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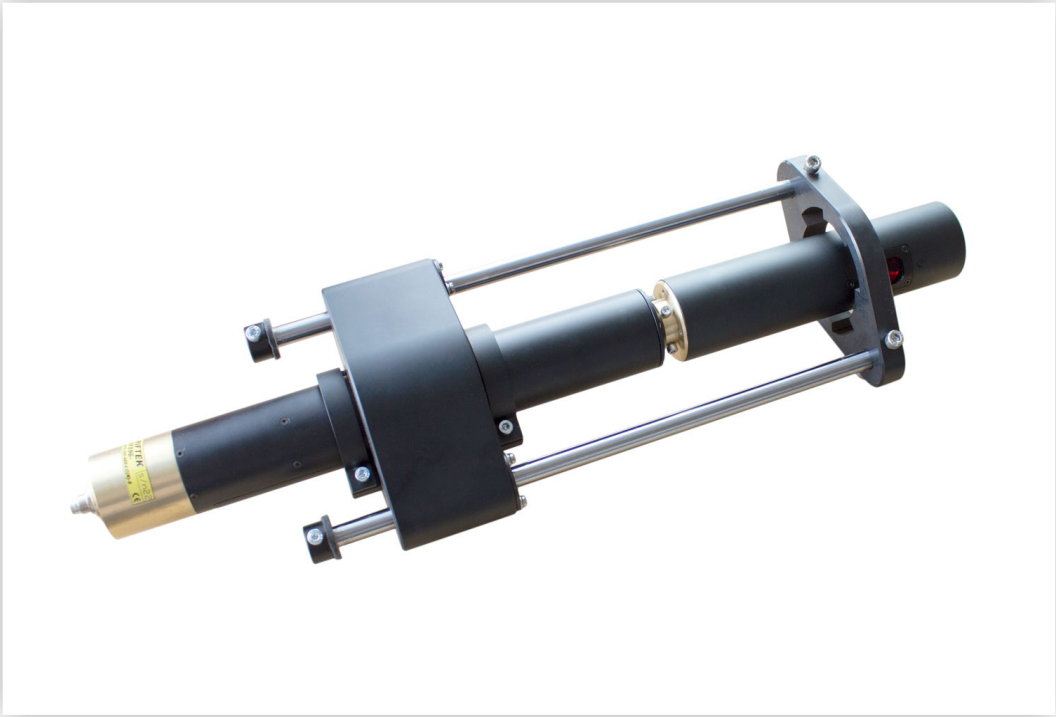
Sensors & Instruments



WHEEL CENTER BORE INNER DIAMETER MEASURING GAUGE

RF096-50/70-200-CIb 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.

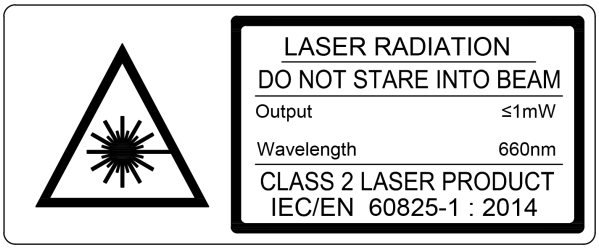
2. CE compliance

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. 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 laser body:



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 the wheel rim center bore. The system is used on the alloy wheel production line as the quality control tool.

5. Basic technical data

Parameter		Value
Diameter measurement range, mm		50...70
Space resolution, points/turnover		3200
Measurement accuracy, um		±5
Depth of measurement, mm		200
Measurement cycle (no more), s		20
Light source		red semiconductor laser, 660 nm wavelength
Output power, mW		<1
Laser safety class		2 (IEC60825-1)
Output interface		Ethernet (UDP)
Power supply, V		9…24
Power consumption, W		3 (standby mode), 20 (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		4000 2000

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

6. Example of item designation when ordering

RF096-Dmin/Dmax-L-Clb

Symbol	Description
Dmin	Minimum measurement diameter, mm
Dmax	Maximum measurement diameter, mm
L	Depth of measurement, mm
Clb	Autocalibration option

Example: RF096-50/70-200-Clb – Wheel Center Bore Inner Diameter Measuring Gauge RF096, diameter measurement range - 50...70 mm, depth of measurement - 200 mm, autocalibration option

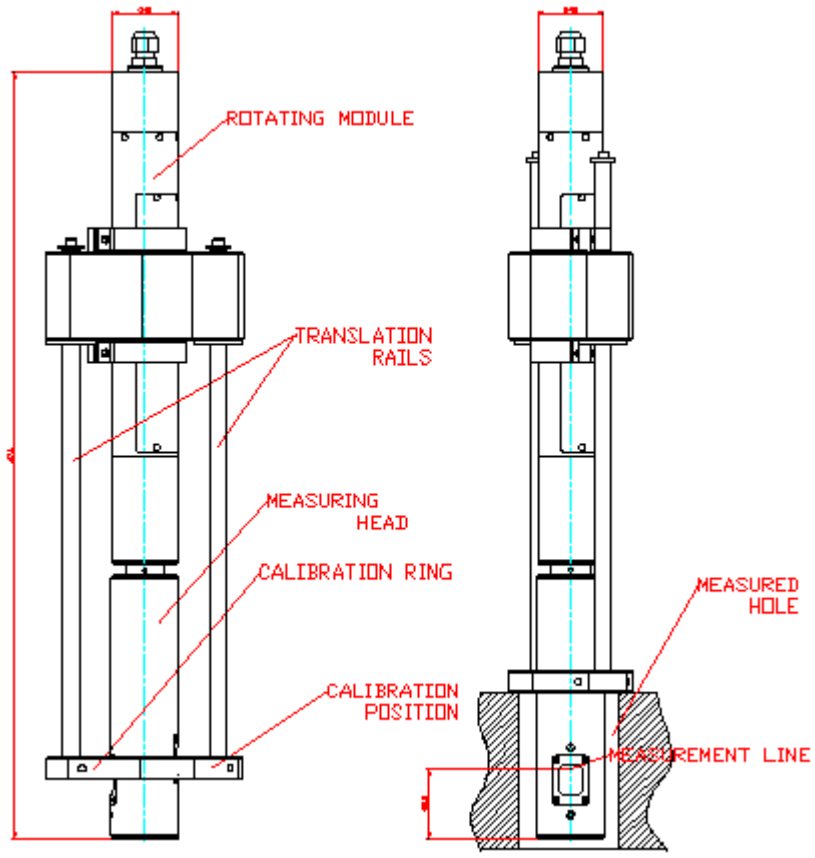
7. Structure and operational principle

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

To get required accuracy for the whole measurement range the measuring gauge contains two laser sensors inside one measuring head. The measuring head is mounted on rotational module. The system also contains a calibration ring placed with the possibility of linear translation along the measuring head.

In the initial state, the calibration ring is located at the level of the laser sensors measuring line. Radiation of a semiconductor laser from the sensors is focused onto an ring surface. Radiation reflected by the surface is collected by input lens of the sensors. Measuring head is rotated and laser sensors scan the inner surface of a ring. 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 for system calibration.

For the rim center bore diameter measurement, the head is inserted into the hole at a given depth. Simultaneously, calibration ring is removed from measuring line by rim outer surface. Measuring head is rotated and PC receives inner surface coordinates for ID calculation.



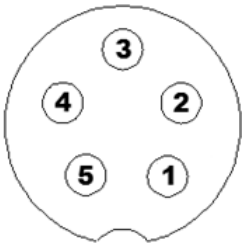
8. Overall demands for mounting

The system is positioned so that the measurement line has to be perpendicular to the hole surface.

9. Connection

9.1. Designation of connector contacts

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



Connector Binder 712 Series, #99-0426-10-08

Designation of contacts is given in the table below:

Pin number	Assignment #99-0426-10-08
1	A (input)
2	GND
3	5V (output)
4	B (input)
5	Z (input)

9.2. Cable

Designation of cable wires is given in the table below:

Pin number		Assignment #99-0426-10-08	Wire color
Binder	1	A (input)	Blue
Binder	2	GND	White-brown
Binder	3	5V (output)	Brown
Binder	4	B (input)	Green
Binder	5	Z (input)	Orange
free lead	-	No connection	White-green
free lead	-	No connection	White-blue
free lead	-	No connection	White-orange

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

The preparation involves the following steps:

- visual inspection;
- setting and connection to the power supply and controller;
- adjustment according to the hole under control.

11.1.1. Visual inspection

- Check the system for completeness and absence of damage.
- Check the cables and ground wire.
- Check the condition of output windows and, if necessary, clean them.
- Rotate the measuring head by hand to check smooth progress.

11.1.2. 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.

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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.
- System 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
rf096015.dll	Dynamic-link library.
rf096015.h	C header file. Refer to this file to understand the SDK functions. There is the detailed description for each of them.
rf096015.lib	LIB file to link DLL to the project.

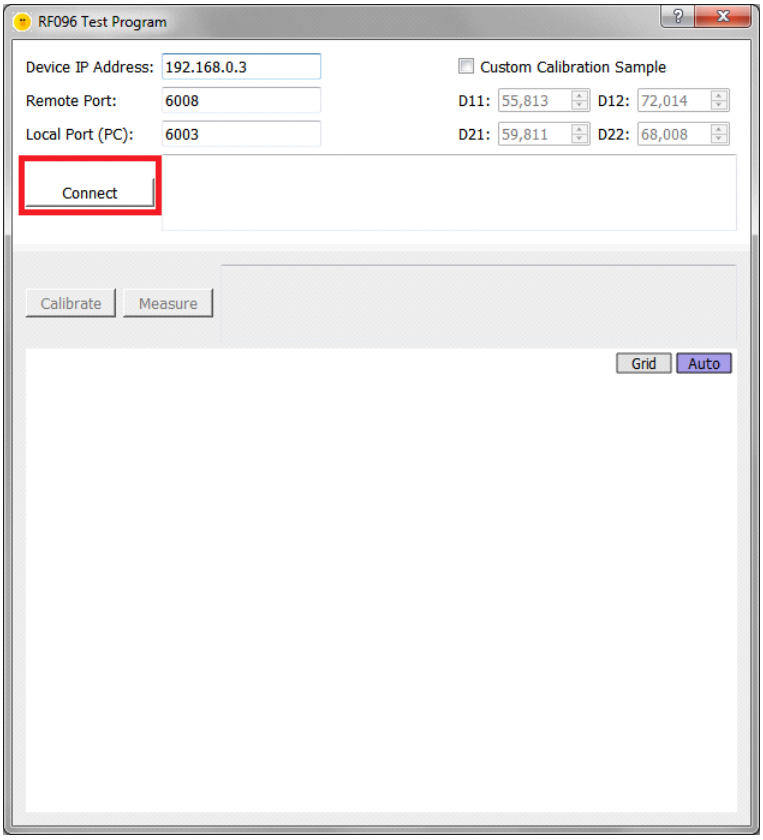
SDK usage scenario:

Step	Description
1	Call *rf096015_init()* on program start.
2	Call *rf096015_connect()* to connect to the device.
3	Call *rf096015_calibrate()* to run the calibration.
4	Call *rf096015_measure()* to run the measurement process.
5	Repeat previous two steps.
6	Call *rf096015_disconnect()* to disconnect from the device.
7	Call *rf096015_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, parameter 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. Otherwise, change factory defaults to the actual system parameters and then click **Connect**.



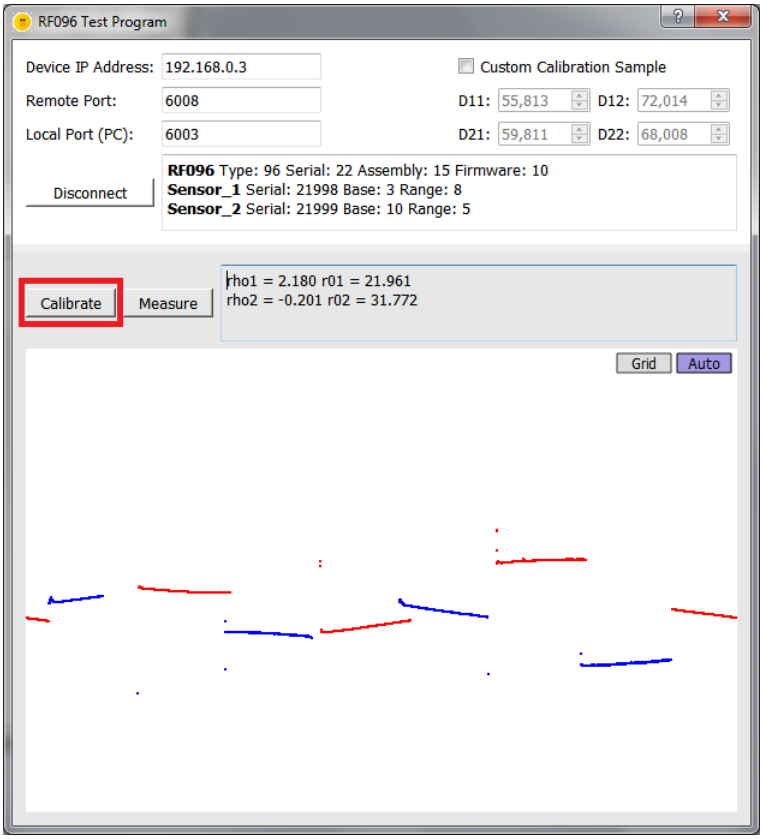
When the connection is established, the system information will be displayed.

12.4.2. Calibration

It is necessary to calibrate the system before you start the measurement process.

Make sure that the calibration ring is on the measurement line. Click the **Calibrate** button.

If needed, you may override the sample dimensions by ticking the **Custom Calibration Sample** checkbox and changing diameter values. By default, the factory values are used.

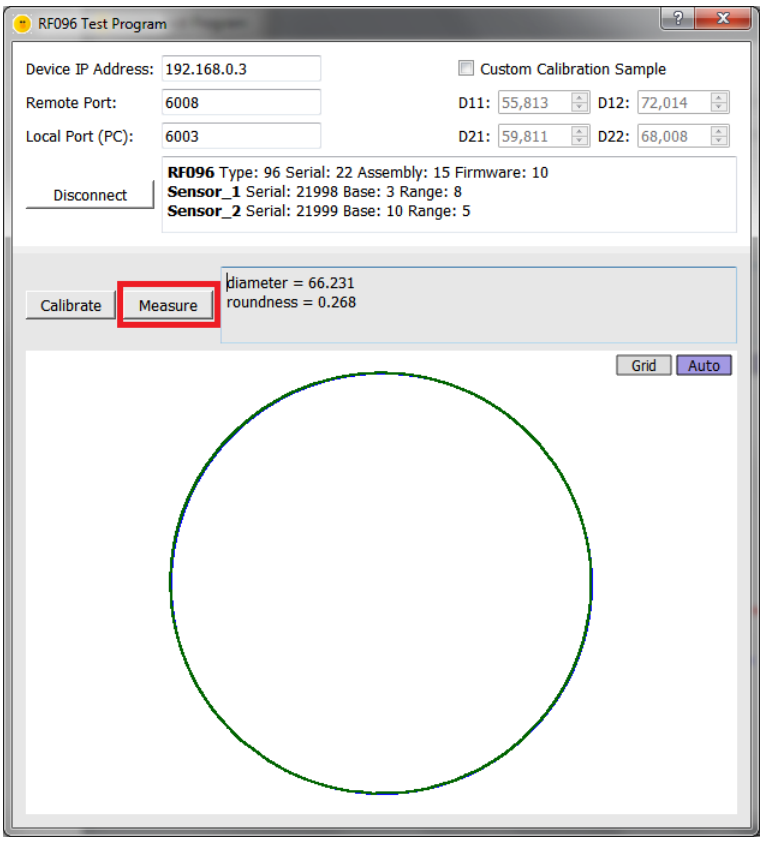


12.4.3. Measurement

When the system is calibrated, it's ready to operate.

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

The program will display the calculated values of diameter and roundness, profile points (in green) and average diameter circle (in blue) on the widget below.



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

When the **Auto** button is pressed, you cannot zoom and move the image. You may zoom in and out (by mouse wheel) and move the image (by pressing the left mouse key and moving a cursor), when the **Auto** button is unpressed (shown in gray).

13. Warranty policy

Warranty assurance for the Wheel Center Bore Inner Diameter Measuring Gauge RF096-50/70-200-Clb Series - 24 months from the date of putting in operation; warranty shelf-life - 12 months.

14. List of changes

Date	Version	Description
15.06.2017	1.0.0	Starting document.