LASER WHEEL PROFILOMETER

IKP-5, IKP-5R Series

User’s manual

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Certified according to ISO 9001:2008
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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 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 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

A laser profilometer IKP5 Series is designed for the measuring of:

- wheel flange height
- wheel flange thickness
- wheel flange slope
- rim thickness
- 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.
5. Basic data and performance characteristics

<table>
<thead>
<tr>
<th>Name of parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement range for the flange height, mm</td>
<td>20...45</td>
</tr>
<tr>
<td>&quot;-&quot; flange thickness, mm</td>
<td>20...40</td>
</tr>
<tr>
<td>&quot;-&quot; flange slope, mm</td>
<td>1...15</td>
</tr>
<tr>
<td>&quot;-&quot; rim thickness*, mm</td>
<td>30...90</td>
</tr>
<tr>
<td>Measurement error for the flange height, mm</td>
<td>± 0,1</td>
</tr>
<tr>
<td>&quot;-&quot; flange thickness, mm</td>
<td>± 0,1</td>
</tr>
<tr>
<td>&quot;-&quot; flange slope, mm</td>
<td>± 0,2</td>
</tr>
<tr>
<td>&quot;-&quot; rim thickness , mm</td>
<td>± 0,1</td>
</tr>
<tr>
<td>Discreteness of indication of the flange height, mm</td>
<td>0,01</td>
</tr>
<tr>
<td>&quot;-&quot; flange thickness, mm</td>
<td>0,01</td>
</tr>
<tr>
<td>&quot;-&quot; flange slope, mm</td>
<td>0,01</td>
</tr>
<tr>
<td>&quot;-&quot; rim thickness , mm</td>
<td>0,01</td>
</tr>
</tbody>
</table>

Profile measurement range – the whole profile between of the wheel tire faces (145 mm maximum)

| Discreteness of the profile formation, not worse than, mm | 0,1 |
| Digital readout device dimensions, mm | see Fig.5 |
| Dimensions of laser scanning module (for the maximum scanning range), mm | see Fig.3 |
| Power supply – rechargeable battery | 4.8V |
| The number of measurements that can be taken before battery recharge is not less than | 1000 |
| PDA memory capacity, no less | 1000 measurements |
| Interface to PC | USB, Bluetooth |

*Rim thickness measurement is an option. Designation for the order is IKP-5R

6. Complete set to be supplied

<table>
<thead>
<tr>
<th>Designation</th>
<th>Name</th>
<th>Quantity</th>
<th>Weight kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF303</td>
<td>PDA</td>
<td>1</td>
<td>0,4</td>
</tr>
<tr>
<td>RF505</td>
<td>Laser scanning module</td>
<td>1</td>
<td>0,6</td>
</tr>
<tr>
<td>RF505.40</td>
<td>Charging device 9V 3.0A for PDA</td>
<td>1</td>
<td>0,2</td>
</tr>
<tr>
<td>RF505.41</td>
<td>Charging device 9V 3.0A for laser module</td>
<td>1</td>
<td>0,2</td>
</tr>
<tr>
<td>RF505.42</td>
<td>Universal cable USB – mini USB</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>RF505.43</td>
<td>Bluetooth/USB - adapter</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>RF505.30</td>
<td>Packing case</td>
<td>1</td>
<td>0,9</td>
</tr>
<tr>
<td>IKP5_DB</td>
<td>Database management system (CD)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>RF505UM</td>
<td>User's manual</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Calibration tools (option):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RF505.11</td>
<td>Wheel-simulator,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PΦ505.11</td>
<td>Calibration software</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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) Calibration block
(4) Charging device
(5) Data cable

7.1.1. Laser scanning module

The module is intended for laser scanning of wheel surface.
Fig. 2 indicates:
(1) Turn ON button
(2) Indicator of turn ON (red LED)
(3) Indicator of Bluetooth connection (blue LED)
(4) Charging device connector
(5) Support for mounting of the device on the wheel flange
(6) Magnetic support for mounting on the wheel side surface
(7) Charging indication, red/green LED
(8) Output window
(9) Rim measurement rod
Overall dimensions of scanning module are shown in 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.
Fig. 4 indicates:
(1) Turn-on button
(2) Charging indication, red/green 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 5.

**Figure 5**

7.1.3. Calibration block

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

Overall dimensions of calibration block are shown in figure 1A of paragraph 20. The suggested profiles are given in paragraph 23. Also possible is supply of a unit with a profile made to the customer’s drawings.

7.2. Operation principle

Operator mounts the laser scanning module onto the wheel to be measured. Having received a command from PDA or PC, the laser module performs non-contact scanning of the wheel 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, wheel pair number, etc.

8. First activation and measurement procedure

8.1. Preparation for use

- Before using the device for the first time, it is necessary to remove the lock screw 2 and to twist in the screw 1 instead (Fig. 6).

![Figure 6]

- Charge accumulators of the laser module and indication device by connecting them to charging devices (see par. 22).

8.2. 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 (1) 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 (3) 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:
8.3. Measurement

To perform measurement, it is necessary to:

- Fix the laser module on the calibration unit or wheel by mounting the module support (5) onto the wheel flange and pressing magnetic support (6) to the internal face of the wheel;
- For rim measurement extract rim measurement rod and hitch it up to the rim.

- Make sure that the module is mounted correctly without any misalignment and gaps;
- Press Measurement button on the PDA display;
- With the Measurement button pressed, the laser module will scan the wheel surface. During scanning time of about 1-2 seconds red LED (2) is lit.
- When scanning is competed, the PDA will show values of measured parameters selected for presentation (see par. 10.6). When the parameter goes beyond set limits its value is highlighted with red color:
To look at wheel profile, press the **Profile** button, and the PDA display will scanned wheel profile as well as measured parameters and parameters of calibration element (or a wheel chosen as a reference):
9. Wheel parameters under control. Terms and definitions

9.1. L-parameters

Geometric parameters of the wheel are calculated automatically after laser scanning of the wheel is completed. To calculate geometric parameters, use is made of reference points on the wheel profile. Location of the reference points is shown in Fig. 8 and is defined by L-parameters (parameters L1…L9). Values of L-parameters preset in PDA are given in Table 1 and can be changed by user (see par. 10.3.).

![Figure 8](image_url)
Table 1.

<table>
<thead>
<tr>
<th>L-parameter</th>
<th>Default value</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>locomotive</td>
<td>MCRS *</td>
</tr>
<tr>
<td>L1</td>
<td>2 mm</td>
<td>5 mm</td>
</tr>
<tr>
<td>L2</td>
<td>70 mm</td>
<td></td>
</tr>
<tr>
<td>L3</td>
<td>13 mm</td>
<td>18 mm</td>
</tr>
<tr>
<td>L4</td>
<td>30 mm</td>
<td>28 mm</td>
</tr>
<tr>
<td>L5</td>
<td>-</td>
<td>60 deg</td>
</tr>
<tr>
<td>L6</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>L7</td>
<td>105</td>
<td>105</td>
</tr>
<tr>
<td>L8</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>L9</td>
<td>140</td>
<td>140</td>
</tr>
</tbody>
</table>

* MCRS – motor coach rolling stock

9.2. Geometric parameters of the wheel under control

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

Table 2.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Designation</th>
<th>Calculation method</th>
</tr>
</thead>
<tbody>
<tr>
<td>The flange thickness (calculation method #1) &quot;From surface&quot;</td>
<td>Sd (figure 8)</td>
<td>is determined as a distance measured horizontally at any pre-selected height (L3) from the surface of the wheel rolling surface between two points lying on the opposite sides of the flange top: one of which lies in the plane of the internal face of the wheel tire and the other on the outer surface of the flange</td>
</tr>
<tr>
<td>The flange thickness (calculation method #2) &quot;From the top&quot;</td>
<td>Sd</td>
<td>is defined as the distance from the flange top measured along the horizontal line at a selected height L3 (factory setting is 18 mm)</td>
</tr>
<tr>
<td>The slope of flange (calculation method #1) &quot;Locomotive&quot;</td>
<td>qR (figure 8)</td>
<td>is calculated as a difference between the flange thickness at the any pre-selected height from the surface of the wheel rolling surface (L3) and that measured at the any pre-selected distance (L1) away from the flange top</td>
</tr>
<tr>
<td>The slope of flange (calculation method #2) &quot;Railcar&quot;</td>
<td>qR</td>
<td>is calculated as the difference between the angle of slope of the reference profile (parameter L5) and the slope of the measured profile. Slope of the measured profile is calculated as the inclination angle of a straight line passing through points on the wheel flange that are located at distances L1 and L3 from the flange top</td>
</tr>
<tr>
<td>The flange height</td>
<td>Sh</td>
<td>is determined as a distance measured vertically between the flange top and the point of wheel rolling surface at the any pre-selected distance (L2) away from the inner face of the wheel tire.</td>
</tr>
<tr>
<td>Roll wear</td>
<td>dW</td>
<td>is defined as the distance between the measured flange height and the nominal height determined by the parameter L4</td>
</tr>
<tr>
<td>Rim thickness</td>
<td>T</td>
<td>Is calculated as a distance between the edge of the rim and the point of wheel rolling surface at the any pre-selected dis-</td>
</tr>
</tbody>
</table>
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 **IKP > Units of measuring > [mm/inch]**
- select **mm** or **inch** options

10.2. Data and Time settings

To set data and time:

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

  - write data and time
10.3. L-parameters settings

To change L-parameters:
- select IKP > L Parameters
- write parameter's value
- press Save

10.4. Calculation methods setting

To set calculation methods (see. Table 2):
- select IKP > Calculation methods
- set the parameters required
- press Save

10.5. Selection of displayed geometric parameters

To select geometric parameters to be displayed after scanning:
- select Profilometer > Displayed parameters
- mark the parameters whose values must be displayed
- press Save
10.6. Tolerances settings

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 set tolerances it is necessary to:

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

![Tolerances settings screen]

- adjust tolerances in the selected group or add a new group of tolerances and write corresponding values. All values are in micrometers.

**Buttons:**
- add new group of tolerances;
- delete selected group of tolerances;
- edit selected tolerance;
- exit.

10.7. Reference profile selection and installation

The program lets compare scanned profile of the wheel with reference profile. Reference profiles are stored in the PDA database as profile description files with extension .ref. PDA is supplied with several pre-installed profiles (see paragraph 23.1). If there is no required reference profile in the database, user can form profile description himself (methods of .ref files formation are described in par. 13.6.) or request the lacking profile from RIFTEK (free service).

10.7.1. Reference profile selection

To select reference profile press Service > Reference profiles:

![Reference profile selection screen]

- Activate the required profile and press the Set key;
• To delete profile from the database, activate the line with selected profile and press the **Delete** key;
• To exit from the window, press the **Exit** key.

### 10.7.2. Writing reference profile to database

If there is no required reference profile in the database, profile description file can be formed by user with the help of one of the procedures described in par. 13.6, and transferred to the PDA as it is shown in par. 14.1.4.

### 10.8. 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 save file in TXT form press нажать **Export**;
- to exit from the window press **Exit**.

### 10.9. Selection and formation of measurement scheme

Measurement scheme is meant as a sequence of making measurements/processing of wheels in the rolling stock. 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.

#### 10.9.1. Selection or removal of the measurement scheme

To select a measurement scheme in the main window menu:
- select **Service > Schemes**. View on the screen:
• by activating lines containing the scheme file name it is possible to look at available wheel processing schemes. Arrows in the figure show direction of processing of wheel pairs as well as the names assigned to wheels (1L-first axis, left side; 2L-second axis, left side; 1R-first axis, right side, etc.);
• to set the selected scheme activate the respective line and press Install;
• to remove a scheme activate the respective line and press Remove.

10.9.2. Formation of a new measurement scheme

To form a new measurement scheme, press Add. The screen will show:

• by using on-screen keyboard type the scheme name;
• select the number of axles;
• select the number of coaches in the rolling stock (train);
• select the wheel processing scheme out of the options suggested
• press Save.

10.9.3. Loading of a new measurement scheme

If you can not form a new scheme in accordance with par. 10.9.2., it is possible to use a special program for PC, see par. 21 and then load the scheme to the PDA as it is shown in par. 14.1.5.

10.10. Wheel type selection

If several wheels types are used it is possible to set definite measurement scheme, reference profile and L-parameters for every wheel type

An example.
WheelType1: Scheme1, Reference1, L-Parameters1;
WheelType2: Scheme2, Reference 2, L-Parameters2;
WheelType3:  Scheme3, Reference 3, L-Parameters3;

10.10.1. Wheel type selection and removal
To select wheel type in the main window menu select Service > Wheel type, View on the screen:
- activate wheel type line you need and press Set;
- for wheel type removal activate wheel type line and press Delete.
- press Edit for wheel type edit;
- to add new wheel type activate the line and press для редактирования строку и нажать Add (see p. 10.10.2).

10.10.2. Wheel type addition
To add new type of the wheel press New. View on the screen:
- use virtual keyboard to write type name (Name);
- select reference profile (Reference);
- select scheme (Scheme);
- write L-parameters (see p. 10.3)
- write Calculation method (see p. 10.4)
- press Save.

10.11. 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 **IKP > New IKP**

![Measurement screen](image)

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

![Searching for Bluetooth devices](image)

![Select a device to connect with and tap “Save”](image)
10.12. 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 Profilometer > Language. Select the required language support file.

If no such file is available, it is necessary to use new files preparation procedure which is described in par. 12.3, and then load a new language file from PC to PDA as it is shown in par. 14.1.2.

10.13. Browsing and updating PDA software

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

```
RIFTEK
RF503M
Version 4.1.1

Copyright © RIFTEK 2007-2012
Republic of Belarus, Minsk, Logoznik trakt 22 / 811

Tel/Fax: +375 (17) 291-35-13
http://www.riftek.com info@riftek.com

```

The updated software version can be downloaded from the site. Procedure of PDA software updating is described in par. 14.1.6, of this manual.

11. Working with the profilometer

11.1. Activation

Switch on the PDA and scanning module as shown in par. 8.2.

11.2. On-line measurements

Procedure of on-line measurements is described in par. 8.3.

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 Profilometer > Measurement, the window of parameters input will appear
If necessary, fill in/edit the required fields
to save parameters, press the Save button, and the program will offer the selected measurement scheme (see par. 10.9):

Designations:
1(1) - order number of the car to be measured (number of cars in the train);
4580 - number of the car to be measured;
- editing of the input wheel parameters;
- a previous/subsequent wheel;
- a measured wheel;
- a wheel to be measured next time;
- a non-measured wheel;
- a measured wheel to be measured again
- measurement.

• Measure the wheel offered by the program (highlighted in green color), as it is shown in par. 8.3.
• after the wheel surface is laser-scanned, the PDA will show the value of selected geometrical parameters. When a parameter falls out of the specific tolerance, its value is indicated with red color.
• to look at the profile press **Profile** button:

• to look at wear degree press **button**

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

• the program will offer to pass to measurement of the next wheel in accordance with selected scheme of measurement

**11.4. Browsing the database**

To browse the database:

• select **Service > Profiles** in the main window. View on the screen:
for data filtering select data, series and number of locomotive

**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. Deactivation

To turn off the PDA, select Device > Turn Off. To turn off the laser module, press button 5, Fig. 2 and hold it down until red LED 2 goes out.

### 12. Installation of software on PC and startup

#### 12.1. Installation of database support software

The ikp5_DB software is intended for maintaining wheel sets wear database on a personal computer (the updated version of the program can be downloaded from [www.riftek.com](http://www.riftek.com)).

To install the software, insert compact disk to PC CD drive, select and start `Install_Ikp5.exe` file in the Software folder. Follow instructions of the installation wizard. The program is installed in `C:\Program Files\RIFTEK\` folder by default.

#### 12.2. Installation of Microsoft Activesync

For combined work PDA and PC, it is necessary to install Microsoft Activesync. Proceed as follows:

- Start ActiveSync42.exe file from the Software folder on CD.
- Follow program installation instructions.
- Check for correctness of the installation by activating PDA and connecting it PC USB port using cable which is part of supply package. In case of successful connection the screen will show the following message:
NOTE: For PC with Microsoft Windows Vista or Microsoft Windows 7 installed, use Windows Mobile Device Center synchronization program instead of Microsoft ActiveSync.

12.3. Preparation and installation of language support file

By default, working language of the program is English. 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\RIFTEK\Ikp5_db\Language\.

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

To create 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, GER.lng
- edit the renamed files 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

12.4. Program starting

To start the program click Start > All programs > IKP5 > IKP5_DB. View of the main program window is shown in the figure.
13. User settings of the program

13.1. Registration of user organization

For registration user organization select Registration > Organization. Fill out the required fields in the opening window. Subsequently, the filled out information will be used in automatic generation of reports.

Buttons:
- add new body;
- edit selected body;
- delete selected body;
- exit;

If the list contains several users, only one of them can be active at the moment. Active user is selected by putting a “tick” in the Organization window.

13.2. Registration of operators

Steps to follow: menu Registration > Operator. Fill out the required fields in the opening window by assigning a unique digital identification cod (up to 4 digits) to each operator.
13.3. Registration of locomotive series

Steps to follow: menu Registration > Series. Enter the name of a series of locomotives under service.

13.4. Registration of locomotive numbers

Steps to follow: menu Registration > Locomotive/car. In the emerging window type locomotive numbers to be serviced and their characteristics (locomotive number and series code).

Functions of buttons are similar to those in par. 13.1.
13.5. Registration of wear limiting values

Steps to follow: menu \textbf{Registration} \rightarrow \textbf{Limiting values}. Enter limiting wear parameters for wheel set for each registered series of locomotives. Subsequently these parameters will be used for automatic control of allowable wear.

Buttons:
- \text{edit limiting value for selected series};
- \text{exit};

13.6. Registration of reference profiles

Reference profiles are stored in the database as profile description files with extension \text{.ref}. The program is supplied with several pre-set profiles (see par. 23). In addition, user can form a description of required profile himself or request it from \text{RIFTEK} (free service).

To browse available profiles, select menu \textbf{Registration} \rightarrow \textbf{Profiles}:

Buttons:
- \text{import of reference profile from \text{*.	ext{ref} file};}
13.6.1. Request and registration of the reference profile file

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

- press button Import
- in the window appeared indicate the way to the .ref-file
- press button Open

13.7. 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 Registration > Values in... > mm or inch in the main menu window. Upon the next program starting, information will be presented in the selected measurement units.
13.8. Selection of software language

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

14. Data exchange between PDA and PC

There are two possible methods of data exchange between PDA and PC:
- by means of direct cable connection of PDA to PC USB-port (special RF505.42 cable is supplied)
- through flash memory card.

14.1. Data exchange through cable

To use cable exchange, it is necessary to:
- activate PDA
- connect cable between PDA and PC (note: Microsoft Activesync must be installed on PC as shown in par. 12.2)
- select data exchange device by executing File > Device selection > select either RF303.

14.1.1. Transfer of database file to PC

To transfer database file from PDA to PC, it is necessary to:
- select File > Data > Data transfer
14.1.2. Transfer of language file from PC to PDA

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

- select File > Data > Resource file > Transfer resource file

- mark the required files in the emerging window and click OK.
14.1.3. Transfer of language file from PDA to PC
To transfer language file from PDA to PC, it is necessary to:
• select File > Data > Resource file > Receive resource file
• select required file

• if transfer is successful, the screen will show:
• if transfer is successful, the screen will show:

![Image]

14.1.4. Transfer of reference profile files from PC to PDA

To transfer reference profile file from PC to PDA, it is necessary:
• select File > Data > Transfer reference file

![Image]

• select required file with extension .ref
• if transfer is successful, the screen will show the following message:

![Image]

14.1.5. Transfer of processing scheme file from PC to PDA

To transfer processing scheme file from PC to PDAS, it is necessary to:
• select File > Data > Transfer scheme file

![Image]

• select required file with extension .sch
• if transfer is successful, the screen will show:
14.1.6. Updating of PDA software

The updated software version can be downloaded from their site www.riftek.com. To transfer the update file to PDA, it is necessary to:

- select File > Update > RF303

  - select file for transfer
  - if transfer is successful, the screen will show:

14.2. Data transfer by means of flash memory card

To transfer database files from PDA to PC by using flash memory card, it is necessary:

- insert flash card to PC USB-port
- select File > Device selection > USB Flash

  - select database files folder
  - select files and click OK for transfer
15. Taking measurements under PC control (without PDA)

The laser scanning module can work under direct control of PC without PDA.

15.1. Preparation for taking measurements

To work under direct control of PC, it is necessary to:

- install Bluetooth-connection between the scanning module and PC. The procedure is described in par. 19.
- select File > Device selection > Profilometer in the main window menu
- select required port (see par. 19)
- click OK for connection
If the connection is successful, the **Measurement** button in the main program window becomes active.

Press the **Measurement** button or select **File > Measurement** in the menu. After the scanning module parameters are read, the program is ready for work:

15.2. **Measurement and saving of data**

To measure the wheel profile, press the **Measurement** button. Measurement being completed, the screen will show graphic image of the wheel profile and calculated profile parameters.
• the procedures of work with obtained data (Value and Parameters tabs) are described below.
• to save the results in the database, go to the Save tab.
• fill in the required parameter fields in the emerging window

![Image of a window with fields for entering parameters]

• after filling the fields press the Save profile button
• the profile measured will be saved in the database:

![Image of a window with a list of profilograms]

16. Working with profilograms and wear calculations

16.1. Profiles lookup

To look at rolling surface profiles select Results > Profiles, or press button Profiles.
Select the required wheel pair from the table offered.

To print picture press button 📷

To save picture in separate file (.bmp file) press button 📖

To look at the points coordinates use Values bookmark

16.2. Browsing/recalculation of parameters

In this tab shows calculated profile parameters and the corresponding values of L-parameters.

By default, only the height (Sh), thickness (Sd) and steepness (qR) of selected profile are calculated. If necessary, values of Slope and profile inclination Angle can be obtained. To do so, put a “tick” on the field Slope and Angle respectively.

To recalculate values of flange parameters for other L-parameters, it is necessary to change values of L-parameters and press the Calculate button.
16.3. Comparing profiles

16.3.1. Selection of reference profile

To compare measured profile with the reference profile, select Parameters tab and tick the Compare with field. Select required reference profile in the pullout list.

To compare two arbitrarily chosen profiles to each other (for example, profiles of left and right wheels), it is necessary to select Measured in the pullout list instead of the reference profile. In the case where measured profile is chosen as comparison profile, the Profiles tab shows additional table for selection of comparison profile out of a number of measured profiles. Then, select profile from the additional table.

16.3.2. Superposition of profiles and rescaling

To superimpose profiles (by vertical translation), select profile to be translated in the Matching window: Reference or Measured.

Set the vertical translation step in the Set step along Y axis window. By pressing the left mouse key drag the profile to required value on the scrolling bar.
16.4. Wear calculation

To calculate wear, select the Parameters and Value tabs, select reference profile and set the calculation step, if necessary. The table will show deviation of coordinates of the selected profile from those of the reference profile in two directions (X and Y).
To save the table in the **Excel-format**, it is necessary to:

- click the right mouse key in the table values section;
- select **File > Write** in the emerging window;
- type the file name, select **Excel 5 (*.xls)** and save.

To obtain fast calculation of the profile wear at a certain point, 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 co-ordinate 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.
To obtain graphic presentation of wear, it is necessary to put a “tick” to the **Wear** field.

Value of the wear area is calculated in square millimeters with respect to selected reference profile:

| Wear | (mm²) | 5.53 | 0.85 |

### 16.5. Calculation of wear intensity

The program allows automatic formation of the table of wheel sets wear intensity values. Two calculation options are available:

- **in millimeters for 100000 km of wheel sets running distance**
  - To perform calculation, the database must contain values of wheel pair running distance. Measurements made on the latest date and the closest date previous to it are automatically taken from the database. The wear value in millimeters is given for (reduced to) the 1000000 km running distance.

- **in millimeters over 1 year of wheel sets use**
  - Measurements made on the latest date and the closest date previous to it are automatically taken from the database. The wear value in millimeters is given for (reduced to) the period of 1 year.

- To form the table, select **Service > Wear intensity** in the main menu of the program. Select options: **mm/100000 km** or **mm/year**
In calculation, it is possible to average wheel sets wear values over all locomotives of a given series. To achieve this, put a “tick” in the Average over series field.

Procedures of navigation over the table, filtration and sorting are described in par. 17. Procedures of generation and printing of reports are given in par. 18.

16.6. Calculation of percentage wear

The program allows automatic formation of tables showing percentage wear of wheel sets.

The percentage wear is calculated as follows:

\[
\text{Wear} = \left( \frac{H - T}{H - \Pi} \right) \times 100\% ,
\]

where \(H\) is the nominal parameter value (parameter value for reference profile), \(T\) is the current parameter value on the measurement date, \(\Pi\) is the limiting parameter value (in accordance with the table of limiting wear values, see par. 13.5).

To generate the table, select Service > % wear in the main program menu.
Select right and left wheel of wheel pair at the bottom part of the tables. The windows above the tables will offer optimal profile type.

To know the wheel cutting depth in a certain point, put the cursor to any profile, and when a cross-like (+) mouse cursor appears press the left mouse key. The resulting screen will show the value of difference between profiles along X- and Y-axes, as shown by arrows. To remove size indication from the screen, put cursor to any of the profiles and press the right mouse key.

17. Scanning and editing of data

17.1. Scanning and filtering of data

To scan data, select Results > Wheel sets in the menu or press the Results button. The form showing results will be as follows:

- Navigation over the table
Laser Wheel Profilometer, IKP-5 and IKP-5R

To navigate between the base entries, use “up/down” arrows or buttons of the navigation panel:

- to the beginning of the database;
- to the previous page of the database;
- to the previous entry of the database;
- to the next entry of the database;
- to the next page of the database;
- to the end of the database.

- **Sorting of data**

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

<table>
<thead>
<tr>
<th>Measurement date</th>
<th>Wheeled set</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.01.2008</td>
<td>000000000001</td>
<td>2001</td>
</tr>
<tr>
<td>01.01.2009</td>
<td>000000000002</td>
<td>5</td>
</tr>
<tr>
<td>01.02.2008</td>
<td>000000000003</td>
<td>5</td>
</tr>
<tr>
<td>01.03.2009</td>
<td>000000000004</td>
<td>5</td>
</tr>
<tr>
<td>07.10.2009</td>
<td>0000SU00011</td>
<td>7102</td>
</tr>
<tr>
<td>07.10.2009</td>
<td>0000SU00012</td>
<td>7102</td>
</tr>
<tr>
<td>14.10.2009</td>
<td>0000SU00011</td>
<td>7102</td>
</tr>
</tbody>
</table>

  To cancel data sorting, press Ctrl 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 emerging pullout list:

<table>
<thead>
<tr>
<th>Measurement date</th>
<th>Series</th>
<th>Wheeled set</th>
</tr>
</thead>
<tbody>
<tr>
<td>(All)</td>
<td>CH3</td>
<td>000000000001</td>
</tr>
<tr>
<td>Custom...</td>
<td>155</td>
<td>000000000002</td>
</tr>
<tr>
<td>01.01.2008</td>
<td>155</td>
<td>000000000003</td>
</tr>
<tr>
<td>07.10.2009</td>
<td>155</td>
<td>000000000004</td>
</tr>
<tr>
<td>14.10.2009</td>
<td>SM3</td>
<td>0000SU00011</td>
</tr>
<tr>
<td>07.10.2009</td>
<td>SM3</td>
<td>0000SU00012</td>
</tr>
<tr>
<td>14.10.2009</td>
<td>SM3</td>
<td>0000SU00011</td>
</tr>
</tbody>
</table>

  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:
To filter data for a grouping field, click left mouse key on the header of the grouping field and select required value in the pullout list:

- *Hide/show field*

To hide field, it is necessary to click left mouse key on the header of the field column, and, with the mouse key pressed, drag it outside of the table header:

The second method: to hide/show the field, click left mouse key on the utmost left header, and remove mark from /mark required field in the table.
• **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 required position:

17.2. Editing data

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

• **Editing data**

To edit the current entry, press the button and input/change required parameter values, after the editing is complete press the Save button.
• **Adding data**

To add a new data entry, press the button and type required parameter values, after the editing is complete press the Save button.

• **Deleting data**;

To delete a current entry, press 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, press the button and confirm the deletion.

17.3. **Creation of empty database**

To create empty database, select **File > New DB** in the main menu. All data except for 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. 17.4.).

17.4. **Import of database**

To import data to database,

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

- press OK to import data.

18. Report preparation

When staying in the scanning and editing of date mode according to par. 17, user can prepare reports in Excel, RTF, TXT formats or print out reports. In the formation of report sorting used at the moment is taken into account.

To generate a report, press the button, and the program will to select the following options:

18.1. Excel-format report

To prepare a report in Excel format, select Report in Excel and press OK. The required data will be transferred to Excel-table:
18.2. Report for printout, Excel, RTF and text files

To prepare the report for printout, select Report for printout and press OK. Data will be presented in the form of report ready for printout. To start printing, press the Printer button.

When staying in this mode, it is possible to export data to Excel, RTF and text files. To export, press the button, and the pullout menu emerges:

To export data to text file, select Text file..., to export to RTF-file select RTF file..., to export to Excel-file select Excel table(OLE).

When exporting to Excel, make required settings in the emerging window and press OK.

Then, type the file name and press the Save button to export to Excel. As a result you will obtain:
19. Annex 1. 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 PDA.
- 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 competed, the wizard will show the devices found:

![Image of Add Bluetooth Device Wizard]

- select the required device (RF505), 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 (see par. 15). In this case, the port is COM20:

![Image of Add Bluetooth Device Wizard with COM-port]

We can supply the profilometer complete with an RF432.10 (Figure 1A) calibration-wheel simulation unit and **F505Calibr** calibration program that are designed for periodic testing and self-calibration of the profilometer in case of unsatisfactory testing results.

Instead of the calibration unit use can be made of the wheel with known profile entered to the database (see par. 13.6.).

### 20.1. Preparation for testing/calibration

- install the **RF505Calibr** program.
- install Bluetooth-connection between the scanning module and PC as described in par. 19.
- adjust the profilometer to the reference profile
- run **RF505Calibr** program

- select the required port

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

• to compare with the reference profile, tick the **Compare** checkbox and select the required reference profile in the drop-down **Reference** list.
20.2. Testing

To carry out automatic testing, do the following steps:

- tick the N Meas checkbox (number of measurements);
- specify the number of measurements (5-10);
- delete the Calibr checkbox, if it is not specified;
- press button Measurement

The scanning module will make the specified number of measurements whose results will be entered to the table. The first three columns will present measured values of height (Sh), thickness (Sd), and flange slope (qR), while the other three columns will present deviations of the measured values from the reference values (d_Sh, d_Sd, d_qR). Deviation of the flange height and thickness from the reference values must not be more than 0.1 mm.

If deviations exceed the permissible value, it is necessary to perform calibration of the scanning module.

20.3. Calibration

To carry out automatic calibration, do the following steps:

- tick the N Meas checkbox (number of measurements)
- specify the number of measurements (5-10)
- tick the Calibr checkbox
- press button Measurement

when scanning is completed, perform testing procedure in accordance with par. 20.2. In case of positive result, press the Write parameters button to save the scanning module parameters.

- 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.

To make measurement schemes, use can be made of the special software SchemeBuilder.exe. When the program is started, the main window appears on the screen:

![SchemeBuilder.exe](image)

**Buttons:**

- create “empty” scheme;
- load the existing scheme;
- save the completed scheme;
- exit;
- next/previous coach in the train.

Enter the scheme name, number of cars, number of axles, type of scheme and press the **New Scheme** button to create a new “empty” scheme.

**Advice:** In addition to formation of the wheel processing scheme this program can be conveniently used for input of wheel pair numbers of a rolling stock and running
distance. If necessary, enter these data and press the **Save scheme** button.

To transfer the scheme file to PDA, use the procedure described in par. 14.1.5.

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

**Example:**

```plaintext
{1d- |SM3|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-|SM3|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-|SM3|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-|SM3|7402|4r|44|SU44|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-|SM3|7502|5r|54|SU54|514|5l|54|SU54|514|4r|43|SU43|513|4l|43|SU43|513|3r|33|SU33|513|3l|33|SU33|513|2r|23|SU23|512|2l|23|SU23|512|1r|13|SU13|511|1l|13|SU13|511|; 6i-|SM3|7602|6r|64|SU64|614|6l|64|SU64|614|5r|53|SU53|613|5l|53|SU53|613|4r|43|SU43|612|4l|43|SU43|612|3r|33|SU33|611|3l|33|SU33|611|; }
```

Where:
- 1d – coaches arranged in direct order (1 – sequence number)
- 1i – coaches 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

### 22. Annex 4. 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—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.

### 23. Annex 5. Reference profiles base

<table>
<thead>
<tr>
<th>Reference profile file</th>
<th>Name of the profile</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Australia</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AUS_WPR 140mm.ref</td>
<td>WPR 140mm</td>
<td></td>
</tr>
<tr>
<td>AUS_WPR 130mm.ref</td>
<td>WPR 130mm</td>
<td></td>
</tr>
<tr>
<td>AUS_WPR 120mm.ref</td>
<td>WPR 120mm</td>
<td></td>
</tr>
<tr>
<td>AUS_WPR7_8 140.ref</td>
<td>WPR7 8 140</td>
<td></td>
</tr>
<tr>
<td>AUS_WPR7_8 130.ref</td>
<td>WPR7 8 130</td>
<td></td>
</tr>
<tr>
<td>AUS_QR_LW3_140.ref</td>
<td>QR_LW3_140</td>
<td></td>
</tr>
<tr>
<td>AUS_QR_LW3_127.ref</td>
<td>QR_LW3_127</td>
<td></td>
</tr>
<tr>
<td>AUS_QR_LW3_120.ref</td>
<td>QR_LW3_120</td>
<td></td>
</tr>
<tr>
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### 24. Warranty policy

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

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<tr>
<th>AUSTRALIA</th>
<th>BENELUX</th>
<th>BULGARIA, HUNGARY</th>
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<td>XN Innovation</td>
<td><strong>Altheris B.V.</strong></td>
<td><strong>RMT Ltd.</strong></td>
</tr>
<tr>
<td>LG Centre, Suite 1, Level M, 55 Parramatta Rd, NSW, 2141, Lidcombe, Australia</td>
<td>Scheveningseweg 15 2517 KS The Hague, The Netherlands</td>
<td>R Zahradní 224 739 21 Paskov, Czech Republic</td>
</tr>
<tr>
<td>Tel: +61 (0)2 8091 2426 Fax: +61 (0)2 9648 6597 <a href="mailto:xni.sales@gmail.com">xni.sales@gmail.com</a></td>
<td>Tel: +31 (70) 3924421 Fax: +31 (70) 3644249 <a href="mailto:sales@altheris.nl">sales@altheris.nl</a> <a href="http://www.altheris.com">www.altheris.com</a></td>
<td>Tel: +420 558640211 Fax: +420 558640218 <a href="mailto:rmt@rmt.cz">rmt@rmt.cz</a> <a href="mailto:lubomir.kolar@rmt.cz">lubomir.kolar@rmt.cz</a> <a href="http://www.rmt.cz">www.rmt.cz</a></td>
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<td>Zhenshangyou Technologies Co., Ltd.</td>
<td><strong>RMT Ltd.</strong></td>
<td><strong>Disynet GmbH</strong></td>
</tr>
<tr>
<td>Rm 1806, Block B, Jinhaiian Building Chuangye Road, Nanshan District Shenzhen, 518054, China</td>
<td>Zahradní 224 739 21 Paskov, Czech Republic</td>
<td>Westwall 12 D-41379 Brueggen, Germany</td>
</tr>
<tr>
<td>Tel: 86)755-26528100/8011/8012 Fax: (86)755-26528210/26436640 <a href="mailto:info@51sensors.com">info@51sensors.com</a> <a href="http://www.51sensors.com">www.51sensors.com</a></td>
<td>Tel: +420 558640211 Fax: +420 558640218 <a href="mailto:rmt@rmt.cz">rmt@rmt.cz</a> <a href="mailto:lubomir.kolar@rmt.cz">lubomir.kolar@rmt.cz</a> <a href="http://www.rmt.cz">www.rmt.cz</a></td>
<td>Tel: +49 (2157) 8799-0 Fax: +49 (2157) 8799-22 <a href="mailto:disynet@sensoren.de">disynet@sensoren.de</a> <a href="http://www.sensoren.de">www.sensoren.de</a></td>
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<tr>
<td><strong>BIP-Industrietechnik GmbH</strong> RAILWAY INSTRUMENTS ONLY</td>
<td><strong>Pragathi Solutions</strong> #698, 5th Main, 8th Cross, HAL 3rd Stage, New Tippasandra Road, Bangalore, 560075, India</td>
<td><strong>PT. DHAYA BASWARA SANIYASA</strong></td>
</tr>
<tr>
<td>Am Elisabethhof 22, D-14772 Brandenburg D-41379 Brueggen, Germany</td>
<td>Tel: +91 80 32973388 Tel/fax: +91 80 25293985 Mobile: +91 9448030426/ +919448492380 <a href="mailto:sales@pragathisolutions.in">sales@pragathisolutions.in</a> <a href="mailto:arghya@pragathisolutions.in">arghya@pragathisolutions.in</a> <a href="http://www.pragathisolutions.in">www.pragathisolutions.in</a></td>
<td>Sentra Niaga Puri Indah Blok T6 No. 41 Kembangan Jakarta, 11610, Indonesia</td>
</tr>
<tr>
<td>Tel: +49 (0) 33 81 75 90 0 Fax: +49 (0) 33 81 75 90 11 <a href="mailto:info@bip-industrie.de">info@bip-industrie.de</a> <a href="http://www.bip-industrietechnik.de">www.bip-industrietechnik.de</a></td>
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<td>Tel: 021 5830 4517 Fax: 021 5830 4518 <a href="mailto:management@ptdbs.co.id">management@ptdbs.co.id</a></td>
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<tr>
<td>Via Tertulliano, 41 20137 Milano, Italy</td>
<td>Juvan teollisuuskatu 28 FI-02920 Espoo, Finland</td>
<td>Serbentu, 222, LT-5419 Siauliai, Lithuania</td>
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<tr>
<td>Tel: +39-02-55187133 Fax: +39-02-55187399 <a href="mailto:fae@fae.it">fae@fae.it</a> <a href="http://www.fae.it">www.fae.it</a></td>
<td>Tel: +358 400 422 900 Fax: +358 9 2511 5510 <a href="mailto:steelwheel@steelwheel.fi">steelwheel@steelwheel.fi</a> <a href="http://www.terasporya.fi">www.terasporya.fi</a></td>
<td>Tel/Fax:+370 41553487 <a href="mailto:comexim@siauliai.alivia.lt">comexim@siauliai.alivia.lt</a> <a href="http://www.komeksimas.lt">www.komeksimas.lt</a></td>
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<td>H-49-2, Jalan 5, Cosmoplex Industrial Park. Bandar Baru Salak Tinggi, Sepang, Malaysia Tel: 603 8706 6806 Fax: 603 8706 6809 <a href="mailto:optocom@tm.net.my">optocom@tm.net.my</a> <a href="http://www.optocom.com.my">www.optocom.com.my</a></td>
<td>ul. Karola Miarki 12, skr.6 44-100 Gliwice, Poland Tel/fax: +48 (32) 231 70 91 <a href="mailto:info@graw.com">info@graw.com</a> <a href="http://www.graw.com">www.graw.com</a></td>
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<td><strong>USA, CANADA, MEXICO</strong></td>
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<td>Railway Instruments Only</td>
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<td>R 60 Fourth Avenue, Albany, New York, USA</td>
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26. Annex 6. RIFTEK measurement instruments for railway transport

**Back-to-back distance measuring gauge. IMR 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. 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.

**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.