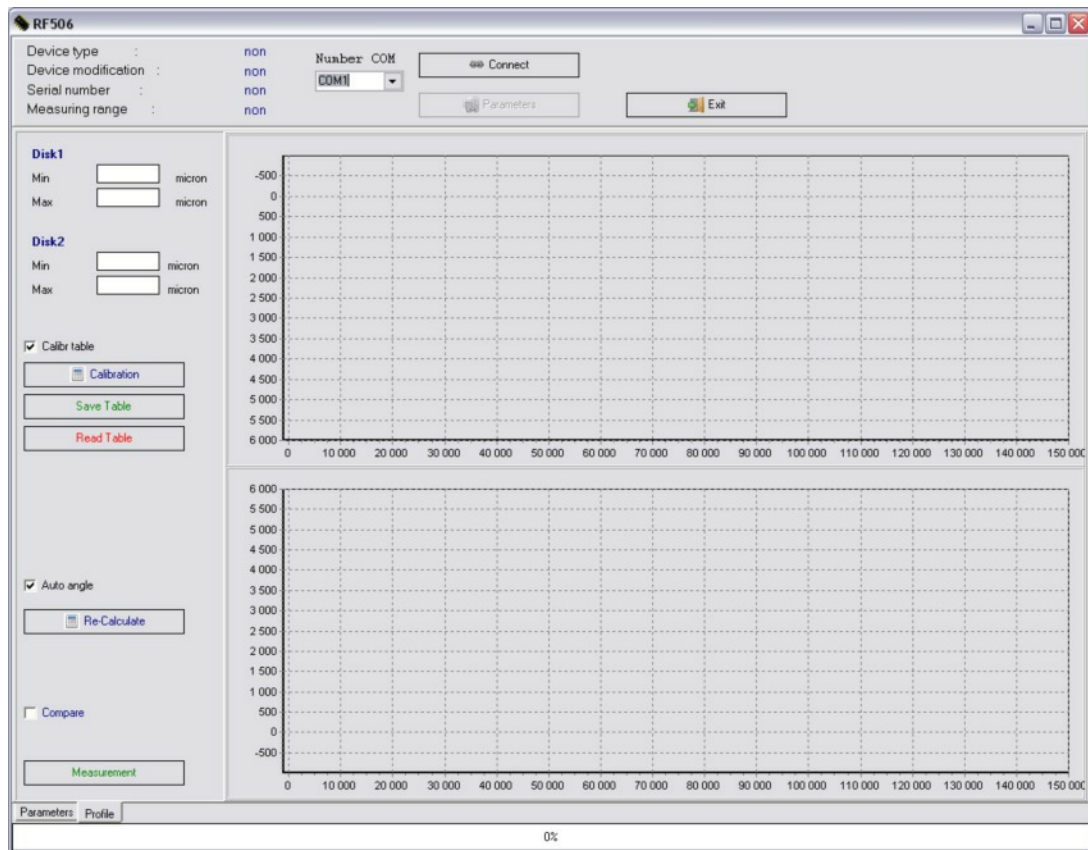


14. Testing and calibration

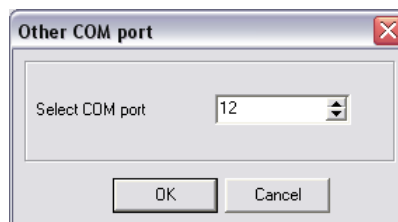
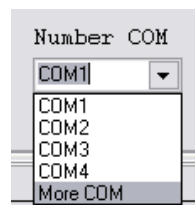
We can supply the profilometer complete with an FDRF432.10 (Figure 1A) calibration-brake-disc simulation unit and F506Calibr calibration program that are designed for periodic testing and self-calibration of the profilometer in case of unsatisfactory testing results

14.1. Preparation for testing/calibration

- install the RF506Calibr program.
- install Bluetooth-connection between the scanning module and PC as described in par. 13
- adjust the profilometer to the calibration-wheel simulation unit - Fig.1
- run RF506Calibr program



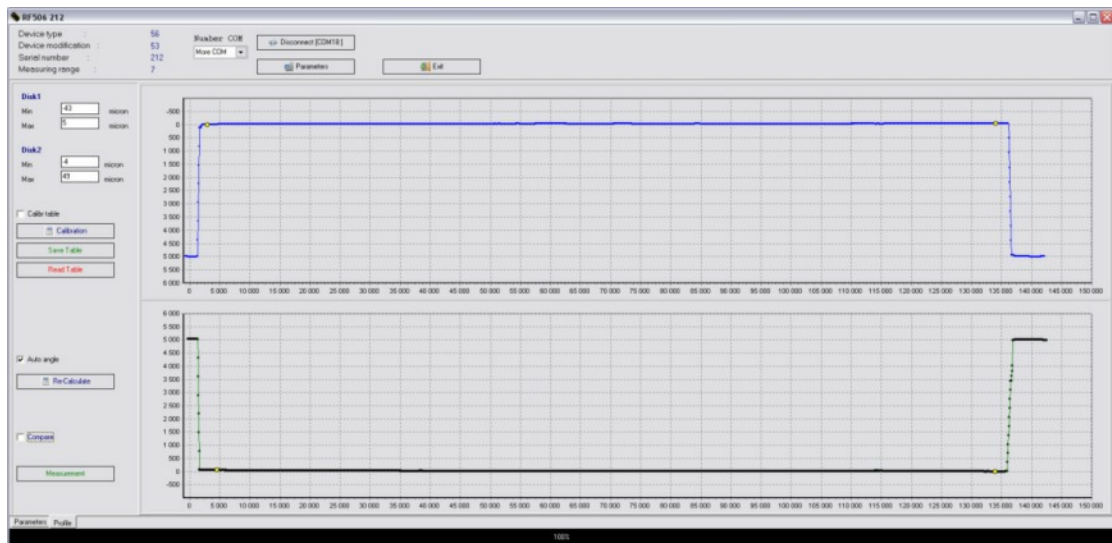
- select the required port



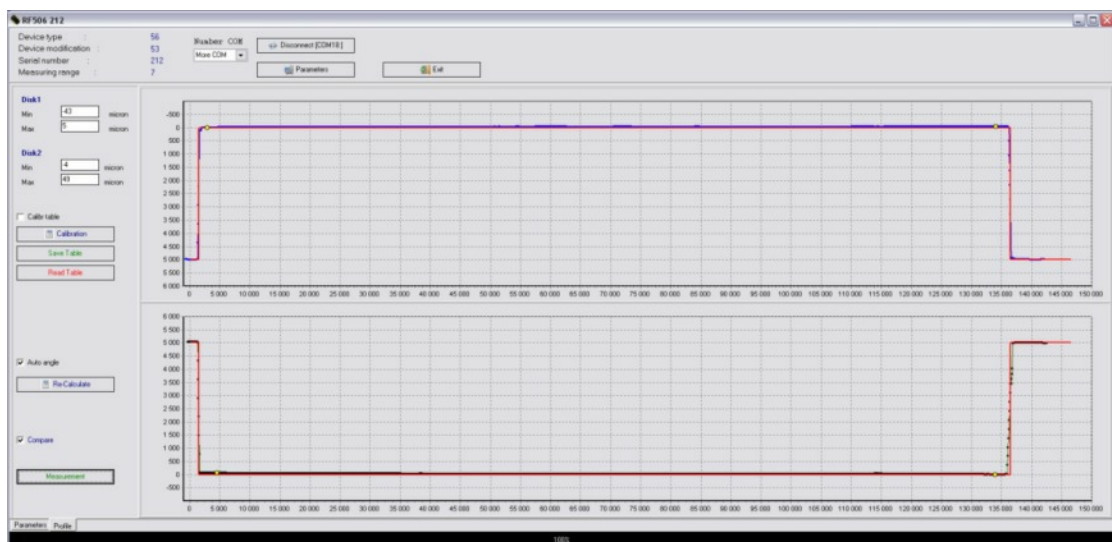
- press "Parameters" button to connection



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



- to compare with the reference profile, tick the **Compare** checkbox.




- The deviation of measurements from the ethalon will be automatically calculated:

Disk1		
Min	<input type="text" value="-43"/>	micron
Max	<input type="text" value="5"/>	micron
Disk2		
Min	<input type="text" value="-4"/>	micron
Max	<input type="text" value="49"/>	micron

14.2. Calibration

For calibration:

Ful fill pointy .14.1

Press **Calibration** -  **Calibration**. After scanning the program forms calibration table and Save Table button begins available **Save table**

 **Save Table**

To save the table press **Save table**.

Please wait the end the table downloads into the memory. It takes sufficiently large time. Don't make any manipulations with profilometer during this time.

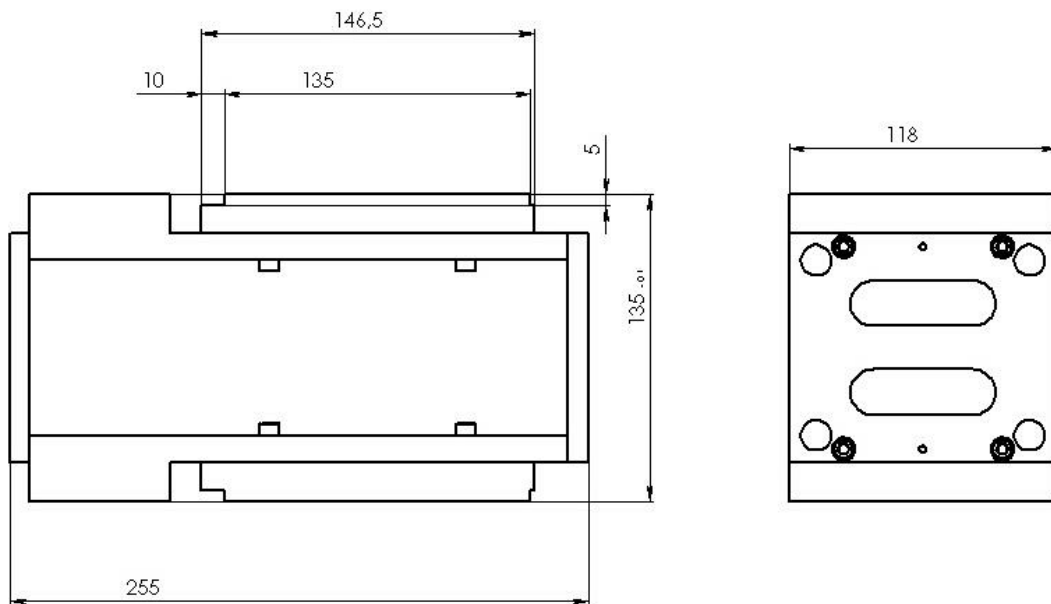


Figure 1A

15. Charging of built-in accumulator battery

- Switch off PDA (laser module).
 - Connect charging device and PDA (laser module)
 - Connect charging device and 220V.
 - Time of charging of DRD – 5 hours (until red LED is OFF), laser module – 4 hours (until green LED is lit).
 - Disconnect charging device and 220V
 - Disconnect charging device and PDA (laser module)
- ATTENTION: please follow the sequence of this points.

16. Warranty policy

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

17. Annex 1. Measurement instrument for railway transport

Laser wheel profilometer. FDKP 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;

Back-to-back distance measuring gauge. FDIRM Series



The device is designed for:

- measuring 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

Portable laser rail profilometer. FPRP Series



The main functions of FPRP 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. FDK 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.