RIFTEK
Sensors & Instruments

STEPPED HOLE ID MEASUREMENT SYSTEM

RF096-15/40-50/70 Series

User's manual

Contents

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.

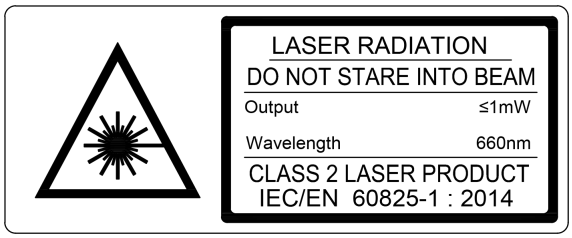
2. CE compliance

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 an 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 diameter measurement of objects having two through-holes of different diameter.

5. Basic technical data

Parameter		Value
Measurement range (1st hole), mm		15...40
Measurement range (2nd hole), mm		50...70
Measurement accuracy (1st hole), mm		±0.02
Measurement accuracy (2nd hole), mm		±0.005
Space resolution, points/turnover		6400
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		4 (standby mode), 10 (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, °C	0…+45
	Storage temperature, °C	-20…+70
Housing material		aluminum
Weight (without cable), gram		1500

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

6. Example of item designation when ordering

RF096-D1min/D1max-D2min/D2max

Symbol	Description
D1min/D1max	ID measurement range (1st hole), mm
D2min/D2max	ID measurement range (2nd hole), mm

Example: RF096-15/40-50/70 – Stepped Hole ID Measurement System, measurement range: 15...40 mm (1st hole), 50...70 mm (2nd hole).

7. Structure and operating principle

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

The system contains the two stages measuring head with three laser sensors inside, Figure 1.

The first stage is intended for measurement of holes with 15...40 mm diameters and contains one laser sensor (Figure 1, sensor #1) with the measurement range of 6...21 mm from the head axis.

The second stage is intended for measurement of holes with 50...70 mm diameters and contains two laser sensors (Figure 1, sensors #2 and #3) with shifted and overlapped measurement ranges, 24...31 mm and 30...37 mm from the head axis.

The measuring head is mounted on the rotation module.

Radiation of a 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.

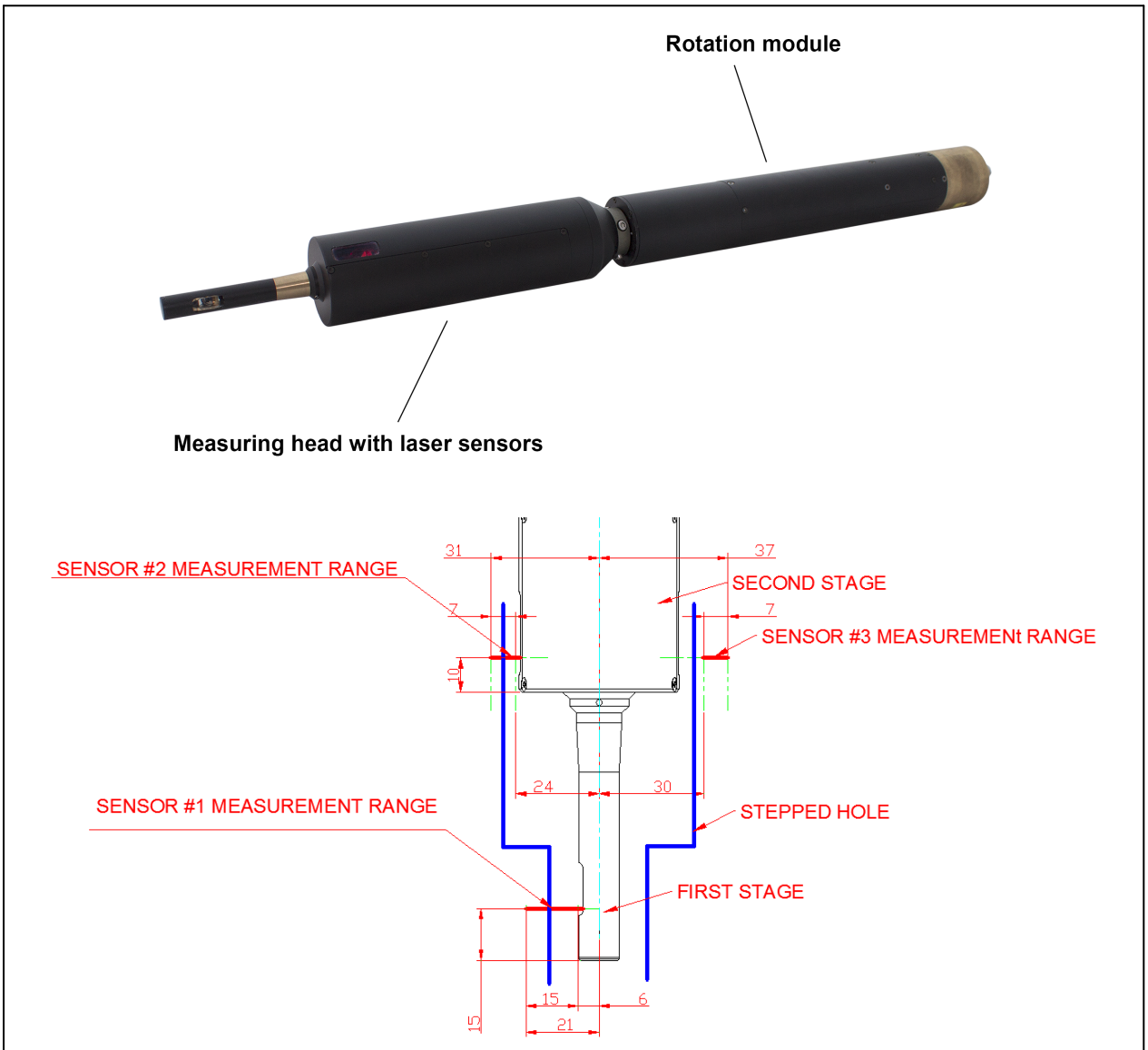


Figure 1. System structure

Overall and mounting dimensions of the system are shown in Figure 2.

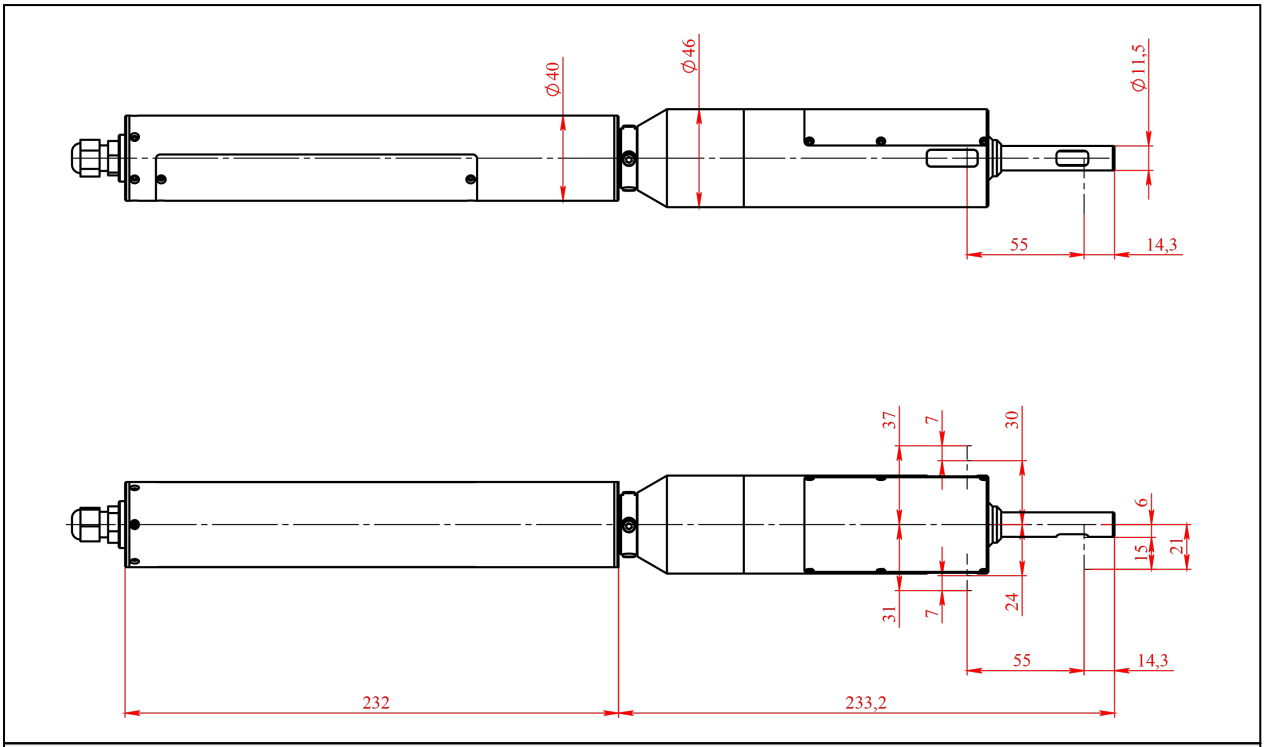


Figure 2. Overall and mounting dimensions of the system

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

View from the side of connector contacts used in the system:

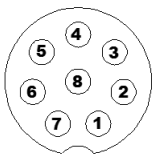


Figure 3. Connector Binder 712 Series, #09-0427-80-08

Designation of contacts is given in the table below:

Pin number	Assignment #09-0427-80-08
1	TX+
2	Power-
3	RX-
4	Power+
5	Power-
6	TX-
7	RX+
8	Power+

9.2. Cable

Designation of cable wires is given in the table below:

Pin number		Assignment #09-0427-80-08	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 your PC's network card in the next address space: 192.168.0.X. Connect system directly to PC or through network switch.

11. Indended use

11.1. Preparation for use

Preparation of the system includes:

- Visual inspection.
- Installation and connection.
- Adjustment.
- Switching 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 on a linear translation module (or 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 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
rf096017.dll	Dynamic link library.
rf096017.h	C header file. Refer to this file to understand the SDK functions. There is the detailed description for each of them.
rf096017.lib	LIB file to link DLL to the project.

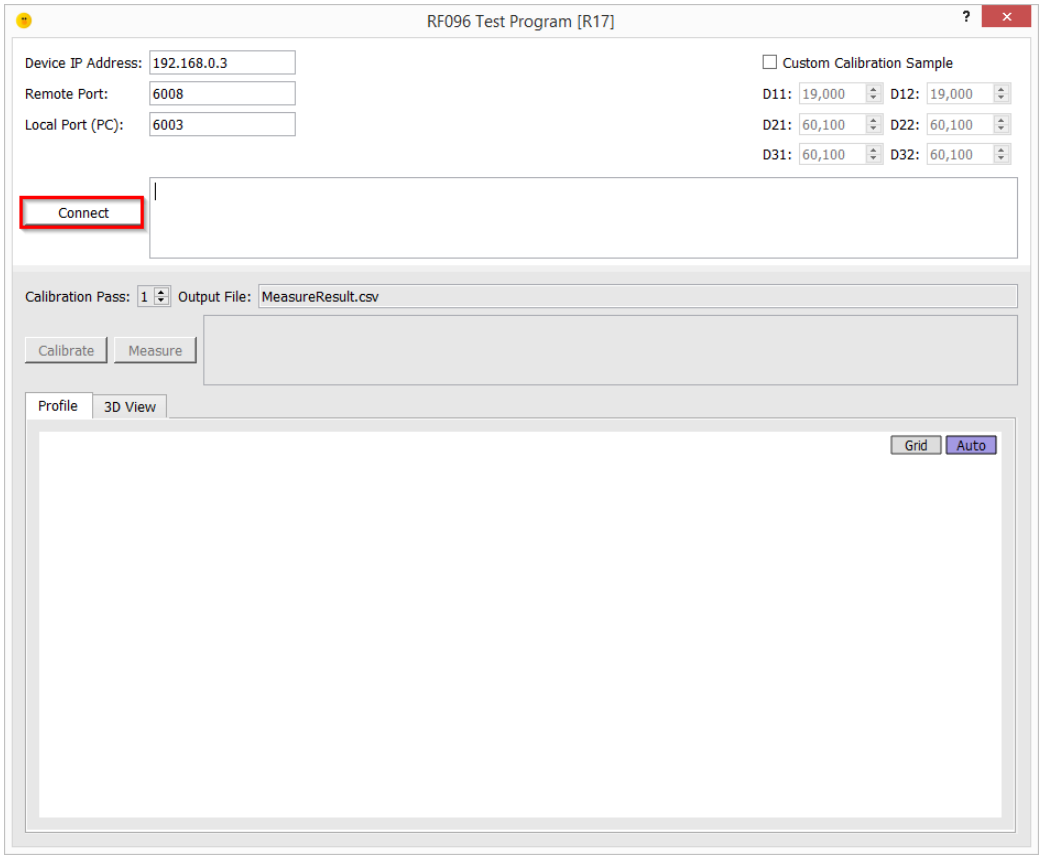
SDK usage scenario:

Step	Description
1	Call *rf096017_init()* on program start.
2	Call *rf096017_connect()* to connect to the device. Returns true on success, false on failure.
3	Call *rf096017_calibrate()* to run the calibration process. Returns true on success, false on failure.
4	Call *rf096017_measure()* to run the measurement process. Returns true on success, false on failure.
5	Call *rf096017_disconnect()* to disconnect from the device.
6	Call *rf096017_deinit()* 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.

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 done by using three calibration samples supplied with the system.

The calibration procedure:

Step	Description
1	Tick the "Custom Calibration Sample" checkbox and enter the real diameters of the samples (D11, D12 - sample 1; D21, D22 - sample 2; D31, D32 - sample 3): ☑ Custom Calibration Sample D11: 19,000 D12: 19,000 D21: 60,100 D22: 60,100 D31: 60,100 D32: 60,100
2	Install the calibration sample (1) so that a laser sensor (1) was in the center of the sample.
3	Click the **Calibrate** button in order to run the 1st pass of calibration. Wait until the calibration is complete.
4	Repeat step 3.
5	Install the calibration sample (2) so that a laser sensor (2) was in the center of the sample.
6	Click the **Calibrate** button in order to run the 2nd pass of calibration. Wait until the calibration is complete.
7	Repeat step 6.

Step	Description
8	Install the calibration sample (3) so that a laser sensor (3) was in the center of the sample.
9	Click the **Calibrate** button in order to run the 3rd pass of calibration. Wait until the calibration is complete.
10	Repeat step 9.

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 Stepped Hole ID Measurement System RF096-15/40-50/70 Series - 24 months from the date of putting in operation; warranty shelf-life - 12 months.

14. List of changes

Date	Version	Description
10.01.2018	1.0.0	Starting document.