

## RECTANGULAR INNER PROFILE MEASUREMENT SYSTEM

**RF096-170x110 Series**

**User's manual**

**since 1976**

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LASER  
MEASURING SYSTEMS

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## 1. Safety precautions

- Use supply voltage and interfaces indicated in the system specifications.
- In connection/disconnection of cables, the system power must be switched off.
- Do not use the system in locations close to powerful light sources.
- The system must be grounded.

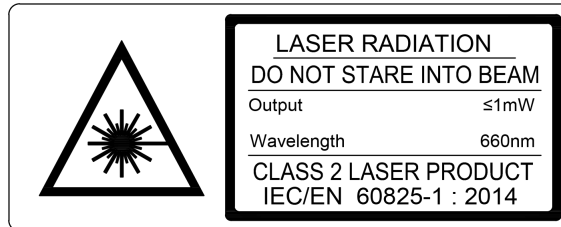
## 2. CE compliance

The system has been developed for use in industry and meets the requirements of the following Directives:

- EU directive 2014/30/EU. Electromagnetic compatibility (EMC).
- EU directive 2011/65/EU, "RoHS" category 9.

## 3. Laser safety

The system makes use of a c.w. 660 nm wavelength semiconductor laser. The maximum output power is 1 mW. The system belongs to the 2 laser safety class according to IEC/EN 60825-1:2014. The following warning label is placed on the housing:



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

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

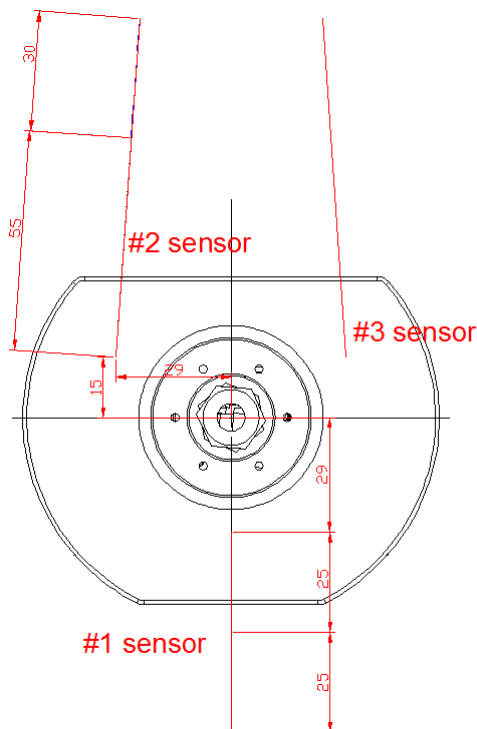
## 4. General information

The system is intended for non-contact scanning and inner dimensions measurement of objects having special profile.

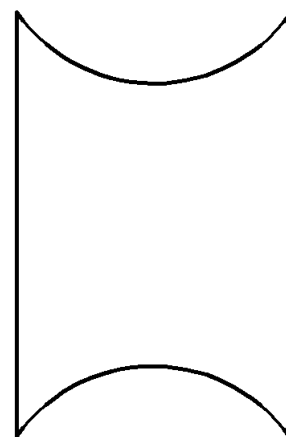
## 5. Basic technical data

Parameter		Value
Base distance/measurement range (#1 sensor), mm		25/25
Base distance/measurement range (#2 sensor), mm		55/30
Base distance/measurement range (#3 sensor), mm		55/30
Profile measurement accuracy, mm		±0.02
Space resolution, points/turnover		3200
Light source		red semiconductor laser, 660 nm wavelength
Laser output power, mW		<1
Laser safety class		2 (IEC60825-1)
Laser beam shape		Round
Output interface		Ethernet (UDP)
Power supply, V		9...24
Power consumption, W		5 (standby mode), 12 (scan mode)
Environmental resistance	Vibration	20 g / 10...1000 Hz, 6 hours for each of XYZ axes
	Shock	30 g / 6 ms
	Permissible ambient light, lx	30000
	Relative humidity, %	5-95 (no condensation)
	Operating ambient temperature, °Ñ	0...+45
	Storage temperature, °Ñ	-20...+70
Housing material		aluminum
Weight (without cable), gram		1500

**NOTE.** Technical characteristics of the system can be changed for a specific task.



Measurement head



Measured profile

## 6. Example of item designation when ordering

RF096-LxW

Symbol	Description
L	Profile length, mm
W	Profile width, mm

**Example:** RF096-170x110 – Rectangular Inner Profile Measurement System, measurement range: Length - 170 mm , Width - 110 mm.

## 7. Structure and operating principle

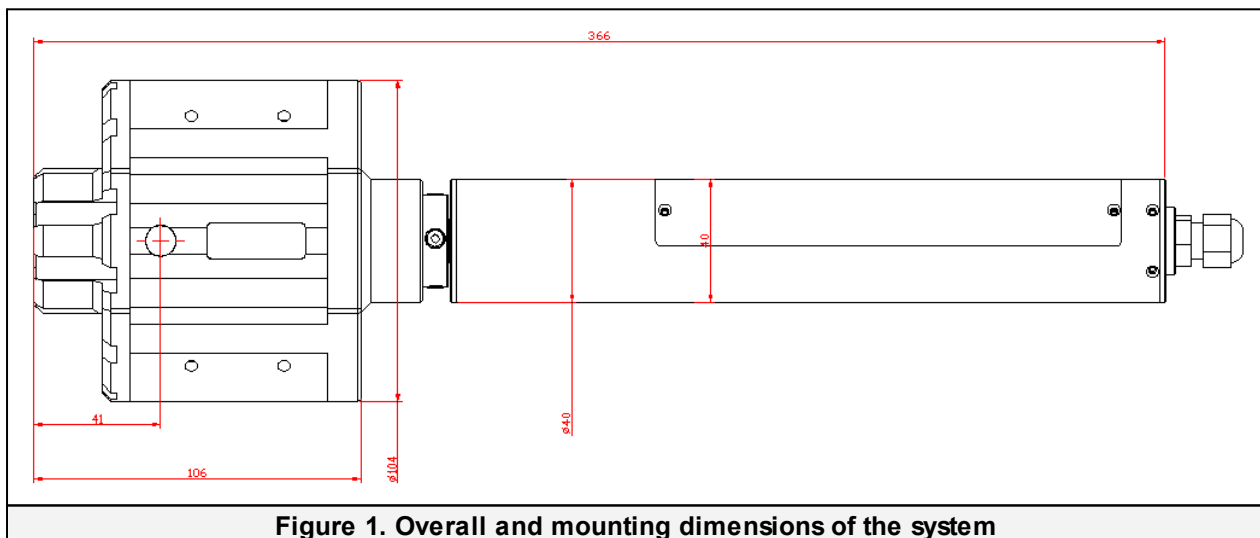
Operation of the system is based on the scanning of the hole inner surface by rotating triangulation laser sensors.

The system contains the measurement head with three laser sensors inside, Figure 1.

The measurement head is mounted on the rotation module.

Radiation of semiconductor lasers from the sensors is focused onto the object surface. Radiation reflected by the surface is collected by input lens of the sensors. Rotating laser sensors scan the inner surface of the object, and the system transmits polar coordinates of the surface (distance from the rotation axis measured by the sensors and a corresponding angle of rotation) to the PC for calculating the required geometric parameters.

Overall and mounting dimensions of the system are shown in Figure 1.



## 8. Overall demands for mounting

The system is positioned so that the object under control has to be placed within the working range of the system.

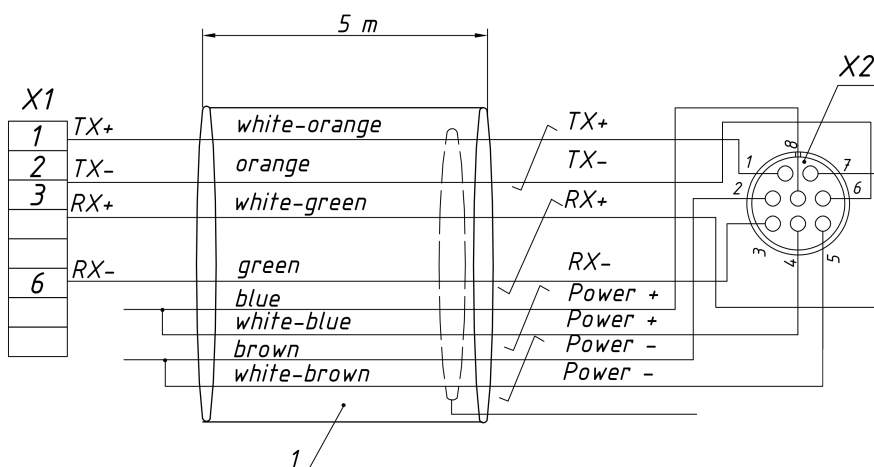


### ATTENTION!

The system must be grounded – static electricity may cause the failure of electronic components.

## 9. Connection

### 9.1. Designation of connector contacts



Designations:

1	Cable F/UTP CAT 5e
X1	RJ-45
X2	Binder 09 0426 10 08

Assignment:

Pin number	Assignment	Wire color	Note
1	TX+	White-orange	Transmit data Ethernet +
6	TX-	Orange	Transmit data Ethernet -
7	RX+	White-green	Receive data Ethernet +
3	RX-	Green	Receive data Ethernet -
8	Power+	Blue	Power supply: 9...24 V Power consumption: 5 W (standby mode), 12 W (scan mode)
4	Power+	White-blue	
2	Power-	Brown	
5	Power-	White-brown	

### 9.2. Cable

Designation of cable wires is given in the table below:

Pin number		Assignment #09 0426 10 08	Wire color
RJ-45	1	TX+	White-orange
RJ-45	2	TX-	Orange
RJ-45	3	RX+	White-green
RJ-45	6	RX-	Green
free lead	-	AL (output)	White-blue
free lead	-	Power+	Blue
free lead	-	IN (input)	White-brown
free lead	-	Power-	Brown

## 10. Network setting

All systems are shipped with the following default network configuration: IP address of the system – 192.168.0.3.

Configure the network card of your PC in the following address space: 192.168.0.0. Connect the system directly to PC or through the network switch.

## 11. Intended use

### 11.1. Preparation for use

Preparation of the system includes:

- Visual inspection.
- Installation and connection.
- Adjustment.
- Switching on the system.

#### 11.1.1. Visual inspection

Before operating, it is needed to ensure of the serviceability of the equipment:

- Check the system for completeness and absence of damage.
- Check the cable and ground wire.
- Check the condition of output windows and, if necessary, wipe them with a soft cloth.

#### 11.1.2. Installation and connection

- Install the system onto a linear translation mechanism (or onto the industrial robot).
- Make the electrical connections in accordance with the cable wires designation.

#### 11.1.3. Adjustment

The system is positioned so that the object under control has to be placed within the working range of the system and on the laser beam axis.

#### 11.1.4. Switching on the system

Feed power to the system – 9...24 V.

## 11.2. Operating the system

The measurement process is fully automated and operation of the system is reduced to the work with the software.

## 12. Service software

### 12.1. General information

The service software is intended for:

- Testing and demonstration of the work of the system.
- Setting parameters.
- Calibration.

The service software includes:

- SDK library.
- RF096 Test Program.

### 12.2. System requirements

- Operating system Windows 7 and later.
- Microsoft Visual C++ Runtime Redistributable for Windows 64-bit. Shipped with the package (you need to run **vcredist\_x64.exe**).

### 12.3. SDK library

SDK contents:

File	Description
rf096021.dll	Dynamic link library.
rf096021.h	C header file. Refer to this file to understand the SDK functions. There is the detailed description for each of them.
rf096021.lib	LIB file to link DLL to the project.

SDK usage scenario:

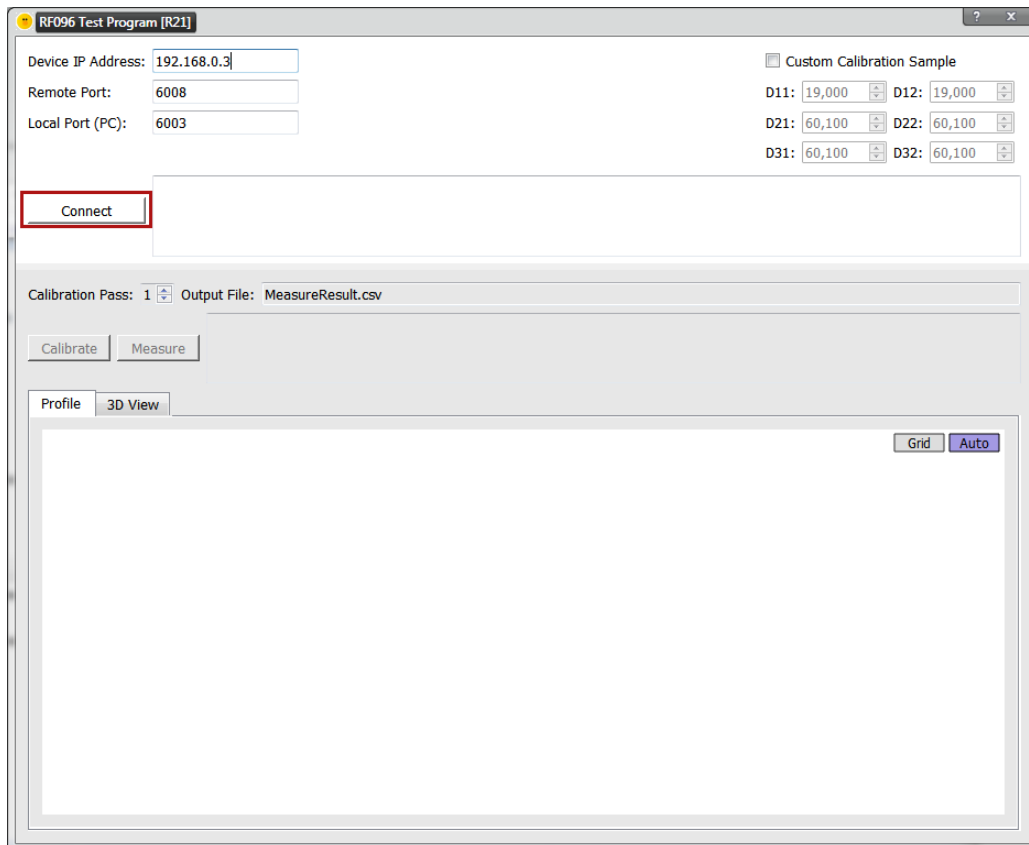
Step	Description
1	Call <code>rf096021_init()</code> on program start.
2	Call <code>rf096021_connect()</code> to connect to the device. Returns true on success, false on failure.
3	Call <code>rf096021_calibrate()</code> to run the calibration process. Returns true on success, false on failure.
4	Call <code>rf096021_measure()</code> to run the measurement process. Returns true on success, false on failure.
5	Call <code>rf096021_disconnect()</code> to disconnect from the device.
6	Call <code>rf096021_deinit()</code> before your program ends to cleanup the memory allocated by the library.

### 12.4. RF096 Test Program

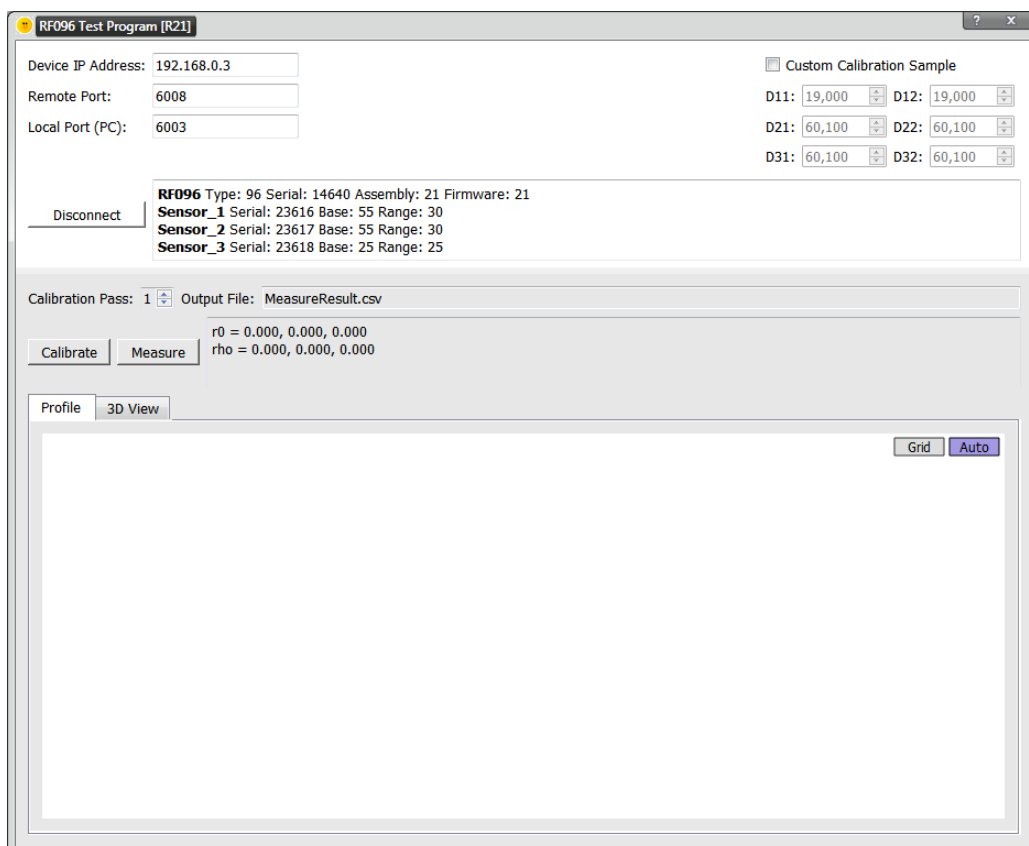
#### 12.4.1. Connection

When you run the program, parameters fields (**Device IP Address**, **Remote Port**, **Local Port**) are populated with factory defaults. If you didn't change the system parameters, you can click the **Connect** button in order to connect to the system. Otherwise, change factory defaults to the actual system parameters and then click **Connect**.





When the connection is established, the system information will be displayed:



To disconnect from the system, click **Disconnect**.

## 12.4.2. Calibration



### ATTENTION!

1. It is imperative to perform the calibration procedure before the first use.
2. While using the system, you can repeat the calibration procedure in case of obtaining incorrect results.

The calibration must be performed by using the calibration block supplied with the system.

The calibration procedure:

Step	Description
1	Install the calibration block: the bottom side is the side with the axes designation, the axes designation must be to the left.
2	Install the system inside the calibration block so that a laser beam of <a href="#">sensor #1</a> was in the center of the left semicircle.
3	Click the <b>Calibrate</b> button and wait until the calibration is complete.

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## 12.4.3. Measurement

When you have calibrated the system, it's ready to run the measurement.

Click the **Measure** button in order to start the measurement process.

The program will display the calculated values.

You may turn on and off a scale grid by clicking the **Grid** button.

You may zoom and move the image when the **Auto** button is unpressed (shown in gray). To zoom the image, use the mouse wheel. To move the image, press the left mouse key and move the cursor.

## 13. Warranty policy

Warranty assurance for the Rectangular Inner Profile Measurement System RF096-170x110 Series - 24 months from the date of putting in operation; warranty shelf-life - 12 months.

## 14. List of changes

Date	Version	Description
24.04.2018	1.0.0	Starting document.

## 15. Distributors

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