



# 手持式钢轨轮廓测量仪

## Rail Partner II

Laser Profiler



## INTRODUCTION简介

In order to be competitive with the new market huirui orbital is able to achieve competitive performance with the best technology on the market.

Moreover, the actual standards of safety, required for railway transportation, impose a high standard of control.

To positively address the above issues, huirui orbital developed this optoelectronic portable system that allows for getting an accurate dimensional control of these track geometry parameters of the railway line.

This manual includes all the information and descriptions relating to the Rail Partner II use for the detection of rail profile and wear.

鉴于现行的铁路运输的安全标准和管理控制标准，就需提高现有的检测设备的检测精度和检测能力。辉瑞轨道公司为了适应市场需求，提升本公司的市场竞争能力，根据第一现场的用户需求反馈，开发了此套手持式钢轨测量仪。此套手持式钢轨测量仪，可获取到精确的轨道几何参数，通过进一步对钢轨断面和磨损数据分析和比对，更好的对线路安全进行控制。本手册详细描述了“Rail partner II”手持式钢轨测量仪的具体使用方法等事宜。



## 2 GENERAL WARNING 一般警告

### 2.1 Incorrect use 错误操作

In the case of negligence to the proper use of this equipment or failure of the operator to apply the instructions written in this handbook, the manufacturer declines from guarantees and responsibilities for any damage to the equipment or to any possible injury to the operators or to other people, caused by this incorrect use.

若由操作者过失或未按照本手册操作而引起的一切问题，辉瑞轨道将拒绝承担任何责任。

It is necessary to read carefully this operating handbook to learn the correct use of the system and to take advantage of its features.

因此，请务必在使用前认真阅读本手册。

The Manufacturer declines from responsibilities in case of:

如发生以下情况，辉瑞轨道拒绝承担任何责任：

improper use of the equipment by not trained operators

未经培训人员的不正当操作

use of the system not according to the European regulations regarding safety;

不按照欧盟安全标准使用本设备

improper installation;非正确安装

defects on power supply;供电不符合要求导致的异常

serious lacks on the preventive or standard maintenance;为按要求进行维护维修导致的异常

not authorized interventions or modifications of the equipment;未经 辉瑞轨道授权许

use of no original parts, or not specified, for this equipment;使用非 辉瑞轨道指定的零部件导致的异常

total or partial inobservance of the instructions included in the handbook;不按照手册指导进行操作

exceptional events;其他异常操作行为引起的。

#### 2.1.1 Assistance conditions 售后服务条件

The present handbook provides all the necessary indications for good operation and handling of the equipment.

Assistance interventions depend on device use and guarantee the above mentioned conditions.

本手册提供了所有有关正确操作和设备处理的相关必要信息。严格按照本手册规定内容操作此设备是获得质保期内的技术援助的必要前提条件。

For warrantee we intend the total free of charge replacement of the equipment components subjected to failure due to manufacturing defects.

在质保期内，只要是在规定的条件下正常使用设备时所发生的故障或零部件损坏，我公司将无偿为用户提供维修或更换相应零部件等服务。



Defected parts because of negligence or improper use, maintenance not executed according to instruction handbook or executed by no authorized personnel, transport damage and circumstances which are not due to manufacturer, are not covered by the guarantee.

如因操作不当、操作人员疏忽、维护不正确等其他未按照本手册规定内容执行，或未经授权的操作所引起的零部件故障及损坏等情形，均不在保修范围之内。

The manufacturer is not responsible for possible damages which can, directly or indirectly, derive from people, things or animals, in consequence of not applying of the instructions in the handbook regarding installation, use and maintenance of the equipment.

由于未经授权的直接或间接的对设备实施安装、使用或维修等操作所引起的人身、物品的伤害，我公司不承担任何责任。

Note: Don't try to open, modify or unscrew Rail Partner II. You lose warranty.

注意:不要试图打开,修改或旋松Rail Partner II。一旦出现此行为，我公司将不再为本产品履行质保服务。

## 2.1.2 Request of assistance 售后服务申请

Assistance under guarantee will be required directly to the company that the manufacturer defined in the manual; any other required assistance support has to be agreed with the manufacturer.

质保期内的售后服务可直接咨询



### 3 Safety安全标准

The equipment has been entirely built in order to guarantee the maximum safety for the operators in any kind of work. Safety rules are a precaution for the person responsible for the job.

设备在设计生产过程当中，最大限度的考虑了操作者的安全问题，但与此同时，还需要操作者认真阅读下面的安全标准，做好预防措施。

The system uses laser sources.

本系统中使用了激光传感器零件。

This analysis is dedicated to define the laser class and to indicate safety requirements.

具体详见下面的激光安全等级介绍和安全须知。

#### 3.1 Characteristics of the laser radiation激光参数

Description of laser characteristics:参数表

| ITEM项目                       | Symbol符号 | Value参数值 |
|------------------------------|----------|----------|
| Wavelength 波长                |          | 657 nm   |
| Angle of divergence 发散角      |          | 60°      |
| Power 功率                     | P        | 35 mW    |
| Width of the laser beam 光束宽度 | s        | 1 mm     |
| Diameter std of eye pupil    | D        | 7 mm     |

#### 3.2 Safety requirements for operators安全须知



Normal system operations do not need particular precautions for operators.

Only in case of maintenance on laser emitters, operators must respect the following indications:

常规的设备操作使用时不需要特别的预防措施。

只有在维护激光发射器的情况下,操作者必须严格按照以下条款进行处理:

MAINTENANCE ON THE LASER EMITTERS MUST BE PERFORMED BY **huirui orbital TECHNICIANS**, SPECIALIZED AND TRAINED FOR THIS TYPE OF MAINTENANCE; BOTH **huirui orbital TECHNICIANS** AND ANY OTHER PERSON WHO IS ON THE INSIDE OF THE NOHD MUST WEAR SPECIFIC EYE-PROTECTION (LASER GLASSES).

维修激光发射器必须由辉瑞技术人员执行,或经过辉瑞轨道特定培训的技术人员才可进行维修操作。所有维修人员必须佩戴特定的激光眼镜。



### 3.3 Conclusions 总结

The system is according to the norm CEI-EN 60825-1:

根据CEI-EN 60825-1 标准，此系统属于 3B级

CLASS 3B

During Normal mode, the NOHD (Nominal Ocular Hazard Distance) is about 40cm. In any case:

NEVER LOOK AT A LASER BEAM DIRECTLY OR WITH A REFLECTED EXPOSURE

在正常的模式下，名义眼危险距离为 40cm,因此，在任何情况下，都不允许直接或间接看激光束

### 3.4 General Safety Precaution 安全预防措施

The extraordinary maintenance of the equipment must be performed by huirui or by competent people (trained by Huirui orbital). If the work is effectuated by more people, it is necessary to nominate a supervisor.

特定的维修只能由辉瑞轨道技术人员或通过辉瑞培训合格的人员来完成，如果多人同时操作完成此工作，必须任命一人主管。

The operator who works on the equipment must be suitably trained;

操作者必须经过辉瑞轨道的严格培训后再进行操作。

The personnel responsible for the equipment operation must read the handbook instructions;

设备负责人必须认真阅读本手册的指导内容

### 3.5 Obligation for the users 用户职责

In quality as user of this equipment, you should consider as follows:

从质量的管理角度来讲，用户最好做如下考虑：

Assign competent personnel to the unit working;

指定特定的人员来负责此设备

Make sure that the necessary controls in the maintenance are effectuated and the safety requirements are totally observed;

有效的控制按时维护，监督执行人员是否了解安全须知，是否能够良好的执行安全须知。



### 3.6 Laser prudence 注意事项

The operational norms on the safety of the laser system have to be observed by all the staff.

They individualize the procedures for the evaluation and the control of the risk using laser or laser system.

所有人员都应严格学习并执行此设备的操作要求及激光部分的安全须知。

每个人员都需单独的经过测评，以此来评估和控制使用激光系统所带来的风险。





## 4 Using the device 设备使用

### 4.1 Positioning 准备工作

After removing the Rail Partner II from his case shall be positioned over the rail horizontally.

Note: Laser and Lenses are precise and delicate devices. Don't touch the sensors and protect them from shocks.

将设备从防护箱拿出后，应立即水平放置到待测钢轨上。

注意：请勿用手触碰激光传感器及镜头等精密器件，避免震动冲击。

### 4.2 Control Panel 控制面板

On the control panel are available:

设备控制面板上包含如下接口：

2 USB Connectors;

2 个 USB 接口

1 Ethernet Cable 10/100;

1 个 10/100Mbps 的网线插口

Button Power;

设备电源开关

Recharging battery connector;

充电插口

DB9 Connector ( ONLY FOR INTERNAL USE );

1 个 DB9 接口，系统调试用接口。





#### 4.2.1 Power Button 设备电源开关

The power button has 2 functions depending on how many seconds is pressed: Is the same behaviour of a normal PC.

此键有两个功能：

Less than 1 sec: The system turn on or off;

开关机：轻按 power 键（1 秒内）开机/关机

More than 5 sec: The system is immediately shut down;

强制断电：长按 power 键（5 秒以上）

#### 4.2.2 Power off 关机步骤

To shut down the system correctly, shutdown the PC and push for less than 1 sec the power button.

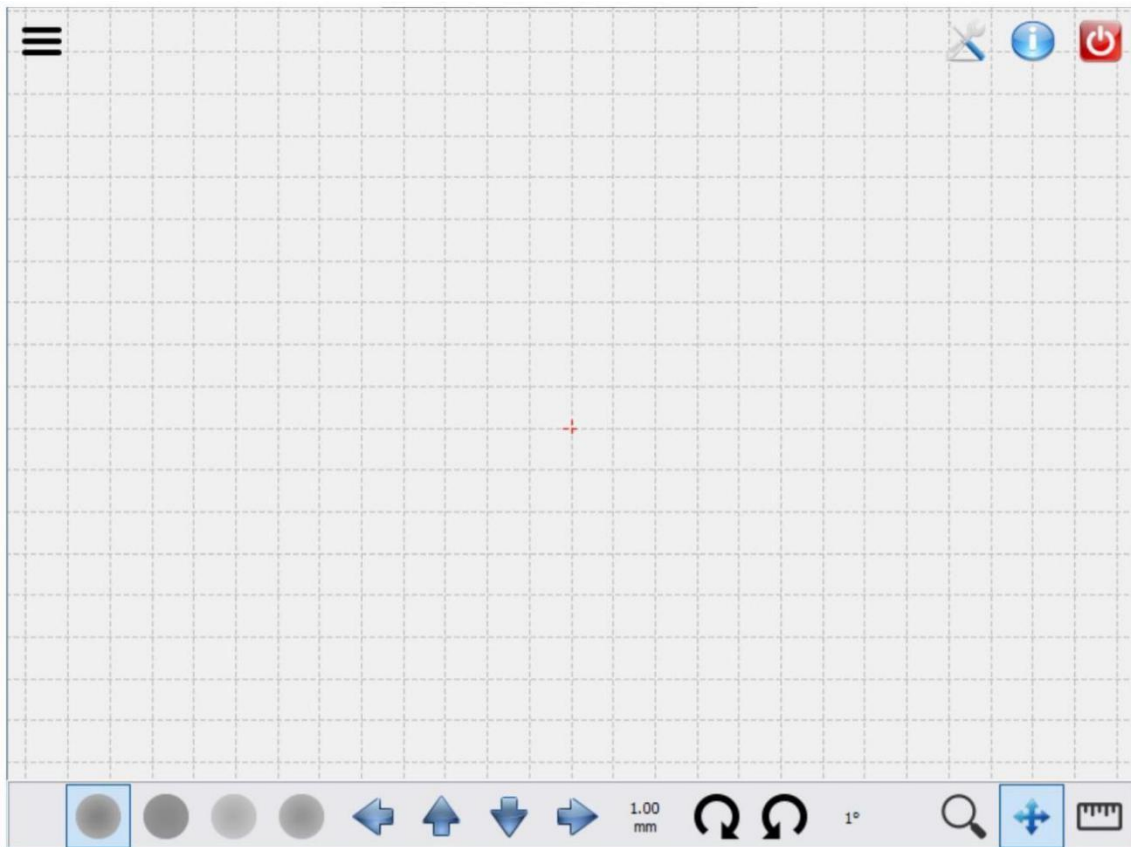
先将Pc关闭，再轻按power键关闭电源。



## 5 Acquisition Software采集软件

On the Rail Partner II device is installed a software that will handle the profile acquisition process. Here you can see the main window.

系统采集软件的主界面如下图所示：



As soon as the software is started a preliminary check up is done to see if the system is working. A progress bar will appear on the top of the windows showing the remaining time to finish the tests.



打开采集软件后，系统会进行自检，各配件是否正常工作，此时可根据主界面顶部所显示的进度条判断系统自检的进度。

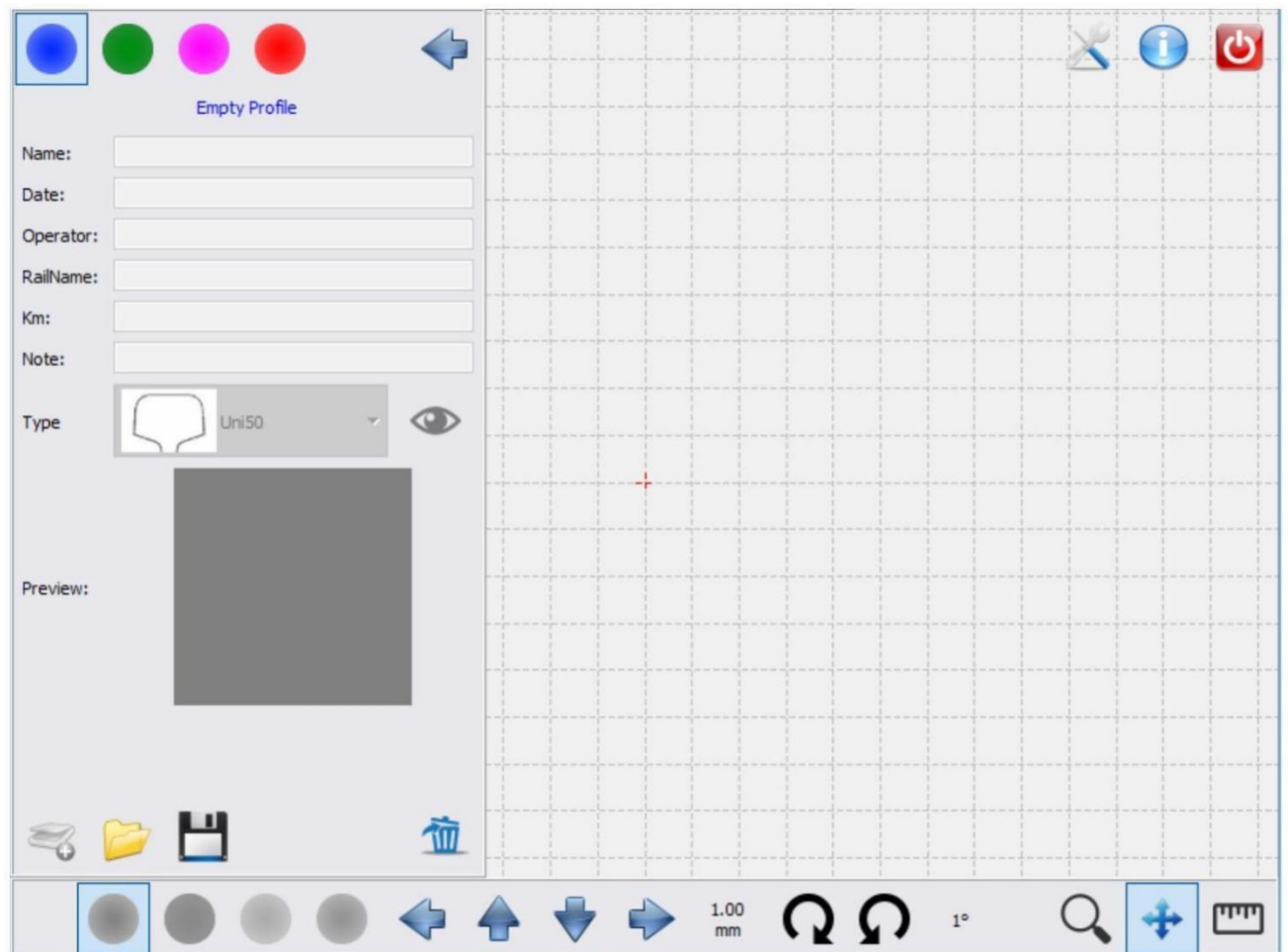


## 5.1 Acquire a profile 采集步骤

To acquire a profile press the menu button (on the top-left), a panel will appear on the left.

Select on the top one of the four profile container (blue, green, pink, red) and then press the acquisition button (on the bottom-left). The scan will take more or less 5 second, depending on the complexity of the profile. A progress bar will appear on the top showing the step of the process.

点击主界面左上角的菜单键 ，选择任意一个颜色作为轮廓的显示颜色（红、绿、粉、红），然后单击采集键 。采集一个完整的钢轨轮廓大约需要 5 秒钟，在窗口的顶部可看到采集进度条。





Now it's possible to insert information about the profile on the left side of the windows:

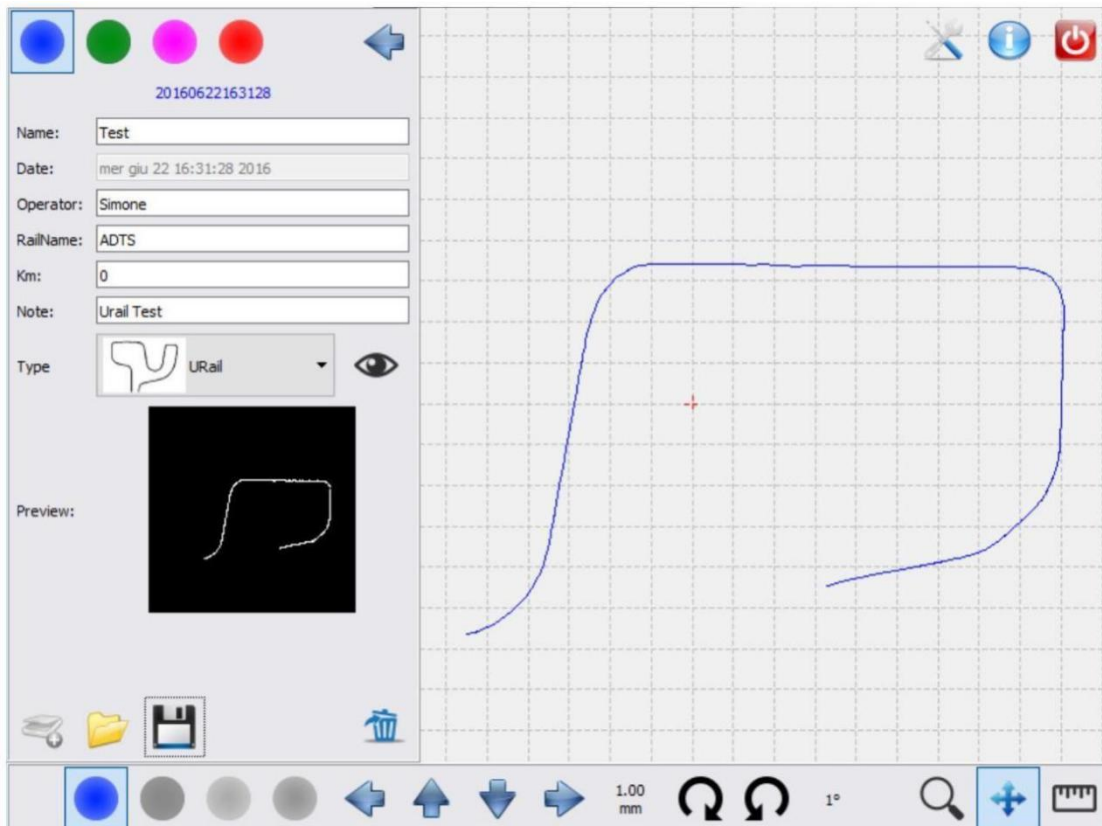
保存数据前，需在左侧窗口输入必要的信息：

- Name 文件名
- Date 日期（系统默认，不可更改）
- Operator; 操作者
- Rail Name; 线路名称
- Km where the acquisition were taken; 公里标
- A note; 备注
- Type 钢轨类型

Data and Type are filled automatically, the first can't be changed, the second is editable.

The profile can be saved by pressing the save button or discarded with the delete button.

操作者可根据采集到的钢轨轮廓质量选择保存  或删除数据  。







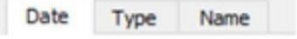


## 5.2 Open a Profile 查看轮廓数据

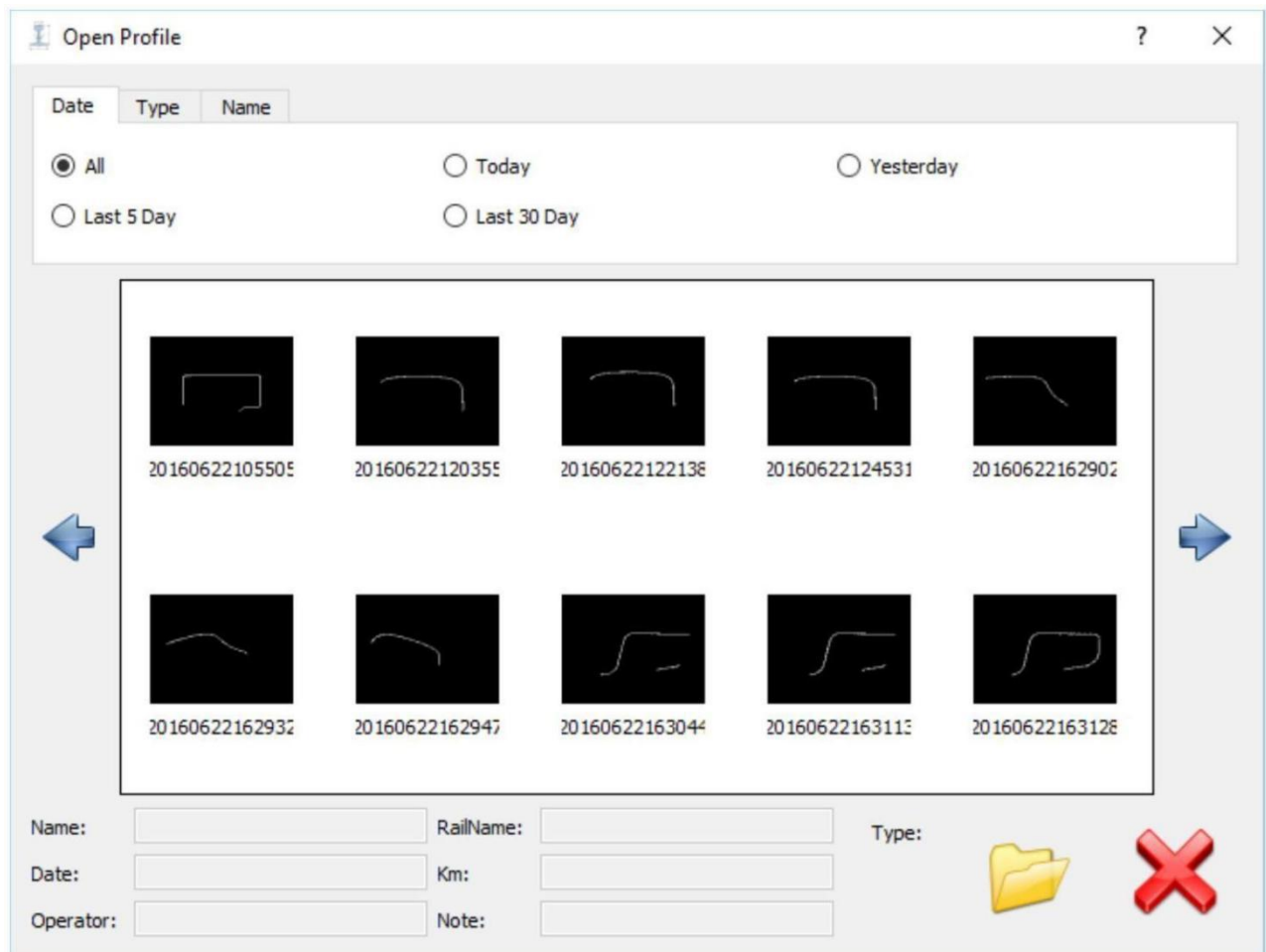
After you saved some profile it's possible to open them and modify them on the software. To open a profile follow the same behavior to make a new acquisition but instead of pressing the Acquisition Button press the open button. A Dialog will appear to help you open the right profile.

A list of the Saved profile will be shown with a preview of them. By selecting one of them additional information will appear on the bottom. It's possible to apply some filters on the search, use the top bar for that.

After selecting the right profile press the open button to load it or cancel to abort the operation.

如何修改已保存过的采集数据:

首先, 单击主界面左上角的菜单键  , 然后点击左下角  图标, 此时主窗口会根据被保存的数据的信息 (日期、文件名、钢轨类型  ) 分类预览, 如下图所示, 也可以根据天下窗口下方的文件信息进行过滤筛选。操作人员找到目标修改文件并选定, 单击窗口右下角  图标打开文件。若取消修改, 请单击关闭  。





It's possible to filter the profiles by:

可以通过以下项目进行筛选

- Date 日期
- Type 钢轨类型
- Name 文件名
- Rail Name 线路名称
- Operator 操作者
- Note 备注

### 5.3 Operation on the profile 轮廓调整

It's possible to interact with the profile by using the bottom bar

可以通过窗口底部的工具栏进行微调。



The four circle will let you select one of the four profiles (if a profile is not loaded, the circle will be gray). The four arrow will let you move the selected profile left, up, down, right. To change the move step press the MeasureStep button that will circle between 10mm, 1mm, 0,1mm and 0,01mm. The profile can be rotate clockwise and counterclockwise with the rotate buttons and the rotate step can be selected between 5°, 1° and 0,1°.

四个圆圈  可以对轮廓的颜色进行定义，当文件未加载时，它们均为灰色 。

四个箭头  可以对轮廓位置进行调整，可以调整移动步进大小，10mm, 1mm, 0,1mm, 0,01mm

钢轨轮廓可以通过旋转键  进行顺时针旋转和逆时针旋转，设有 5°,1°和 0,1°三个微调值/



## 5.4 Zoom and move 缩放&平移


On the right of the bar there is two buttons that will handle the movement and the zoom of the view.

Click on the zoom button to select if you want to zoom in (+) or zoom out (-) then just press on the point where you want to zoom.

To move the view press the move button and then drag on the image.

使用窗口右下角的   按键，可对采集到的钢轨轮廓进行缩放和平移。

平移：单击窗口右下角的平移键  ，然后将鼠标放置到主窗口，按住鼠标左键，向目标方向移动鼠标，来实现轮廓的平移。

缩放：单击窗口右下角的缩放键  ，然后将鼠标放置到主窗口，鼠标左键单击后，拨动鼠标滚轮来实现轮廓的放大和缩小。

## 5.5 Measure 量测

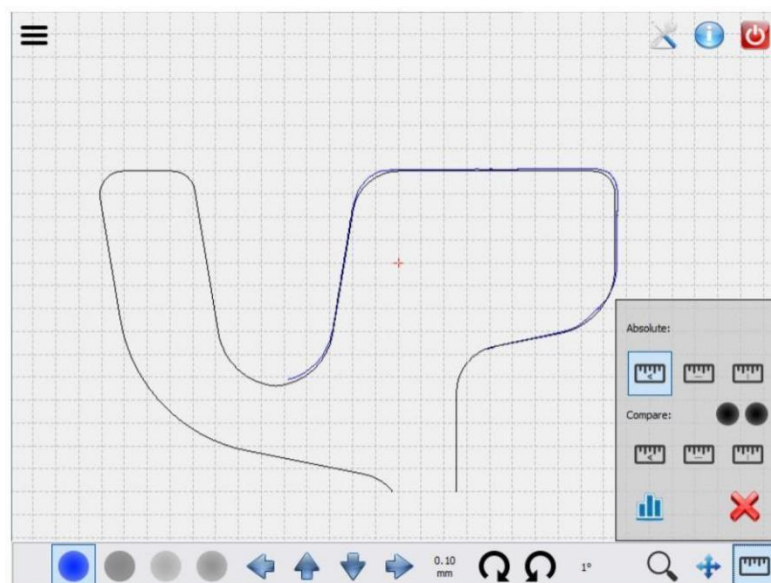
Clicking the bottom-right button will open the measure panel.

With the absolute one only the selected profile will be considered.

With the comparative the difference between the selected profile and the last loaded profile will be calculated.

It's possible to acquire an angular, an horizontal or a vertical measure. Just press on the point where you want to measure and a quota will appear.

测量：单击窗口右下角的测量键  ，会有一个测量控制对话框出现在右下角，如下图所示。操作者可以根据实际需求选择相应的测量方式：

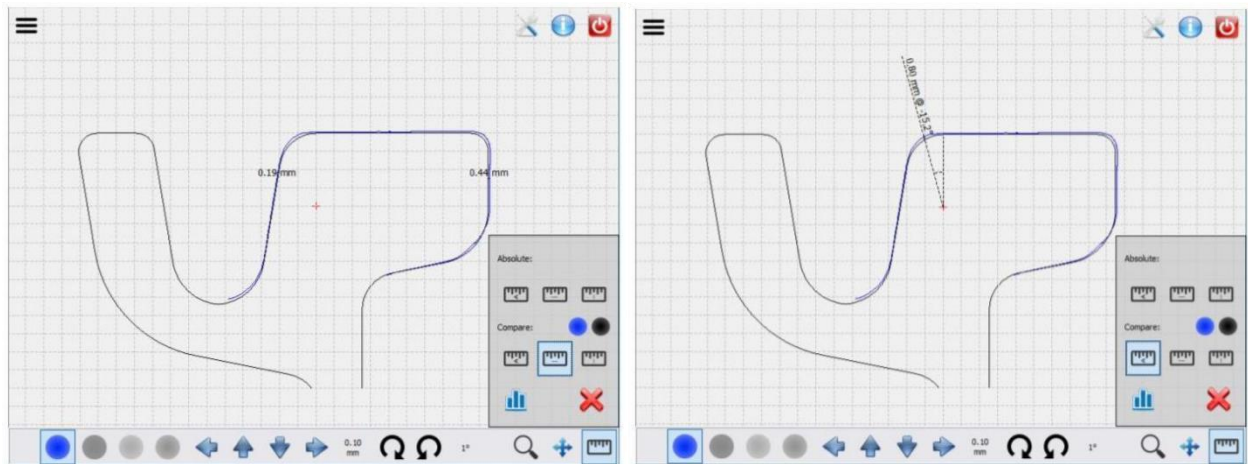




It's possible to make two type of measure:  
两种标尺:

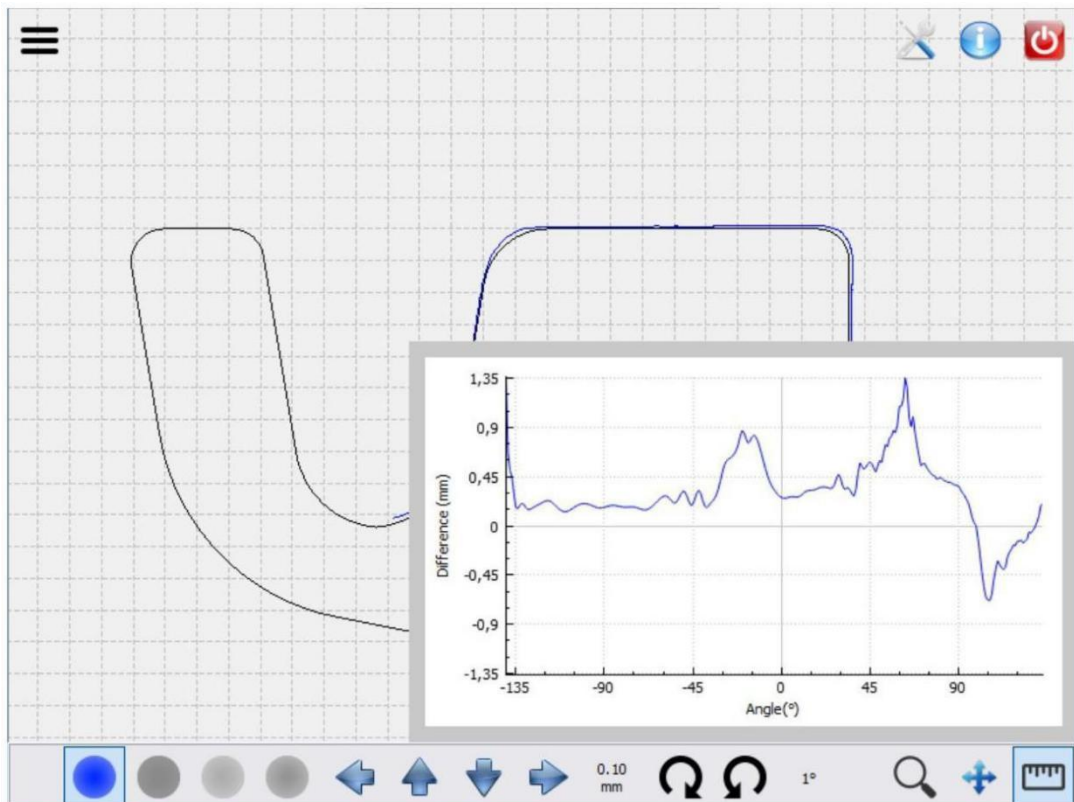
Absolute 绝对尺寸 (水平、垂直、弧度)

Comparative 相对尺寸 (水平、垂直、弧度)



It's possible to generate a graph of the comparative angular measure by pressing the graph button:

点击graph键，可以生成与当前钢轨轮廓所对应的graph的图表

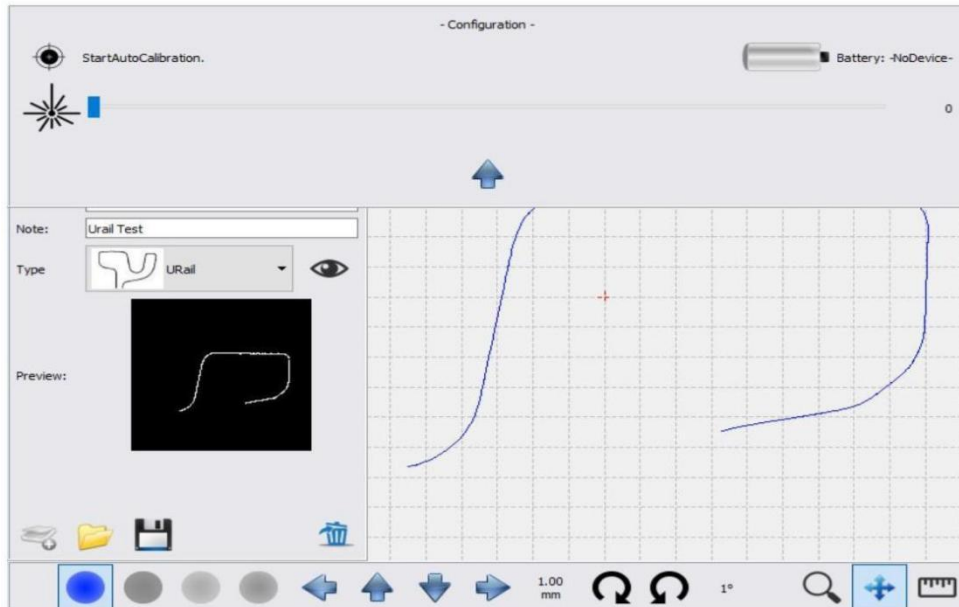




## 5.6 Configuration 配置文件

Near the exit button on the top right of the screen there is the configuration button, by pressing it a panel will slide down.

配置文件按钮  位于窗口的右上方，单击会弹出配置文件对话框。



Here will be possible to start the auto calibration feature (it require to install the on the device the caliber support to make it work, see chapter 6) And it's possible to adjust the lasers power (usually it's ok to let the power at the max but if the metal it super reflective it's better to scale it down). In the end you can check the battery status of the device on the top-right.

这里包含系统自动标定功能，当设备更换激光机相机传感器后，需使用此功能重新对系统进行标定，具体标定步骤，详见章节 6。

这里也可对激光功率进行调整，通常情况下，设置为最大功率，但若被测材料的放射率较大，就要尝试将激光功率调小。

同时，用户可在这里查看电池的使用量。

## 5.7 Manage the profiles 轮廓管理

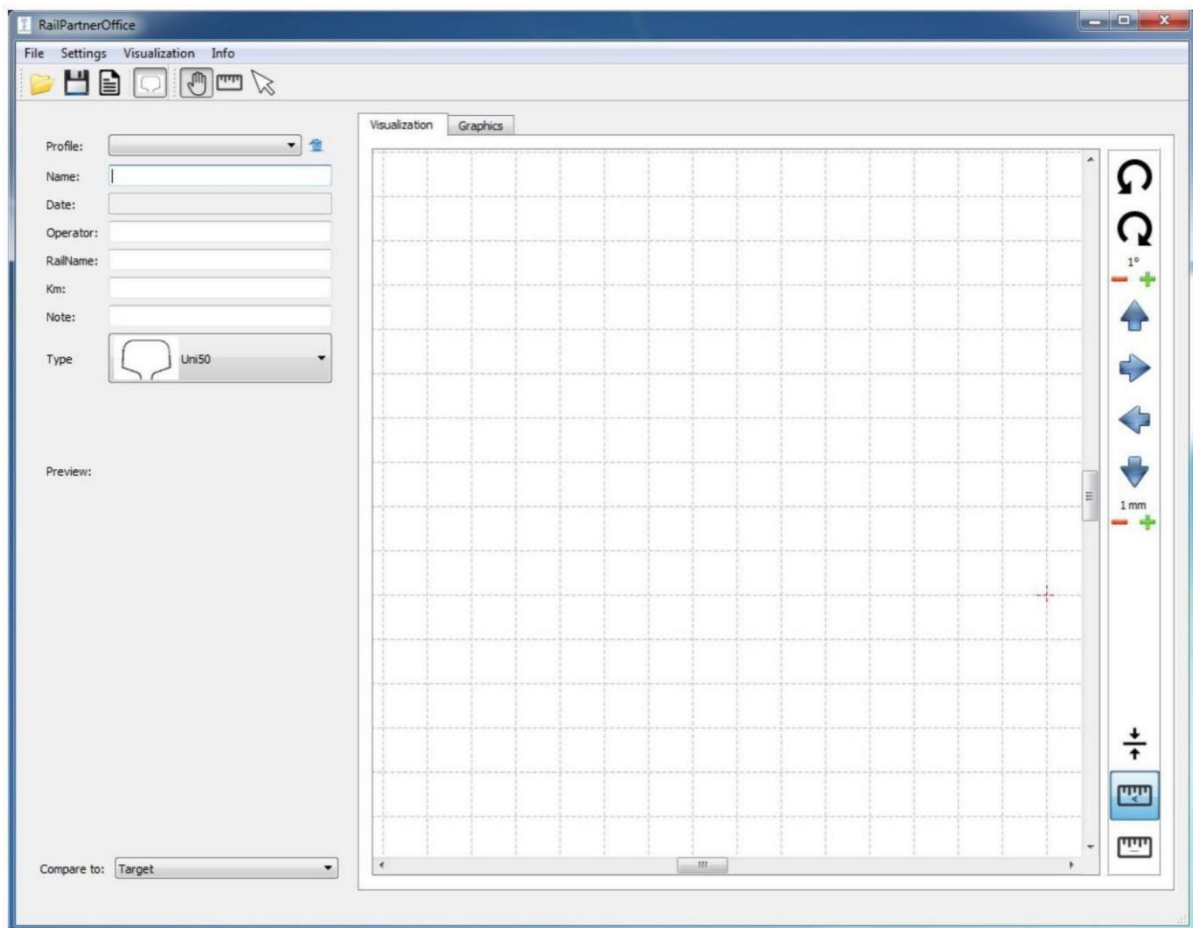
The device has "Windows 7" installed so if you want to copy or delete the acquisitions just close the program, go to the directory "Documents\ADTS\RailPartnerTouch\RailProfile\" where you can find all the profile saved (file extension .rpr) and do with them as you prefer.

该软件支持“Win7”系统，可进入目录“Documents\ADTS\RailPartnerTouch\RailProfile\”，找到以.rpr为后缀的文件，进行复制或删除等操作

## 6 Rail Partner Office后处理软件


The Rail Partner II system is provided with an elaboration software that allow to analyze in depth the acquisition acquired by Rail Partner II device.

此套系统还随机附带一个后处理分析软件，便于用户将数据带回办公室做进一步的分析和历史数据比对等。

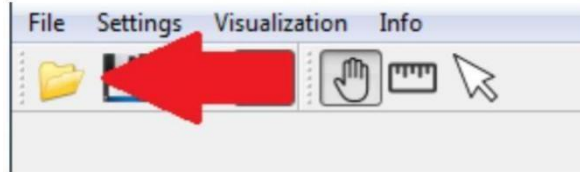




## 6.1 Open a profile 打开数据

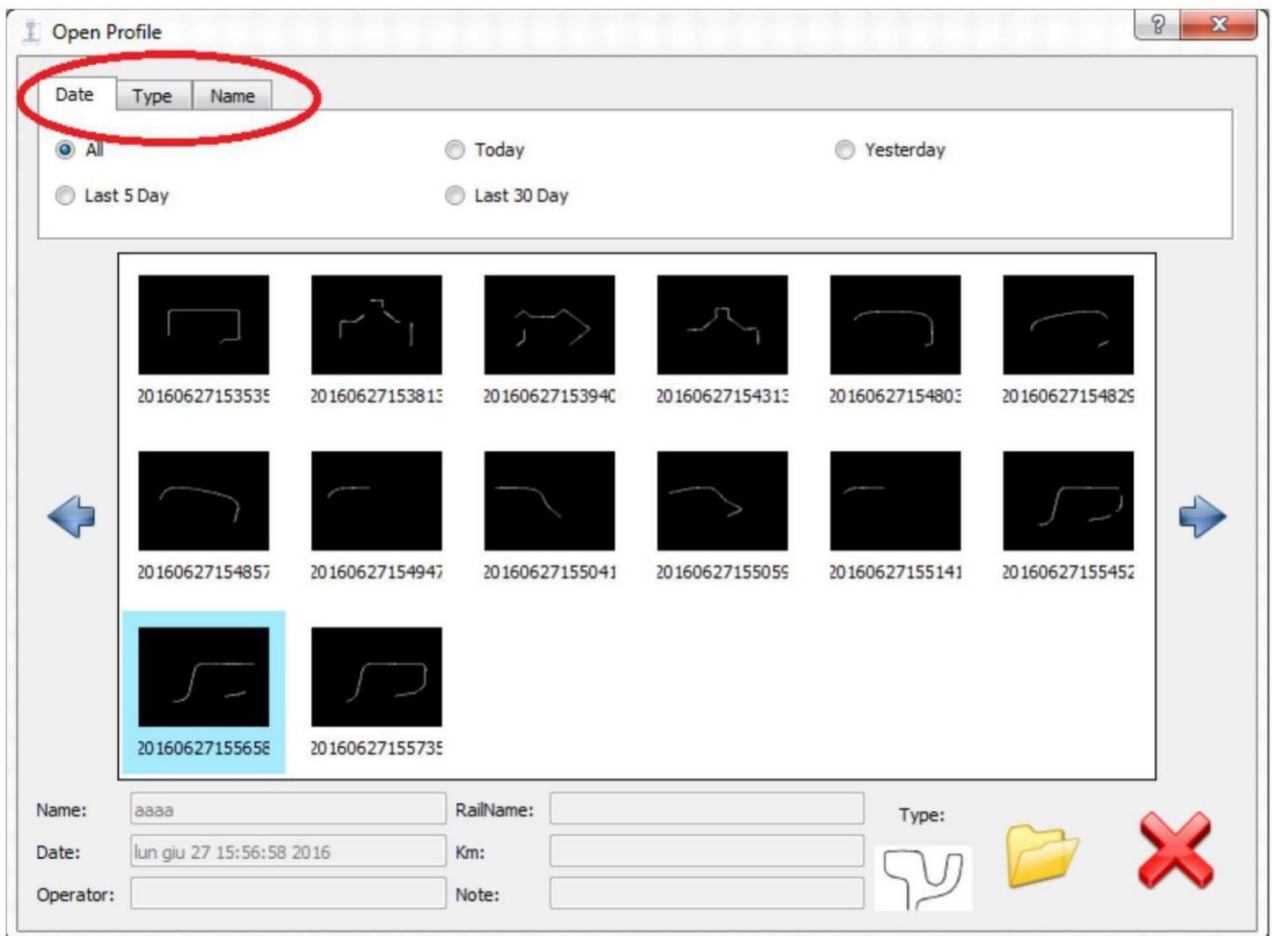
To load an acquisition the icon on the upper left  should be pressed. The “Open Profile” dialog appear”.

打开文件，单击图标  ，会弹出“dialog appear”对话框



On this dialog you can load the acquisition and you can apply a filter setting the parameters on the Date, Type and Name Tab showed on the red circle.


在“dialog appear”对话框中，可通过Date日期、Type类型、Name名称进行自定义筛选。如下图红圈处所示。






The scroll icons allow to scroll the acquisition.

可单击翻页箭头标志查看上一页或下一页。

After selecting the profile to be analysed, to open it simply double click on icon  or press the yellow folder at the bottom right.

选中要打开的轮廓数据后，直接双击文件加载，或选中文件后单击右下角的  图标

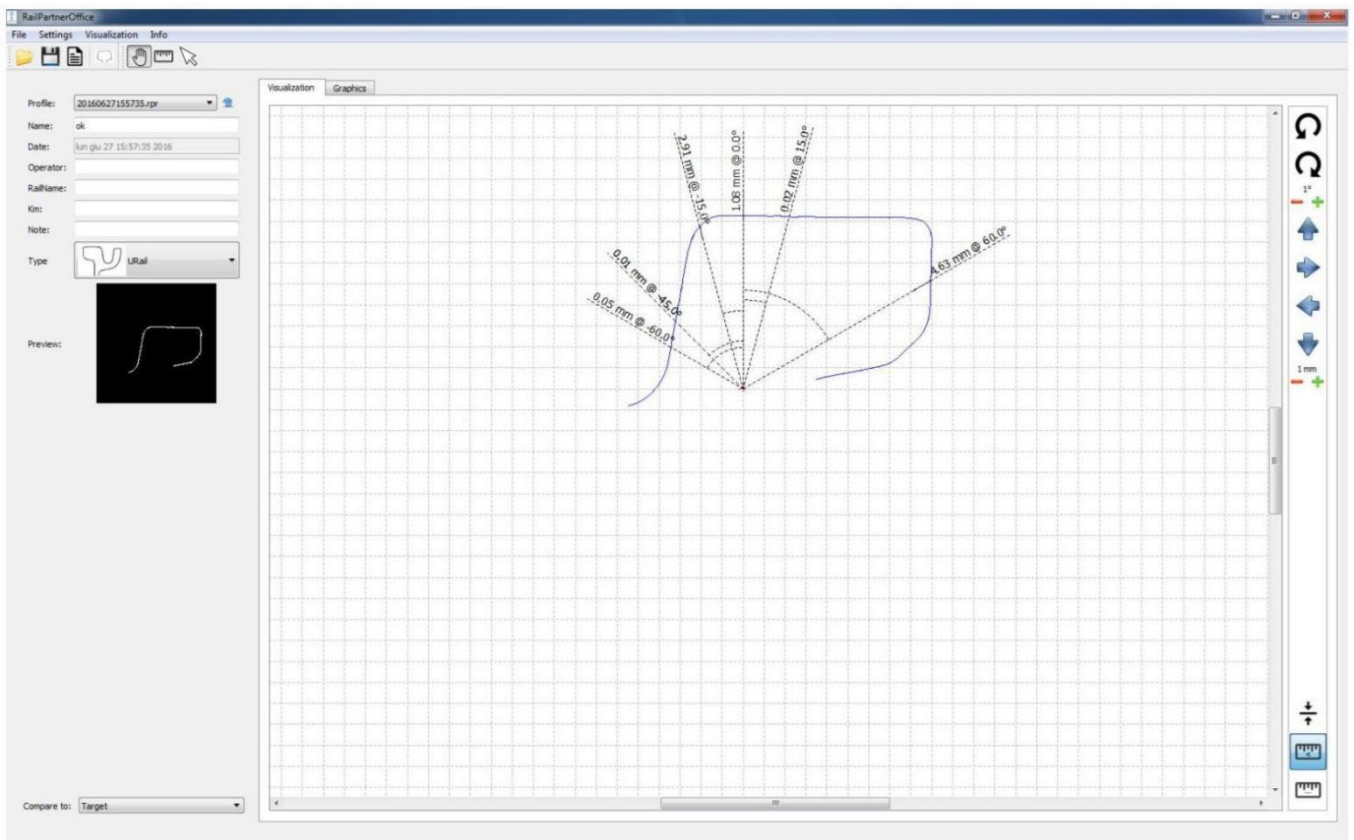
The  icon close the "Open Profile" dialog.

关闭"Open Profile"对话框，只需单击右下角的  图标

## 6.2 Main Dialog 主页面

In the Main Dialog all the toll necessary for the measurement can be found as icons.

在主页面上，后处理分析软件的所有功能都可以直接找到并使用。



Moving Function: 微调功能



Rotate Left and Right : allow the left or right rotation of profile.

逆时针旋转/顺时针旋转



Move: these icons allow the up, down, left and right shifting of profile.

上/下/左/右移动轮廓位置



Increase and decrease the step rotation and shift of profile.

增加或减少步进单位量

Measurement Functions: 测量功能



Auto Alignment : this function allow the horizontal and vertical alignment. The alignment is achieved by calculating the minimum standard deviation on certain points. For proper operation of algorithm must be manually move the profile close to the target.

自动校准



Angle Measurement : this function allow to measure the difference between target and profile at -60°, -45°, -15°, 0°, 15°, 45° and 60°.

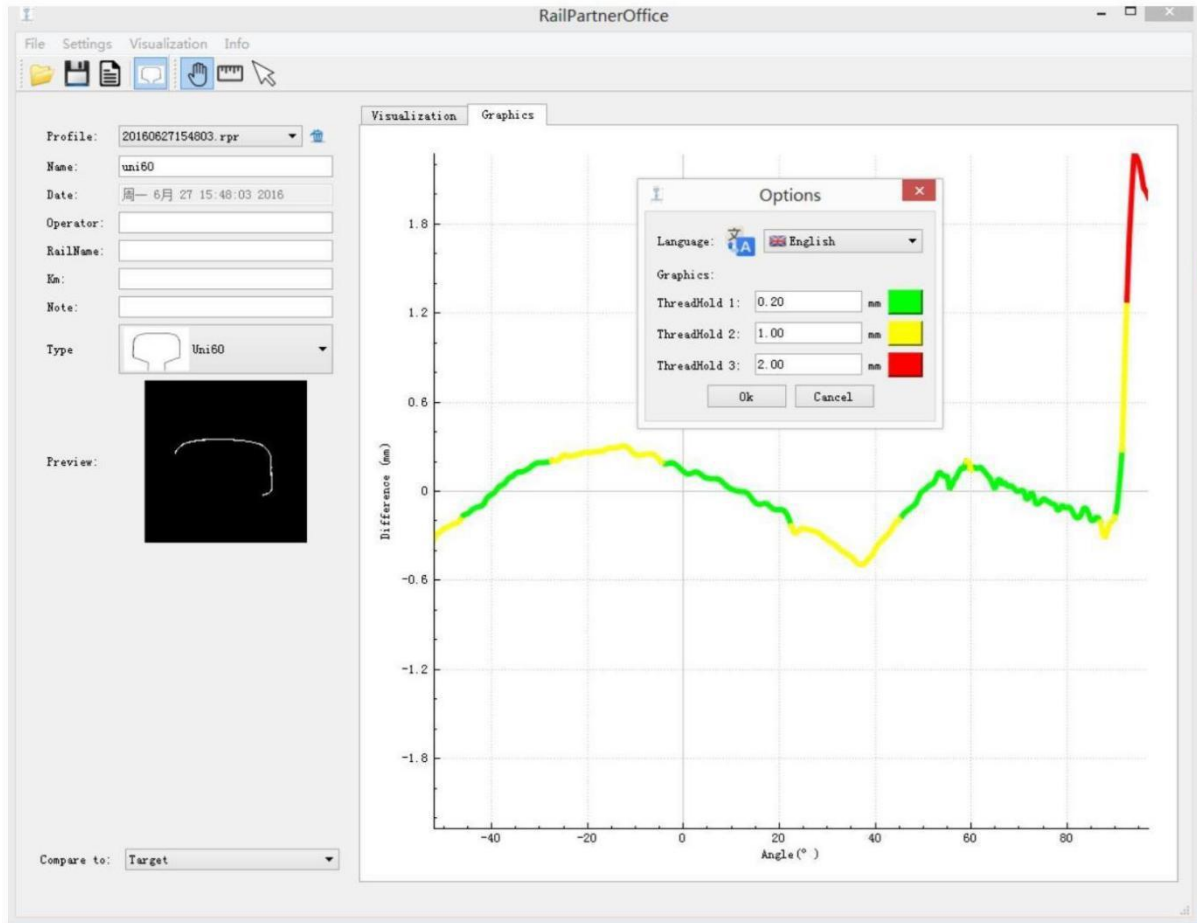
测量角度:



Gauge Measurement : The gauge measurement is calculated as difference between target and profile at the point of 14mm on the bottom of top rail.

测量误差

## Tab Graphics: 磨损图标



The wear can be settled in 3 levels.

磨损可自定义分为三个级别，并用不同的颜色来显示。

The levels can be adjusted to Settings->Options.

On this Dialog is allowed to change the color of threshold and the value.

自定义阈值：主页面上点击**Settings->Options**，对阈值进行设置，并且调整显示颜色。如下图



### 6.3 Report Generation 生成报告



The report is generated by clicking on the icon. A save dialog appear and a file name shall be write.

Clicking on save a PDF file is generated in the selected directory.



单击保存键，屏幕上会弹出一个对话框，操作者键入文件名，选择目标文件夹和保存类型，然后单击保存即可。

|           |                 |      |      |       |          |      |             |
|-----------|-----------------|------|------|-------|----------|------|-------------|
| Name:     | 1_              |      |      |       |          |      |             |
| Date:     | lun giu 27 2016 |      |      | Time: | 15:35:35 |      |             |
| RailName: |                 |      |      | Km:   |          |      |             |
| Operator: |                 |      |      | Type: | Dummy    |      |             |
| Note:     |                 |      |      |       |          |      |             |
| -60°      | -45°            | -15° | 0°   | 15°   | 45°      | 60°  | Gauge Point |
| 0.18      | 0.03            | 0.01 | 0.04 | 0.06  | 0.04     | 0.03 | 0.03        |



## 7 Auto Calibration Procedure 自动标定

This procedure must be carefully followed to avoid eye exposure to the laser.

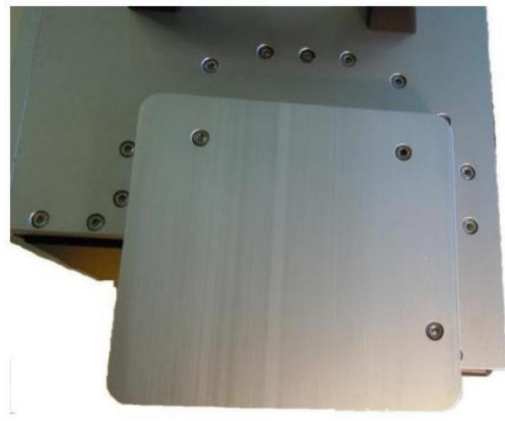
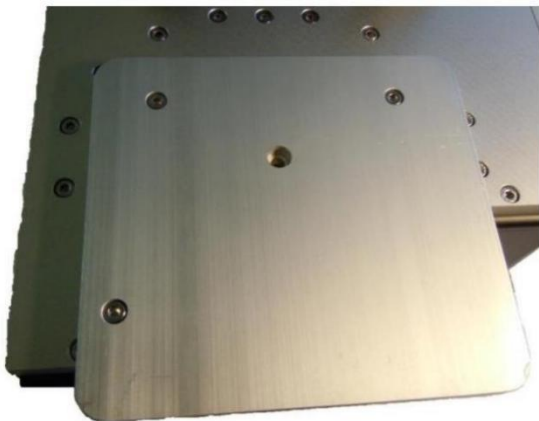
To begin Auto calibration, switch the equipment off. Insert the gauge in the relative housing.

The next figures show the correct position of the gauge.

在进行系统标定之前，务必将系统电源关闭，确保激光传感器未打开！将支撑板安装在轨道轮廓检测仪的端部，然后将标靶安装到支撑板上

Fix the supports plate in the device;

将支撑板安装到仪器上



Fix the support caliber in the support plate;

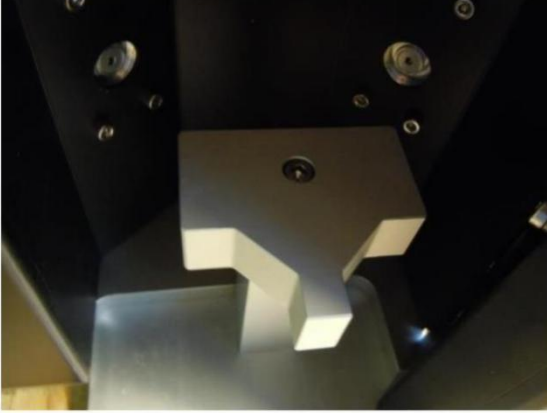
将标靶支架固定到支撑板上





Fix the caliber .

固定标靶



Then proceed following the instruction on chapter 5.6.

具体步骤详见章节 5.6

## 7.1 Uni60 Rail工字轨（60 轨）

If you measure the Uni60 Rail, it is need to insert the respective support

在对工字轨进行测量时，需安装辅助支架。



## 7.2 U Rail槽型轨

If you measure the U Rail, it is not need to insert the support

对槽型轨的测量，无需装入辅助支架。



see 4.2 BATT), the led in the battery recharger change color from green to red;

将充电器连接后（详见章节 4.2），充电器上的led指示灯显示红色，表示正在充电。

When the led in the battery recharger change color from red to green, the battery is charged.

当Led指示灯由红色变为绿色后，表示蓄电池充电结束。可将充电器移除。



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