## Optoelectronic Instruments and Systems for Geometric Quantities Measurement

### Product Catalog 2019

<table>
<thead>
<tr>
<th>Measurement Type</th>
<th>Icon</th>
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<tbody>
<tr>
<td>Displacement and Position Measurement</td>
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<tr>
<td>Gap Measurement</td>
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<tr>
<td>Thickness and Width Measurement</td>
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<tr>
<td>Profile Measurement</td>
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<tr>
<td>Outer Diameter and Profile Measurement</td>
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<td>Level Measurement</td>
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<tr>
<td>Inner Diameter and Profile Measurement</td>
<td>2D Measurement</td>
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<tr>
<td>2D Measurement</td>
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<tr>
<td>Vibration and Run-out Measurement</td>
<td>3D Measurement</td>
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<tr>
<td>3D Measurement</td>
<td></td>
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<tr>
<td>Straightness and Flatness Measurement</td>
<td>Machine Vision Systems</td>
</tr>
</tbody>
</table>
The parent company, Scientific and Production Company «RIFTEK» was founded in 1993. The enterprise specializes in development and fabrication of optoelectronic instruments for measuring of geometrical quantities.

The group also includes:
Enterprise «RIFTEKTECHNO» – manufacturing of mechanical parts and components for the parent company, contract manufacturing;
Enterprise «RIFTEK-SMT» – automated assembling of printed circuit boards (PCB), contract manufacturing;
Enterprise «Riftek Russia» – assembly unit in Russia.

The basic product line includes:
- laser triangulation position sensors,
- 2D and 3D laser scanners,
- absolute linear encoders,
- optical micrometers,
- hardware and software system for welding robots,
- specialized systems for measuring dimensions, displacements and distances, thickness, diameter, etc.,
- measurement instruments for railway transport,
- video processing FPGA IP-cores and hardware,
- machine vision systems.

RIFTEK products are delivered in more than 60 countries. Company representative offices operate in 45 countries.

RIFTEK company is certified according to ISO 9001:2015 in the field of management of quality of design and manufacture of optoelectronic instrumentation.

We offer integrated solution to control and automation problems – from sensing devices to multifunctional measuring and control systems.
LASER TRIANGULATION SENSORS

**PURPOSE**
Contactless dimensions, surface profile, deformation, vibration measurement, sorting, sensing presence or absence, positional checking, bulk materials and liquids level measurement.

**OPERATION**
Sensor operation is based on the principle of optical triangulation.
Radiation of a semiconductor laser is focused by an objective on an object. The radiation scattered at the object is collected on the CMOS array by the input lens. Object motion causes a corresponding motion of the image. Built-in signal processor calculates the distance to the object according to the light spot image position on the CMOS array.

**MAIN FEATURES**
- Measuring ranges from 2 to 2500 mm
- ±1 um accuracy
- Sampling rate up to 180 kHz
- RS232/RS485/Ethernet/CAN/CANopen +4...20 mA/0...10 V/ModbusRTU
- Binocular sensors for laser scanning
- Binary and ASCII data formats
- Sensors with BLUE lasers to control high temperature, mirrored and semitransparent objects
- Sensors with IR lasers
- Mutual synchronization of the sensors (master-slave) for multi-axis measurement tasks
- Service Software for parameter setting and results visualization
- Free SDK and examples for Windows, Linux, .NET, MathLAB, LabView

**PARAMETERS**

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>VALUE</th>
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<tbody>
<tr>
<td>Output interface</td>
<td>digital or analog</td>
</tr>
<tr>
<td>Synchronization input</td>
<td>2.4 – 5 V (CMOS, TTL)</td>
</tr>
<tr>
<td>Logic output</td>
<td>programmed functions, NPN: 100 mA max; 40 V max for output</td>
</tr>
<tr>
<td>Power supply, V</td>
<td>9...36</td>
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<tr>
<td>Power consumption, W</td>
<td>1.5...2</td>
</tr>
<tr>
<td>Enclosure rating</td>
<td>IP67 (for sensors with cable connector only)</td>
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<tr>
<td>Vibration</td>
<td>20g/10...100Hz, 6 hours, for each of XYZ axes</td>
</tr>
<tr>
<td>Shock</td>
<td>30 g / 6 ms</td>
</tr>
<tr>
<td>Operation temperature, °C</td>
<td>-10...+60, (-30...+60 for the sensors with in-built heater), (-30...+120 for the sensors with in-built heater and air cooling housing)</td>
</tr>
<tr>
<td>Permissible ambient light, lx</td>
<td>&gt;30000</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>5-95% (no condensation)</td>
</tr>
<tr>
<td>Storage temperature, °C</td>
<td>-20...+70</td>
</tr>
<tr>
<td>Housing material</td>
<td>aluminum</td>
</tr>
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</table>

**MODELS**
- RF603 - universal sensors
- RF603HS - high speed sensors
- RF600 - RF6001 - large-base and long range sensors
- RF605 - compact sensors
- RF602 - super compact sensors
- RF607 - high-precision high-speed sensors
- RF609 - laser probes for inner surface control

Sensors for special applications.
SOFTWARE
■ Setting sensor parameters
■ Receiving, storage, visualization
■ Speed and acceleration calculation

OPTIONS
■ Protective housing with air and water cooling
■ Custom versions with non-standard base, range or housing shape
■ Special version for use in high vibration conditions
■ Special flexible cable for robotic applications
■ Variants with round and elliptical spot

LASER TRIANGULATION SENSORS

RF603 Series

- Varied diode powers
- Binocular sensors
- Available with Red, Blue or IR laser diodes
- Accuracy ± 0.05% working range
- 9400 Hz sampling rate

TABLE

<table>
<thead>
<tr>
<th>RF603-</th>
<th>R- X/4</th>
<th>X/2</th>
<th>X/5</th>
<th>X/10</th>
<th>X/15</th>
<th>X/25</th>
<th>X/30</th>
<th>X/50</th>
<th>X/100</th>
<th>X/250</th>
<th>X/500</th>
<th>X/750</th>
<th>X/1000</th>
<th>X/1250</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base distance X, mm</td>
<td>39</td>
<td>15</td>
<td>15</td>
<td>13, 25</td>
<td>60</td>
<td>13, 30</td>
<td>65</td>
<td>25, 45</td>
<td>80</td>
<td>35, 55</td>
<td>95</td>
<td>45, 65</td>
<td>105</td>
<td>60, 90</td>
</tr>
<tr>
<td>Measurement range, mm</td>
<td>4</td>
<td>2</td>
<td>5</td>
<td>10</td>
<td>15</td>
<td>25</td>
<td>30</td>
<td>50</td>
<td>100</td>
<td>250</td>
<td>500</td>
<td>750</td>
<td>1000</td>
<td>1250</td>
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<tr>
<td>Linearity, %</td>
<td>±0.05 of the range</td>
<td>±0.1</td>
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<td>Resolution, %</td>
<td>0.01 of the range (for the digital output only)</td>
<td>0.02</td>
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<tr>
<td>Temperature drift</td>
<td>0.02% of the range/°C</td>
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<tr>
<td>Max. measurement frequency, Hz</td>
<td>9400</td>
<td></td>
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<tr>
<td>Light source</td>
<td>red semiconductor laser, 660 nm wavelength or UV semiconductor laser 405 nm wavelength (BLUE version)</td>
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</tbody>
</table>

Light source:
- RF603 model:
  - output power ≤0.2 mW
  - laser safety Class 1
- RF603L model:
  - output power ≤0.95 mW
  - laser safety Class 2 (IEC60825-1)
- RF603P model:
  - output power ≤20 mW
  - laser safety Class 3B (IEC60825-1)
| Weight (without cable) | 100 |

Note 1: RF603-R-39/4 sensor is designed to use with mirror surfaces and glass.

RF603HS Series

- Universal high-speed compact laser sensors
- Sampling rate up to 180 kHz
- Available with Red and Blue laser diodes
- Ideal for fast event logging
LASER TRIANGULATION SENSORS

RF603HS- X/2 X/5 X/10 X/15 X/25 X/30 X/50 X/100 X/250 X/500 X/750 X/1000 X/1250

<table>
<thead>
<tr>
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<th>15</th>
<th>15</th>
<th>15, 25</th>
<th>60</th>
<th>15, 30</th>
<th>65</th>
<th>25, 45</th>
<th>80</th>
<th>35, 55</th>
<th>95</th>
<th>45, 65</th>
<th>105</th>
<th>60, 90</th>
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<td>100</td>
<td>250</td>
<td>500</td>
<td>750</td>
<td>1000</td>
<td>1250</td>
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<tr>
<td>Max. measurement frequency, kHz</td>
<td>60, 120, 180</td>
<td>±0.1 (60 kHz), ±0.2 (120 kHz), ±0.3 (180 kHz)</td>
<td>±0.01 (60 kHz), 0.02 (120 kHz), 0.04 (180 kHz)</td>
<td>±0.02% of the range/°С</td>
<td>±0.02% of the range/°С</td>
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<tr>
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<td>red semiconductor laser, 660 nm wavelength or UV semiconductor laser 405 nm wavelength (BLUE version)</td>
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<tr>
<td>Laser safety Class</td>
<td>3R (IEC60825-1)</td>
<td>3B (IEC60825-1)</td>
<td>3B (IEC60825-1)</td>
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<tr>
<td>Weight (without cable)</td>
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</table>

LARGE-BASE AND LONG RANGE SENSORS

RF600 Series

■ High-precision measurement of the position of remote objects
■ High-speed (70 kHz) sensors

RF600- X/10 X/30 X/40 X/100 X/250 X/500 X/600 X/1000 X/1500 X/2000 X/2500 X/20 X/50

<table>
<thead>
<tr>
<th>Base distance X, mm</th>
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<th>330</th>
<th>500</th>
<th>230</th>
<th>300, 100</th>
<th>230</th>
<th>1300</th>
<th>380</th>
<th>390</th>
<th>410</th>
<th>420</th>
<th>540</th>
<th>535</th>
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<tbody>
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<td>250</td>
<td>500</td>
<td>100</td>
<td>1000</td>
<td>1500</td>
<td>2000</td>
<td>2500</td>
<td>20</td>
<td>50</td>
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<td>Max. measurement frequency</td>
<td>9.4 kHz, 70 kHz</td>
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<tr>
<td>Linearity, % of the range</td>
<td>±0.1</td>
<td>±0.2</td>
<td>±0.05</td>
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<tr>
<td>Resolution, % of the range</td>
<td>0.01 of the range (digital output only)</td>
<td>0.03</td>
<td>0.01</td>
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<tr>
<td>Temperature drift</td>
<td>0.02% of the range/°С</td>
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</tr>
<tr>
<td>Light source</td>
<td>red semiconductor laser, 660 nm wavelength or UV semiconductor laser 405 nm wavelength (BLUE version)</td>
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<td>Output power</td>
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<td>≤20 mW</td>
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</tr>
<tr>
<td>Laser safety Class</td>
<td>3R (IEC60825-1)</td>
<td>3B (IEC60825-1)</td>
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<tr>
<td>Weight (without cable)</td>
<td>500</td>
<td>2000</td>
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</table>

COMPACT LASER SENSORS

RF605 Series

RF605- 25/50 45/100 65/250 105/500

<table>
<thead>
<tr>
<th>Base distance X, mm</th>
<th>25</th>
<th>45</th>
<th>65</th>
<th>105</th>
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<tbody>
<tr>
<td>Measurement range, mm</td>
<td>50</td>
<td>100</td>
<td>250</td>
<td>500</td>
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<tr>
<td>Max. measurement frequency</td>
<td>2000 Hz</td>
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<tr>
<td>Linearity, % of the range</td>
<td>±0.1</td>
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</tr>
<tr>
<td>Resolution, % of the range</td>
<td>0.01 (digital output only)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Temperature drift</td>
<td>0.02% of the range/°С</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Light source</td>
<td>red semiconductor laser, 660 nm wavelength</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output power</td>
<td>≤0.95 mW</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laser safety Class</td>
<td>2 (IEC60825-1)</td>
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<tr>
<td>Weight (without cable)</td>
<td>60</td>
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</table>
### LASER TRIANGULATION SENSORS

#### SUPER COMPACT LASER SENSORS

**RF602 Series**

- **Unique combination of dimensions, performance and operating ranges**

<table>
<thead>
<tr>
<th>RF602-</th>
<th>20/ 10</th>
<th>20/ 25</th>
<th>30/ 50</th>
<th>50/ 100</th>
<th>65/ 250</th>
<th>105/ 500</th>
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</thead>
<tbody>
<tr>
<td>Base distance X, mm</td>
<td>20</td>
<td>20</td>
<td>30</td>
<td>50</td>
<td>65</td>
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<td>25</td>
<td>50</td>
<td>100</td>
<td>250</td>
<td>500</td>
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<tr>
<td>Max. measurement frequency</td>
<td>9400 Hz</td>
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<tr>
<td>Linearity, % of the range</td>
<td>±0.05</td>
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<td>0.01 (digital output only)</td>
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<tr>
<td>Temperature drift</td>
<td>0.02% of the range/°C</td>
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<tr>
<td>Light source</td>
<td>red semiconductor laser, 660 nm wavelength or UV semiconductor laser 405 nm wavelength (BLUE version)</td>
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<tr>
<td>Output power, mW</td>
<td>≤0.95 mW</td>
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<td></td>
</tr>
<tr>
<td>Laser safety Class</td>
<td>2 (IEC60825-1)</td>
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</tr>
<tr>
<td>Weight (without cable), gram</td>
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</table>

#### SPECIALIZED LASER SENSORS FOR PAVEMENT PROFILE AND TEXTURE MEASUREMENT

**RF60i Series**

- **Accuracy ± 0.03% of working range**
- **Sampling rate up to 70 kHz**

<table>
<thead>
<tr>
<th>MODEL</th>
<th>SPECIFIC FEATURES</th>
<th>ASSIGNMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF603P-125/500 RF603P-245/1000</td>
<td>■ high resistance to solar radiation  ■ stable operation on wet surfaces  ■ 70 kHz operating frequency</td>
<td>Pavement profile measurement</td>
</tr>
<tr>
<td>RF607-195/500</td>
<td>■ 70 kHz operating frequency  ■ round laser spot, diameter &lt;1 mm</td>
<td>Pavement profile measurement</td>
</tr>
<tr>
<td>RF607-210/230 RF607-230/250</td>
<td>■ 70 kHz operating frequency  ■ round laser spot, diameter &lt;0.8 mm  ■ accuracy ±0.03% of the range</td>
<td>Pavement roughness (texture) measurement</td>
</tr>
<tr>
<td>RF603Tx-30/30</td>
<td>■ reduced triangulation angle  ■ round laser spot, diameter &lt;60 um  ■ simultaneously obtaining profile and image of the surface</td>
<td>Pavement roughness (texture) measurement</td>
</tr>
</tbody>
</table>
Contactless measurement of inner diameter, ovality, coaxiality, cylindricity and shape of holes, tubes, hosepipes, bushes, gun barrels, etc.

The probe is inserted into the hole and is driven in rotation. Laser triangulation sensor built in the probe measures the distance to the hole wall synchronously with the rotation angle of the probe. The set of the polar surface coordinates allows to calculate the required parameters.

- Probe diameter – from 6 mm
- Measured inner diameter - from 6,5 mm
- Accuracy - from ±2 um
- Sampling rate - up to 9,4 kHz
- Probes with BLUE laser to control reflecting and semitransparent objects

<table>
<thead>
<tr>
<th>inner diameter</th>
<th>steps and hole alignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>measurement</td>
<td>measurement</td>
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<tr>
<td>cavity</td>
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<tr>
<td>coaxiality</td>
<td>ovality</td>
</tr>
<tr>
<td>measurement</td>
<td>measurement</td>
</tr>
</tbody>
</table>
PURPOSE

Absolute linear encoders are designed for measuring and checking displacements, dimensions, run-outs, surface profiles and deformations of engineered objects.

<table>
<thead>
<tr>
<th>RF25X-</th>
<th>RF251-3</th>
<th>RF251-25</th>
<th>RF256-15</th>
<th>RF256-35</th>
<th>RF256-55</th>
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</thead>
<tbody>
<tr>
<td>Measurement range, mm</td>
<td>3</td>
<td>25</td>
<td>15</td>
<td>35</td>
<td>55</td>
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<tr>
<td>Accuracy (at T=20 °C), um</td>
<td>±2</td>
<td>±2</td>
<td>±3</td>
<td>±3</td>
<td>±3</td>
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<tr>
<td>Resolution, um</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Output interface</td>
<td>digital</td>
<td>RS422</td>
<td>(RS485 and SSI or RS232)</td>
<td>EncD5 or EncD10 - emulation of quadrature signals of incremental transducers</td>
<td>0...20 mA (&lt;500 Ωm load) or 0...10 V</td>
</tr>
<tr>
<td>Analog</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>Synchronization input</td>
<td>no</td>
<td>no</td>
<td>opto-isolated</td>
<td>opto-isolated</td>
<td>opto-isolated</td>
</tr>
<tr>
<td>Logical outputs</td>
<td>no</td>
<td>two outputs, NPN: 100 mA max; 40 V max</td>
<td>no</td>
<td>two outputs, NPN: 100 mA max; 40 V max</td>
<td>no</td>
</tr>
<tr>
<td>Indication</td>
<td>no</td>
<td>two-color LED (red/green)</td>
<td>no</td>
<td>two-color LED (red/green)</td>
<td>no</td>
</tr>
<tr>
<td>Power supply, V</td>
<td>12 (without analogue output) 15 (with analogue output)</td>
<td>12 (without analogue output) 15 (with analogue output)</td>
<td>12 (without analogue output) 15 (with analogue output)</td>
<td>12 (without analogue output) 15 (with analogue output)</td>
<td>12 (without analogue output) 15 (with analogue output)</td>
</tr>
<tr>
<td>Power consumption, W</td>
<td>0.75</td>
<td>0.75</td>
<td>0.75</td>
<td>0.75</td>
<td>0.75</td>
</tr>
<tr>
<td>Enclosure rating</td>
<td>IP57</td>
<td>IP57</td>
<td>IP57</td>
<td>IP57</td>
<td>IP57</td>
</tr>
<tr>
<td>Operating temperature, °C</td>
<td>-40...+50</td>
<td>-40...+50</td>
<td>-10...+50</td>
<td>-10...+50</td>
<td>-10...+50</td>
</tr>
<tr>
<td>Weight (without cable), gram</td>
<td>70</td>
<td>110</td>
<td>110</td>
<td>150</td>
<td>180</td>
</tr>
</tbody>
</table>
**OPTICAL MICROMETERS**

**PURPOSE**
Contactless diameter, gaps and technological object position measurement.

---

**WORKING PRINCIPLE**
The micrometer operation is based on the so-called ‘shadow’ principle. The micrometer consists of two blocks – transmitter and receiver. Radiation of a semiconductor laser or LED is collimated by a lens. With an object placed in the collimated beam region, shadow image formed is scanned with a photo-detector array. A processor calculates the position (size) of the object from the position of shadow border (borders).

---

**MAIN FEATURES**
- Measurement range from 5 to 100 mm
- Up to ±0.3 um accuracy
- Up to 10 000 Hz sampling rate
- RS232/RS485/Ethernet/CAN +4...20 mA/0...10V
- Micrometers with telecentric lens
- Mutual synchronization of the sensors (master-slave) for multi-axis measurement tasks
- Service Software for micrometers parameterization
- Free SDK and examples for Windows, Linux, .NET, MathLAB, LabView
- Dual, three and multi axis Micrometers
- Air-knife window protection

---

**MODELS**
- **RF651** - universal micrometers
- **RF656** - high-precision micrometers with telecentric optics
- **RF651XY** and **RF656XY** - two-coordinate micrometers
- **RF659** - edge sensors

---

**RF65X Series OPTICAL MICROMETERS**
OPTICAL MICROMETERS

The sensors are intended for non-contact measuring and monitoring the position of the edge (edges) of various objects, such as tapes, plates, substrates, etc.

**RF651-25**
- Measurement range: 25 mm
- Accuracy: ±5 μm
- Measurement frequency: 500 Hz
- Light source: LED or laser
- Laser safety class: 1 (IEC 60825-1)
- Output interface: digital, RS232 (max. 921.6 kbit/s) or RS485 (max. 921.6 kbit/s) or Ethernet & (RS32 or RS485)
- Synchronization input: 2.4 – 5 V (CMOS, TTL)
- Power supply, V: 24 (9 … 36)
- Power consumption, W: 1.5 – 2
- Housing material: aluminum
- Weight (without cable), gram: 600

**RF651-50**
- Measurement range: 50 mm
- Accuracy: ±10 μm
- Measurement frequency: 500 Hz
- Light source: LED or laser
- Laser safety class: 1 (IEC 60825-1)
- Output interface: digital, RS232 (max. 921.6 kbit/s) or RS485 (max. 921.6 kbit/s) or Ethernet & (RS32 or RS485)
- Synchronization input: 2.4 – 5 V (CMOS, TTL)
- Power supply, V: 24 (9 … 36)
- Power consumption, W: 1.5 – 2
- Housing material: aluminum
- Weight (without cable), gram: 2000

**RF651-75**
- Measurement range: 75 mm
- Accuracy: ±15 μm
- Measurement frequency: 500 Hz
- Light source: LED or laser
- Laser safety class: 1 (IEC 60825-1)
- Output interface: digital, RS232 (max. 921.6 kbit/s) or RS485 (max. 921.6 kbit/s) or Ethernet & (RS32 or RS485)
- Synchronization input: 2.4 – 5 V (CMOS, TTL)
- Power supply, V: 24 (9 … 36)
- Power consumption, W: 1.5 – 2
- Housing material: aluminum
- Weight (without cable), gram: 2600

**RF651-100**
- Measurement range: 100 mm
- Accuracy: ±20 μm
- Measurement frequency: 500 Hz
- Light source: LED or laser
- Laser safety class: 1 (IEC 60825-1)
- Output interface: digital, RS232 (max. 921.6 kbit/s) or RS485 (max. 921.6 kbit/s) or Ethernet & (RS32 or RS485)
- Synchronization input: 2.4 – 5 V (CMOS, TTL)
- Power supply, V: 24 (9 … 36)
- Power consumption, W: 1.5 – 2
- Housing material: aluminum
- Weight (without cable), gram: 4000

**RF656-5**
- Measurement range: 5 mm
- Accuracy: ±5 μm
- Measurement frequency: 1500 Hz
- Light source: LED or laser
- Laser safety class: 1 (IEC 60825-1)
- Output interface: digital
- Synchronization input: 2.4 – 5 V (CMOS, TTL)
- Power supply, V: 24 (9 … 36)
- Power consumption, W: 1.5
- Housing material: aluminum
- Weight (without cable), gram: 600

**RF656-10**
- Measurement range: 10 mm
- Accuracy: ±10 μm
- Measurement frequency: 1500 Hz
- Light source: LED or laser
- Laser safety class: 1 (IEC 60825-1)
- Output interface: digital
- Synchronization input: 2.4 – 5 V (CMOS, TTL)
- Power supply, V: 24 (9 … 36)
- Power consumption, W: 1.5
- Housing material: aluminum
- Weight (without cable), gram: 600

**RF656-25**
- Measurement range: 25 mm
- Accuracy: ±20 μm
- Measurement frequency: 1500 Hz
- Light source: LED or laser
- Laser safety class: 1 (IEC 60825-1)
- Output interface: digital
- Synchronization input: 2.4 – 5 V (CMOS, TTL)
- Power supply, V: 24 (9 … 36)
- Power consumption, W: 1.5
- Housing material: aluminum
- Weight (without cable), gram: 600

**RF656-50**
- Measurement range: 50 mm
- Accuracy: ±100 μm
- Measurement frequency: 1500 Hz
- Light source: LED or laser
- Laser safety class: 1 (IEC 60825-1)
- Output interface: digital
- Synchronization input: 2.4 – 5 V (CMOS, TTL)
- Power supply, V: 24 (9 … 36)
- Power consumption, W: 1.5
- Housing material: aluminum
- Weight (without cable), gram: 600

**RF656-75**
- Measurement range: 75 mm
- Accuracy: ±150 μm
- Measurement frequency: 1500 Hz
- Light source: LED or laser
- Laser safety class: 1 (IEC 60825-1)
- Output interface: digital
- Synchronization input: 2.4 – 5 V (CMOS, TTL)
- Power supply, V: 24 (9 … 36)
- Power consumption, W: 1.5
- Housing material: aluminum
- Weight (without cable), gram: 600

**RF656-100**
- Measurement range: 100 mm
- Accuracy: ±200 μm
- Measurement frequency: 1500 Hz
- Light source: LED or laser
- Laser safety class: 1 (IEC 60825-1)
- Output interface: digital
- Synchronization input: 2.4 – 5 V (CMOS, TTL)
- Power supply, V: 24 (9 … 36)
- Power consumption, W: 1.5
- Housing material: aluminum
- Weight (without cable), gram: 600

**RF65X TWO AND THREE AXIS MICROMETERS**

Non-contact measurement of the diameter of wires, tubes, fibers, measurement of gaps and position.

**RF656.2D-60**

Measurement of geometrical parameters of complex objects.
LASER SCANNERS

PURPOSE
Non-contact measuring and checking of surface profile, dimensions, deformations, flatness, gaps, volume, 3D models construction.

WORKING PRINCIPLE
Scanner operation is based on the principle of optical triangulation.

Radiation of a semiconductor laser is formed by a lens in a line and projected to an object. Radiation scattered from the object is collected by the lens and directed to a two-dimensional CMOS image sensor. The image of object outline thus formed is analyzed by a signal processor, which calculates the distance to the object (Z-coordinate) for each point of the set along the laser line on the object (X-coordinate). Scanners are characterized by base distance (beginning of the range), SMR, for Z-coordinate, measuring range (MR) for Z-coordinate, measuring range for X-coordinate at the beginning of Z (Xsmr) and measuring range for X-coordinate at the end of Z (Xemr).

MAIN FEATURES
- Measuring ranges from 5 to 1500 mm
- ±2 um accuracy
- Sampling rate up to 6800 profiles/s
- RS485/Ethernet
- Binocular scanners for laser scanning
- Scanners with BLUE lasers to control high temperature, mirrored and semitransparent objects
- Scanners with high-power IR laser
- Mutual synchronization of the sensors (master-slave) for multi-axis measurement tasks
- Service Software for parameter setting and results visualization
  * Web-interface
- Free SDK and examples for Windows, Linux, .NET, MathLAB, LabVIEW
- Specialized scanners for welding robots
  * including hand-held instruments for welded joints geometry control
- Specialized scanners for hole control

MODELS
RF625 - universal scanners
RF627 - compact high-speed scanners with increased accuracy
RF629 - ultra-fast scanners (from May 2019)
Laser scanners for special applications.

![Diagram of Laser Scanner Components]

- CMOS array
- Processor
- Lens
- Interference Filter
- Focusing lens
- Cooling and Air Knife System

<table>
<thead>
<tr>
<th>gaps</th>
<th>diameter</th>
<th>weld joint</th>
<th>profile</th>
<th>object</th>
<th>dimensions</th>
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<tbody>
<tr>
<td>control</td>
<td>measurement</td>
<td>control</td>
<td>measurement</td>
<td>recognition</td>
<td>measurement</td>
</tr>
</tbody>
</table>
LASER SCANNERS

RF625 Series

### Laser Scanners RF625 Series. Working ranges and dimensions

<table>
<thead>
<tr>
<th>Range</th>
<th>MR, mm</th>
<th>SMR, mm</th>
<th>LMR, mm</th>
<th>SM, mm</th>
<th>LM, mm</th>
<th>Laser</th>
<th>Size, mm</th>
<th>Weight, g</th>
<th>Housing version</th>
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<tbody>
<tr>
<td>40/5-6/7</td>
<td>40</td>
<td>5</td>
<td>45</td>
<td>7</td>
<td></td>
<td></td>
<td>30х88х120</td>
<td>400</td>
<td>Compact</td>
</tr>
<tr>
<td>55/10-10/11</td>
<td>55</td>
<td>10</td>
<td>65</td>
<td>10</td>
<td>11</td>
<td></td>
<td>30х88х120</td>
<td>500</td>
<td>Standard</td>
</tr>
<tr>
<td>30/25-18/26</td>
<td>30</td>
<td>25</td>
<td>55</td>
<td>18</td>
<td>26</td>
<td>Class 2M</td>
<td>50х98х144</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>65/25-17/23</td>
<td>65</td>
<td>25</td>
<td>90</td>
<td>17</td>
<td>23</td>
<td>Class 2M</td>
<td>50х98х144</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>55/50-27/45</td>
<td>55</td>
<td>50</td>
<td>105</td>
<td>27</td>
<td>45</td>
<td>Class 2M</td>
<td>50х98х144</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>90/50-23/35</td>
<td>90</td>
<td>50</td>
<td>140</td>
<td>23</td>
<td>35</td>
<td>Class 2M</td>
<td>50х98х144</td>
<td>500</td>
<td></td>
</tr>
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<td>75/95-54/67</td>
<td>75</td>
<td>95</td>
<td>170</td>
<td>34</td>
<td>67</td>
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<td>49х84х162</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>140/110-43/68</td>
<td>140</td>
<td>110</td>
<td>250</td>
<td>43</td>
<td>68</td>
<td></td>
<td>50х98х144</td>
<td>1000</td>
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</tr>
<tr>
<td>125/200-60/130</td>
<td>200</td>
<td>125</td>
<td>325</td>
<td>60</td>
<td>130</td>
<td>Class 2M or 3B</td>
<td>50х98х144</td>
<td>500</td>
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<tr>
<td>100/250-75/180</td>
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<td>100</td>
<td>350</td>
<td>75</td>
<td>180</td>
<td>Class 2M or 3B</td>
<td>50х98х144</td>
<td>500</td>
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<td>390</td>
<td>70</td>
<td>155</td>
<td>Class 2M or 3B</td>
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<td>500</td>
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</tr>
<tr>
<td>90/10-9/10</td>
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<td>100</td>
<td>9</td>
<td>10</td>
<td>Class 2M</td>
<td>49х84х162</td>
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<tr>
<td>240/20-14/16</td>
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<td>260</td>
<td>14</td>
<td>16</td>
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<td>425</td>
<td>115</td>
<td>230</td>
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<td>66х171х235</td>
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<td>165/300-130/240</td>
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<td>465</td>
<td>130</td>
<td>240</td>
<td>Class 2M or 3B</td>
<td>48х106х219</td>
<td>1100</td>
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<tr>
<td>240/290-200/320</td>
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<td>240</td>
<td>530</td>
<td>200</td>
<td>320</td>
<td>Class 2M or 3B</td>
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<td>3000</td>
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<td>450/650-190/420</td>
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<td>450</td>
<td>1100</td>
<td>190</td>
<td>420</td>
<td>Class 3B</td>
<td>50х110х300</td>
<td>3000</td>
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</tr>
<tr>
<td>425/990-330/660</td>
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<td>425</td>
<td>1415</td>
<td>330</td>
<td>660</td>
<td>Class 3B</td>
<td>48х198х480</td>
<td>2500</td>
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</tr>
<tr>
<td>540/1400-340/980</td>
<td>1400</td>
<td>540</td>
<td>1940</td>
<td>340</td>
<td>980</td>
<td>Class 3B</td>
<td>48х210х415</td>
<td>3000</td>
<td></td>
</tr>
</tbody>
</table>

### Overall specifications

- **Sampling rate and accuracy**
  - Nominal sampling rate: 248 profiles/s (standard mode), 491 profiles/s (mode of increased frequency)
  - Maximal sampling rate: 1875 profiles/s
  - Linearity, Z axis: ±0.1% of the range
  - Linearity, X axis: ±0.2% of the range

- **Interface**
  - Ethernet IPv4

- **Synchronization inputs/outputs**
  - RS422
  - Up to 3 channels

- **Synchronization outputs**
  - Up to 2 channels

- **Power supply**
  - 15...30 V

### OPTIONS
- Protective housing with air and water cooling
- Customized versions with non-standard base, range and housing shape
- Special version for use in vacuum conditions
- Special flexible cable for robotic applications

### SOFTWARE
- Setting sensor parameters
- Data receiving, storage, visualization

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www.riftek.com
**Laser Scanners RF627 Series**

**COMPACT HIGH-SPEED SCANNERS WITH INCREASED ACCURACY**

- Measuring range from 10 to 300 mm
- Linearity 0.05%
- Sampling rate up to 6800 profiles/s
- Red, Blue (two wavelength), IR Lasers Class 2 Safety
- Trigger and encoder synchronization
- Web-interface
- Special modification for welding robots
- Very compact design
- Service software and free SDK and examples for Windows, Linux, .NET, MatLab, LabView

---

### Laser Scanners RF627 Series, Working ranges

<table>
<thead>
<tr>
<th>Range</th>
<th>MR, mm</th>
<th>XMM, mm</th>
<th>XMMt, mm</th>
<th>Laser</th>
<th>Weight, g</th>
</tr>
</thead>
<tbody>
<tr>
<td>25/10-8/11</td>
<td>25</td>
<td>10</td>
<td>8</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>65/25-21/25</td>
<td>65</td>
<td>25</td>
<td>21</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>70/50-30/42</td>
<td>70</td>
<td>50</td>
<td>30</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>70/100-48/82</td>
<td>70</td>
<td>100</td>
<td>48</td>
<td>82</td>
<td></td>
</tr>
<tr>
<td>65/150-58/122</td>
<td>65</td>
<td>150</td>
<td>58</td>
<td>122</td>
<td></td>
</tr>
<tr>
<td>90/150-54/105</td>
<td>90</td>
<td>150</td>
<td>54</td>
<td>105</td>
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<tr>
<td>75/200-72/150</td>
<td>75</td>
<td>200</td>
<td>72</td>
<td>150</td>
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</tr>
<tr>
<td>90/250-65/180</td>
<td>90</td>
<td>250</td>
<td>65</td>
<td>180</td>
<td></td>
</tr>
<tr>
<td>95/300-65/200</td>
<td>95</td>
<td>300</td>
<td>65</td>
<td>200</td>
<td>400</td>
</tr>
</tbody>
</table>

---

### Overall specifications

- **Sampling rate and accuracy**
  - Full range: 485 or 938 (DS mode), 1096 or 6800 (DS mode)
  - Linearity Z, %FS: 0.05 or 0.1 for DS mode
  - Linearity X, %FS: 0.1
  - Resolution Z, %FS: 0.01% or 0.02% (DS mode)
  - Resolution X: 648 or 1296 (programmable value)

- **Environment resistance:**
  - Enclosure rating: IP67
  - Vibration: 20g/10...1000Hz, 6 hours, for each of XYZ axes
  - Shock: 30g/6 ms
  - Ambient temperature, °С: 0...+40, (-20...+40 for the sensors with in-built heater), (-30...+120 for the sensors with in-built heater and water/air cooling housing)
  - Relative humidity: 5-95% (no condensation)
  - Storage temperature, °С: -20...+70
  - Housing/windows material: aluminum/glass

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**SPECIALIZED SCANNERS**

- Rail profile control scanners with high-power (2W) IR laser
- Ore volume control scanners with high-power (2W) IR laser
- Internal thread control scanners

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**WEB-INTERFACE**

For scanner parameterization, image and profile visualization.
SPECIALIZED SCANNING SYSTEMS FOR WELDS, WELDED JOINTS AND EDGE PREPARATION

- Integrated in one system:
  - 2D scanner for measurement control automation
  - video camera for visual control automation
- Sampling rate - more than 1000 profiles/s
- Linear parameters measurement error – ±0.05 mm for 100 mm range
- Defect detection (porosity, cracks)
- Systems mounted on the robot
- Hand-held instruments with interchangeable measuring heads and built-in display

EDGE PREPARATION CONTROL

- MEASUREMENT OF OFFSET, JOINT ANGLE, GAP WIDTH AND ETC.

WELD CONTROL

- MEASUREMENT OF WELD HEIGHT AND WIDTH, CUTTING DEPTH, CAMBER AND ETC.

SPECIALIZED ALGORITHMS OF PROFILE SELECTION FROM THE IMAGE, NOISE-CONTAMINATED WITH REREFLECTIONS ON THE WALLS

- IMAGE
- PROFILE
RIFTEK LAMIA IS APPLICATION SOFTWARE FOR CONTROL OF WELDING AND MEASUREMENT ROBOTS, EQUIPPED WITH LASER SCANNERS RF625

MAIN FUNCTIONALITY

- Recognizing, tracking and measuring geometric parameters of objects (for example, weld seams) in accordance with the selected math algorithm (template)
- Connecting to the client controllers to transmit results
- Visualizing data
- Setting and control of 2D laser scanner parameters

MAIN FEATURES

- Two sets of ready-to-use math algorithms ("Welding" and "Measurement") for recognizing, tracking and measuring geometric parameters of objects in the realtime mode
- Built-in application ("Template Creator") that allows the users to create their own templates for unique solutions
- Automatic recognition of the objects to measure in accordance with the selected template. There is no need to set the measurement area manually
- Noise reduction: intellectual filtering of the side objects
- Implementation of various protocols for communication with industrial robots
- Calibration of the scanner in accordance with the robot arm
- Work with the scanners of various measurement ranges

STEP 1

1. Connection between the scanner and the PC with Riftek Lamia
2. Connection between the PC with Riftek Lamia and the robot controller
3. Connection between the robot and the robot controller

Connect equipment in accordance with functional diagram:

STEP 2

Choose either Measurement Template or Welding Template

STEP 3

Select Robot Exchange Protocol

STEP 4

START WORKING

RIFTEK LAMIA SOFTWARE PACKAGE HOW IT WORKS

www.riftek.com
3D Laser Scanning Kit is designed for mounting on any type of CNC machine and intended for non-contact scanning of products and obtaining 3D computer-simulated models.

In the scanning mode, the machine CNC system moves the sensor line-by-line over the item prototype. Thus, XYZ coordinate array for the surface is formed, i.e. a digital prototype model is created which is saved as a point cloud file as well as in a common STL format suitable for subsequent use in CNC.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials to be scanned</td>
<td>any material</td>
</tr>
<tr>
<td>Size of scanning area</td>
<td>arbitrary</td>
</tr>
<tr>
<td>Average scanning speed, points/s</td>
<td>up to 100 000</td>
</tr>
</tbody>
</table>

3D measuring machine is designed for non-contact measurement of geometrical parameters of objects, specifically sunflower seeds. Laser scanner RF625 Series, that is installed in the machine, scans the objects and identifies it’s geometry. As result of scanning we get the parameters of every sunflower seed and their total quantity.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal sampling rate, profiles/sec</td>
<td>250</td>
</tr>
<tr>
<td>Scanning speed, mm/s</td>
<td>100</td>
</tr>
<tr>
<td>Accuracy, um</td>
<td>±150</td>
</tr>
</tbody>
</table>

3D Measurement Machine was specially developed to measure suspension arm’s parameters for automotive industry. Laser scanner RF625 Series, which is installed in the machine, scans the suspension arm, measures and controls its geometrical parameters.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal sampling rate, profiles/sec</td>
<td>250</td>
</tr>
<tr>
<td>Scanning speed, mm/s</td>
<td>50</td>
</tr>
<tr>
<td>Accuracy, % of the range</td>
<td>±0.1</td>
</tr>
</tbody>
</table>

Specialized measurement machine is designed to control geometric parameters of brake discs and wheel hubs during their production.

The system of mobile laser scanners RF625 and RF603 sensors installed in the machine allows to obtain a computer 3D model of a part and calculate the parameters of run-outs, alignment and cylindricity.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy, mm</td>
<td>±0.005...0.05</td>
</tr>
</tbody>
</table>
3D LASER SCANNING SYSTEMS

3D LASER MEASUREMENT MACHINE

3D Measurement Machine is specially designed for control of geometric parameters of large diameter pipes. The machine consists of 24 wide-range high speed synchronized laser scanners type RF625-650 located on the outer circumference of the pipe, which makes it possible to inspect full profile of the pipe in the course of manufacture.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipes diameter range, mm</td>
<td>500...1450</td>
</tr>
<tr>
<td>Accuracy, mm</td>
<td>±0.1</td>
</tr>
</tbody>
</table>

INNER DIAMETER MEASUREMENT SYSTEMS

Systems are intended for contactless measuring of inner diameter and profiles of gun barrels, cylindrical and taper pipes, progressive cavity stators, turbodrills and so on.

TWO WORKING PRINCIPLES

- Multisensor measurement by stationary laser sensors - RF040 Series
- Inner surface laser scanning by rotating sensors - RF096 Series

SYSTEM PARAMETERS

- Measured ID – from 6 mm
- Up to several um accuracy
- Up to 32000 measured points on the surface in 2 seconds
- Calculation of ovality and roundness
- Surface defects detection and measurement
- 3D model of inner surface design

SYSTEM STRUCTURE

- Laser measurement module with
  - stationary sensors
  - rotating sensors
- Translation module intended for transportation of measurement module inside the pipe:
  - self propelled
  - any kind of pulling machine
- Software for PC
- Calibration rings

SYSTEM CAN CONTAIN

Centering frame to hold measurement module near pipe axis

OPTIONS

- Pipe straightness measurement module
- Video inspection module
- Wireless connection (Wi-Fi) module

MULTISENSOR MEASUREMENT HEAD

The Multisensor Measurement Module contains up to 6 laser triangulation sensors located circumferentially in one housing at known fixed angles.

The measurement module is inserted into the pipe and moved by translation module to the definite position.

Calibrated laser sensors measure distances to the inner surface.

Software calculates diameter of the pipe.
INNER DIAMETER MEASUREMENT SYSTEMS

**MULTISENSOR LASER SYSTEM FOR SMOOTH GUN BARRELS CONTROL**

Developed together with D-Test Company

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Six triangulation sensors inside</td>
<td></td>
</tr>
<tr>
<td>Diameter range, mm</td>
<td>125...132</td>
</tr>
<tr>
<td>Accuracy, μm</td>
<td>±2</td>
</tr>
<tr>
<td>Barrels straightness measurement</td>
<td>±5</td>
</tr>
<tr>
<td>Accuracy, μm</td>
<td></td>
</tr>
<tr>
<td>Self-propelled system for device</td>
<td></td>
</tr>
</tbody>
</table>

**ROTATING MEASUREMENT HEAD**

RF096 Series

MULTISENSOR MEASUREMENT MODULE CONTAINS

Laser triangulation sensor 1 (one or several with different measurement range and stand-off distance), mounted on rotating platform 2, which contains motor 3 with electronic driver 4, and rotary encoder 5 coupled to the motor 3. The system also includes a tilt sensor 6, intended for control of inclination of rotating platform during measurement.

OPTIONS

In-built Wi-Fi module 7 is used for communication between the system and PC; the system can be powered from internal batteries 8.

2D laser scanner can be installed instead of points sensor.

The measurement module is inserted into the pipe and moved by pulling machine to the definite position.

Rotating laser sensor scans inner surface of the pipe and the module transmits polar coordinates of the surface (distance from rotation axis, measured by triangulation sensor and a corresponding angle, measured by encoder).

Software uses the set of transmitted coordinates to calculate:
- ID of measured pipe
- Ovality and roundness

To find:
- Surface defects

To design:
- Full profile in definite section
- 3D model of the pipe inner surface

www.riftek.com
INNER DIAMETER MEASUREMENT SYSTEMS

WHEEL CENTER BORE INNER DIAMETER MEASURING GAUGE

MODEL RF096-50/70-200-CIb
Non-contact scanning and inner surface geometry measurement of wheel center bore.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotating measurement head with 2 sensors</td>
<td></td>
</tr>
<tr>
<td>ID range, mm</td>
<td>50…70</td>
</tr>
<tr>
<td>ID measurement accuracy, um</td>
<td>±5</td>
</tr>
<tr>
<td>Depth of measurement, mm</td>
<td>200</td>
</tr>
</tbody>
</table>

莱佛斯激光内径测量系统

MOBILE LASER SCANNING SYSTEM FOR PIPE DIAMETER CONTROL

- Rotating measurement head with 2 sensors
- Linear scanning along the tube

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID range, mm</td>
<td>146…176</td>
</tr>
<tr>
<td>ID measurement accuracy, um</td>
<td>±10</td>
</tr>
<tr>
<td>Depth of measurement, mm</td>
<td>programmable, up to 70</td>
</tr>
<tr>
<td>Battery power supply</td>
<td></td>
</tr>
<tr>
<td>Built-in Wi-Fi module</td>
<td></td>
</tr>
</tbody>
</table>

LASER SCANNING SYSTEMS FOR PIPE DIAMETER CONTROL

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID range, mm</td>
<td>45…55 or by request</td>
</tr>
<tr>
<td>ID measurement accuracy, um</td>
<td>±2</td>
</tr>
<tr>
<td>Rotating measurement head with 2 sensors</td>
<td></td>
</tr>
<tr>
<td>ID range, mm</td>
<td>50…70</td>
</tr>
<tr>
<td>ID measurement accuracy, um</td>
<td>±5</td>
</tr>
<tr>
<td>Depth of measurement, mm</td>
<td>200</td>
</tr>
<tr>
<td>Autocalibration</td>
<td></td>
</tr>
</tbody>
</table>

LEAF SPRING HOLE INNER DIAMETER MEASUREMENT MACHINE

The machine is designed for contactless scanning and geometrical parameters measurement of the leaf springs holes.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured diameters, mm</td>
<td>30-75</td>
</tr>
<tr>
<td>ID measurement accuracy, mm</td>
<td>±0.04</td>
</tr>
<tr>
<td>Depth of measured hole, mm</td>
<td>120</td>
</tr>
<tr>
<td>Measured parameters</td>
<td>diameter, roundness, conicity, cylindricity</td>
</tr>
</tbody>
</table>

LASER DEBRIS INSPECTION SYSTEM

The system is intended for non-contact detection of the debris inside the circular grooves of different technological items, for example brake calipers and so on. The system can be used also for groove seal profiling (seal deformation inspection).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspected grooves diameter range, mm</td>
<td>35-53</td>
</tr>
<tr>
<td>Minimal size of detected debris, mm</td>
<td>0,1х0,1х0,1</td>
</tr>
<tr>
<td>Laser sensor linearity, um</td>
<td>±10</td>
</tr>
<tr>
<td>Depth of measured hole, mm</td>
<td>120</td>
</tr>
<tr>
<td>Inspection time, s</td>
<td>1,2</td>
</tr>
</tbody>
</table>
PIPE INNER DIAMETER MEASUREMENT MACHINE

MODEL RF096-32/42-100
The machine is designed for contactless scanning and geometrical parameters measurement of inner diameter of pipes, bushes, holes, tubes, and so on. Application of the machine - large-scale production.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured diameters, mm</td>
<td>32...42</td>
</tr>
<tr>
<td>ID measurement accuracy, um</td>
<td>±5</td>
</tr>
<tr>
<td>Depth of measured hole, mm</td>
<td>≤80</td>
</tr>
<tr>
<td>Measurement cycle (5 sections), s</td>
<td>13</td>
</tr>
</tbody>
</table>

LASER SCANNING SYSTEM FOR METALLURGICAL NOZZLE INNER DIAMETER CONTROL

MODEL RF096_Insp2D-50/140-1000-A
- 2D rotating laser scanner
- synchronous linear translation
- air cooling system
- generating of 3D model of inner surface
- surface defects detection

The multipurpose instrument is designed to measure smooth and profiled pipes with various diameters, including conical and multi-conical tubes. The instrument allows to measure:
- inner diameter;
- ovality;
- out-of-roundness;
- probe position in respect to the pipe end;
- profiling and rifling geometrical dimensions (step, height, width, spherical radius, angles);
- geometrical dimensions of visible superficial defects.

The probe may consist of:
- 2D laser rotating scanner (one or two);
- six-beam laser diameter sensor (one or two);
- front channel for non-straightness (warpage) measuring;
- laser distance meter which measures the distance from the probe to the pipe end to bind measured results;
- inclinometer;
- front/side video inspection channel (one or two).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured diameters, mm</td>
<td>50...140</td>
</tr>
<tr>
<td>ID measurement accuracy, um</td>
<td>±50</td>
</tr>
<tr>
<td>Minimum size of defects controlled, mm</td>
<td>0,1</td>
</tr>
</tbody>
</table>

ROTATING LASERS SYSTEM FOR GUN BARRELS CONTROL

Developed together with D-Test Company

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy</td>
<td>±0.01</td>
</tr>
<tr>
<td>Inner diameter, mm</td>
<td>±0.01</td>
</tr>
<tr>
<td>Ovality, mm</td>
<td>±0.01</td>
</tr>
<tr>
<td>Out-of-roundness, mm</td>
<td>±0.01</td>
</tr>
<tr>
<td>Non-straightness (warpage), mm</td>
<td>±0.01</td>
</tr>
<tr>
<td>Profile height, mm</td>
<td>±0.01</td>
</tr>
<tr>
<td>Profile width, mm</td>
<td>±0.05</td>
</tr>
</tbody>
</table>
SPECIAL MEASUREMENT SYSTEMS

LAMINATED TUBES GEOMETRY MEASUREMENT SYSTEM

The system is designed for contactless scanning and geometrical parameters (outer and inner diameter, foil thickness, weld width, tube length) measurement of laminated tubes, made of PBL and ABL foil.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured diameters, mm</td>
<td>13...50</td>
</tr>
<tr>
<td>Diameter measurement accuracy, um</td>
<td>±10</td>
</tr>
<tr>
<td>Foil thickness range, mm</td>
<td>0,05...0,5</td>
</tr>
<tr>
<td>Foil and weld thickness measurement accuracy, um</td>
<td>±5</td>
</tr>
<tr>
<td>Tube length measurement accuracy, mm</td>
<td>±0,1</td>
</tr>
<tr>
<td>Interface to PC</td>
<td>Ethernet</td>
</tr>
<tr>
<td>Power supply</td>
<td>220</td>
</tr>
</tbody>
</table>

LASER SYSTEMS FOR SHEET MATERIALS THICKNESS CONTROL

The systems are intended for in-process contactless measurements of thickness of various sheet materials (plastic, metal, rubber).

ADVANTAGES
- Manufacturing process optimization
- Continuous quality monitoring

OPTIONS
- Based on laser triangulation sensors
- Based on laser scanners
- Based on optical micrometers
- Based on laser absolute linear sensors

ONLINE SYSTEMS FOR CONTROL AND REGULATION OF DIAMETER

The systems are designed for non-contact measurement, control and regulation of diameter of technological objects (wire, fiber, hoses, tubes, rods, sausage casings) during their production.

AUTOMATED SYSTEM FOR MOTOR SHAFTS MEASUREMENT

The system is designed for motor shafts measurement and control.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured diameters, mm</td>
<td>0,1...25</td>
</tr>
<tr>
<td>Accuracy, um</td>
<td>±1</td>
</tr>
<tr>
<td>Carriage movement range, mm</td>
<td>200</td>
</tr>
<tr>
<td>Scanning speed, mm/s</td>
<td>50</td>
</tr>
</tbody>
</table>

Parameter Value
SPEED AND DISTANCE SENSORS

The sensors are intended for automotive and industrial application for precise contactless measurement of speed and length of nearly any moving object.

Designed for use in automobile and railway transport, metallurgy, cable, chemical, pulp and paper, textile and wood industries, in automated control systems, cutting and accounting systems.

### ISD-3  Parameter | Value | Comments
--- | --- | ---
Speed range, Km/h | 0.4 - 200 | At TTLout 400 Hz per m/s. Others on request
Speed accuracy | ±0.2 % RMS | Determined on test bench (treadmill) at 18.38 km/h
Absolute distance accuracy* | ±0.2 % RMS | After calibration at 5 >100 m
Measuring frequency, Hz | 22 | 
Nominal distance to the road and tolerance (range of working distance), mm | 280 ± 140 (140 - 420) | Up to 800 mm on request
System power supply (tolerance) | 12 V nominal (11 - 14.5V) | 
System power consumption, Wt | Sensor head: 10 W, Processor unit: 5 Wt | 
Sensor head operation temperature range, °C | -20…+50 | 
Weight of the sensor + mounting bracket, g | 280 ± 120 | Without cable
Weight of the processor unit, g | 400 | 
Sensor dimensions, mm Ø55 x 205 + illuminator | 120x100x35 | 
Processor unit dimensions, mm | 2 | Up to 10 m on request
Sensor cable length, m | 2.5 | Up to 10 m on request
System power cable length, m | 2 | Up to 10 m on request
Environmental sensor head protection | IP67 | 
Magnetic fixing tool | 4 magnets x 16 Kg strength | 
Output signal | TTL (SMOS): 0 - 5 V meander type, 400 Hz per m/s (≈400 pulses/m) | Others on request

### ISD-5  Parameter | ISD-5 Standard | ISD-5 Mini | Comments
--- | --- | --- | ---
Speed range, m/s | 0.02 - 20 | 0.005 - 5 | Typical values. The less nominal working distance the less min and max speed range
Speed accuracy*, % RMS | ±0.07 | ±0.15 | ±0.05 | No signal averaging
With averaging 0.2 - 0.3 s, at V > 1 m/s
Length accuracy*, % RMS | ±0.05 | ±0.1 | While pre-calibration for path lengths > 2 m
Measuring frequency, Hz | 16 - 54 | 
Nominal distance to the object (tolerance), cm | 10, 20, 30, 50, 75, 100 | 10, 15, 20 | Could be noted at ordering
Distance tolerance | ±20-25% of nominal | Depends on the surface (on the edge of the range signal decreased)
Emitter type, mW | Visible or IR (c.v. laser, 5 – 120 mW) | Visible c.v. laser, <5 | class 3B – 3R
Power supply, V | 12 (8 - 14) | Internal linear voltage regulators +5V in sensor and controller unit
Power consumption, Wt: Sensor | 0.5 - 2 | 0.5 | 
Controller unit | 1 | 
Temperature working range, °C | +15...+50 | +15...+50 – with active thermostabilization option; +50...+80°C with protect air cooling housing (option)
Sensor weight, g | 320 | 70 | 
Sensor size, mm | 85x79x46 | 58x43x30 | Without connector, blend and fixing holes
Cable length from sensor to controller unit, V | 1.8 or 3 | Standard cable RS-232 or VGA with DB9 connectors are used. To extend a length it is possible to connect cables sequential
Sensor environmental protection | IP67 | 
Controller unit: Dimensions, mm | 120x100x35 | 
Weight, g | 350 | 
Analog out: Length, 2000 pulses/m (=speed 2000 Hz/m), meander 0 – 3 V, TTL compatible, up to 200 kHz | Typical values, user adjustable (see software description below)
Frequency out: Ethernet (UDP protocol) | Others on request | 
Digital out: | 
Physical data latency at measurement freq, ms | 9 | 31 | Stable, ±1% of measuring time, without averaging
Base Software | - Program to read data via Ethernet, visualization and saving data, - Program for sensor diagnostics, - Read data example (LabView 8.2.1 and higher), - Dynamic library (DLL) to read data via Ethernet, - Sensor parameters configuration via any internet browser | Custom software by request are possible

www.riftek.com
The laser profilometer is designed for measuring:
- flange thickness, slope and height, rim/tire 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.

The device is supplied with database and software package for wheel sets wear data storage and processing.

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement range flange height, mm</td>
<td>20...45</td>
</tr>
<tr>
<td>flange thickness, mm</td>
<td>20...50</td>
</tr>
<tr>
<td>flange slope, mm</td>
<td>± 0.15</td>
</tr>
<tr>
<td>rim thickness, mm</td>
<td>36...100 (30...90)</td>
</tr>
<tr>
<td>diameter (calculation method), mm</td>
<td>400...1400</td>
</tr>
<tr>
<td>Measurement error flange height, mm</td>
<td>± 0.03</td>
</tr>
<tr>
<td>flange thickness, mm</td>
<td>± 0.03</td>
</tr>
<tr>
<td>flange slope, mm</td>
<td>± 0.1</td>
</tr>
<tr>
<td>rim thickness, mm</td>
<td>± 0.1</td>
</tr>
<tr>
<td>diameter, mm</td>
<td>± 0.1</td>
</tr>
<tr>
<td>Discreteness of indication all parameters, mm</td>
<td>0.01</td>
</tr>
<tr>
<td>Profile measurement range, mm</td>
<td>145</td>
</tr>
<tr>
<td>Discreteness of the profile formation, not worse than, mm</td>
<td>0.025 (5800 points for profile)</td>
</tr>
<tr>
<td>Measurement time, s</td>
<td>adaptive, depending on surface quality, 4 average</td>
</tr>
</tbody>
</table>

IKP Series

PDA is intended for control of the laser scanning module, data reception from the scanning module, indication of measurement result, parameter input and data storage.

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.

IKP-5 SOFTWARE

- The possibility to align Measured Profile manually (by buttons) relative to the reference with saving;
- Possibility to save several Bluetooth-devices in the PDA memory and then to select the required one from the list. I.e. You save addresses of several IKP and after that you need only to select the required one from the list without a necessity of searching procedure (the same is for IMR and IDK);
- Possibility to connect PDA to PC as an External Storage Device (alternative of ActiveSync).
Electronic gauge is designed for measuring wheel rolling circle diameter. Measurements are made directly on rolling stock without wheel set roll-out. The measurement of the diameter is performed according to the “three points” technique, without the complete wheel coverage.

The gauge contains numeric display to show the value of the wheel diameter. IDK-BT gauge contains Bluetooth interface for transfer results into wheel-set wear database management system.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement range, mm</td>
<td>400...1400 or on request</td>
</tr>
<tr>
<td>Measurement error, mm</td>
<td>±0.2</td>
</tr>
<tr>
<td>Indication discreteness</td>
<td>0.1mm, 0.01mm * or 0.01 inch **</td>
</tr>
<tr>
<td>Position of measurement, S, mm</td>
<td>On request</td>
</tr>
<tr>
<td>Distance between axes of ball bearings</td>
<td>122±0.5 (400...750 mm) or</td>
</tr>
<tr>
<td>and diameters measurement range, mm</td>
<td>200±0.5 (400...950 mm) or</td>
</tr>
<tr>
<td></td>
<td>250±0.5 (600...1400 mm) or</td>
</tr>
<tr>
<td></td>
<td>300±0.5 (720...1400 mm) or</td>
</tr>
<tr>
<td>Display</td>
<td>build-in, LED</td>
</tr>
<tr>
<td>Operating temperature, °C</td>
<td>-15...+55</td>
</tr>
<tr>
<td>Power supply</td>
<td>rechargeable battery 2 x AAA 1.2V</td>
</tr>
<tr>
<td>Weight, kg</td>
<td>0.5</td>
</tr>
<tr>
<td>The number of measurements that can be</td>
<td>1000</td>
</tr>
<tr>
<td>taken before battery recharge is not</td>
<td>less than</td>
</tr>
</tbody>
</table>

**SPECIAL MODELS OF IKP-5 AND IDK FOR TRAMWAY WHEELS**

Special models of IKP-5 and IDK are designed especially for measurement of wheels with restricted space for device placement (tramway wheels):

- Laser Wheel Profile Gauge model IKP-5-short (Fig. A) with a shortened handle,
- Laser Wheel Profile Gauge model IKP-5-Super short (Fig. B) version for Ansaldo Breda low floor trams,
- Wheel Diameter Measurement Gauge model IDK-compact (Fig. C) with the measurement base (distance between ball supports) of the gauge 122 mm and diameter measurement range - 400...750 mm.

**LASER PROFILOMETER FOR RAILROAD RAILS AND SWITCHERS**

The device consists of frame for device placement on the rails and laser measurement head placed with possibility of linear translation. The measurements are carried out automatically. The measurement result is rails transfer profile.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement range, mm</td>
<td>600</td>
</tr>
<tr>
<td>Measurement error, mm</td>
<td>±0.1</td>
</tr>
</tbody>
</table>
Electronic gauge 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. The method of measurement is based on direct measurement the distance by contactless laser sensor. Measurements are made directly on rolling stock without wheel set roll-out.

### IMR Series

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement range, mm</td>
<td>L±25 (L - nominal distance)</td>
</tr>
<tr>
<td>Measurement error, mm</td>
<td>±0.1</td>
</tr>
<tr>
<td>Discretions of indication</td>
<td>0.1mm; or 0.01 inch **</td>
</tr>
<tr>
<td>Display</td>
<td>build-in, LED</td>
</tr>
<tr>
<td>Operating temperature, °C</td>
<td>-15...+50</td>
</tr>
<tr>
<td>Weigh, kg</td>
<td>1</td>
</tr>
<tr>
<td>Dimensions, mm</td>
<td>D+137х30х124</td>
</tr>
<tr>
<td>Power supply</td>
<td>rechargeable batteries 2xAAA, 1.2V</td>
</tr>
</tbody>
</table>

### IMR-L Series

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement range, mm</td>
<td>1360...1440 or on request (nominal distance ± 15mm)</td>
</tr>
<tr>
<td>Measurement error, mm</td>
<td>±0.3</td>
</tr>
<tr>
<td>Discretions of indication</td>
<td>0.1mm; 0.01mm * or 0.01 inch</td>
</tr>
<tr>
<td>Display</td>
<td>build-in, LED</td>
</tr>
<tr>
<td>Operating temperature, °C</td>
<td>-15...+50</td>
</tr>
<tr>
<td>Weigh, kg</td>
<td>0.85</td>
</tr>
<tr>
<td>Dimensions, mm</td>
<td>234.2x87.7x32</td>
</tr>
<tr>
<td>Power supply</td>
<td>rechargeable batteries 4 x AA 1.2V</td>
</tr>
<tr>
<td>Connection to PC</td>
<td>Bluetooth</td>
</tr>
</tbody>
</table>

### Profilometer for Measuring Parameters of Disk Brakes

Profilometer uses non-contact method of registration with a laser sensor and a scanning device.

**Main Functionality**

- Obtaining data on the parameters of railway wheel disk brakes working surface;
- Full profile scanning and analysis of the working surface of disk brakes;
- Visualization of combined graphic images of the actual and new profiles of the wheel brake disks;
- Support of the electronic database of profiles.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement range, mm</td>
<td>30</td>
</tr>
<tr>
<td>Profile measurement range, mm</td>
<td>150</td>
</tr>
<tr>
<td>Measurement error</td>
<td>± 0.03</td>
</tr>
<tr>
<td>Discretions of indication</td>
<td>0.01</td>
</tr>
<tr>
<td>Discretions of the profile formation, not worse than, mm</td>
<td>0.1</td>
</tr>
<tr>
<td>Power supply, laser module</td>
<td>3.7 Li-ion rechargeable battery 6800 mAh</td>
</tr>
<tr>
<td>Power supply, PDA</td>
<td>3.7 Li-polymer battery 3300 mAh</td>
</tr>
<tr>
<td>The number of measurements that can be taken before battery recharge is not less than</td>
<td>1000</td>
</tr>
<tr>
<td>PDA memory capacity</td>
<td>100 000 measurements</td>
</tr>
<tr>
<td>Interface between laser scanning module and PDA</td>
<td>Bluetooth</td>
</tr>
<tr>
<td>Working temperature range, °C</td>
<td>-15...+35</td>
</tr>
<tr>
<td>Enclosure rating</td>
<td>IP42</td>
</tr>
</tbody>
</table>
Portable laser rail profilometer (PRP) is designed for non-contact registration of cross-section of the railhead acting face.

The profilometer uses non-contact method of registration with a laser sensor and a scanning device.

**MAIN FUNCTIONALITY**
- 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 crosssection.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Railhead vertical wear, mm</td>
<td>-15.0...+20.0</td>
</tr>
<tr>
<td>Lateral railhead wear, mm</td>
<td>-15.0...+20.0</td>
</tr>
<tr>
<td>Redused railhead wear, mm</td>
<td>Up to 20.0</td>
</tr>
<tr>
<td>Scanning angle inside rail track, degrees</td>
<td>108</td>
</tr>
<tr>
<td>Scanning angle outside rail track, degrees</td>
<td>108</td>
</tr>
<tr>
<td>Measurement error, not more than, mm</td>
<td>±0.03</td>
</tr>
<tr>
<td>Scanning time, sec</td>
<td>10-12</td>
</tr>
<tr>
<td>Digital readout device (PDA) dimensions, mm</td>
<td>112,5х95,5х22,7</td>
</tr>
<tr>
<td>Laser module dimensions, mm</td>
<td>293х230х220</td>
</tr>
<tr>
<td>Power supply, laser module</td>
<td>3.7V, Li-ion battery, 6800mAh</td>
</tr>
<tr>
<td>Power supply, PDA</td>
<td>3.7V, Li-polymer battery, 3300mAh</td>
</tr>
<tr>
<td>The number of measurements that can be taken before battery recharge is not less than</td>
<td>500</td>
</tr>
<tr>
<td>PDA memory capacity, no less</td>
<td>100 000 measurements</td>
</tr>
<tr>
<td>Interface to PC</td>
<td>Bluetooth</td>
</tr>
</tbody>
</table>

The system is intended for contactless automatic real-time measurement of geometrical parameters of railway vehicles (locomotives, railcars, subway, trams) and uses combination of 2D laser scanners mounted wayside in the track area and calibrated into one common coordinate system.

Measurement cycle starts when an inductive sensor detects a wheel. While the wheel passes through the system of synchronized 2D laser scanners its profile is taken at many sections.

All measurement readings for all the wheels are sent through Ethernet to control computer for profiles reconstruction and dimensions calculations.

Finally, all the data are collected in the host depot computer in wheel sets wear database.
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The VIDEO_TRACKER_v2.2.1 software library can make use of any processor platform as a hosting platform. The library is developed in C language (C99 standard) and uses an OpenMP 1.0 parallel computation standard. Compatibility is ensured with any C++ (C) compiler that support the above standards. The software library can be used on x86 processors, ARM, DSP (digital signals processors) and the others given the presence of a compiler that supports C99 and OpenMP 1.0 standard. A variety of computing module standards are available for development engineers, such as COM Express, Compact PCI, PC/104, EXT, XTX, QSeven, etc.

PERFORMANCE

The results (for 128x128 pxl object) for some CPU are shown below:

- i5 - 4590(4 core) - 1.4 ms / 714 fps
- i7 - 4720HQ(8 core) - 1.5 ms / 667 fps
- i3 - 3470(4 core) - 2.9 ms / 344 fps
- Atom-Z8300(4 core) - 10 ms / 100 fps
- Atom-E3950(4 core) - 6 ms / 166 fps
- TI C6678L(8 core) - 15 ms / 66 fps

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