

# LASER TRIANGULATION SENSORS, RF60x SERIES

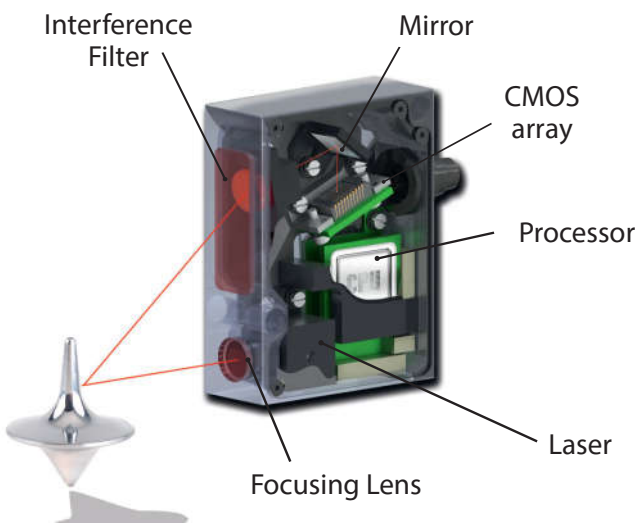
## PURPOSE

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.

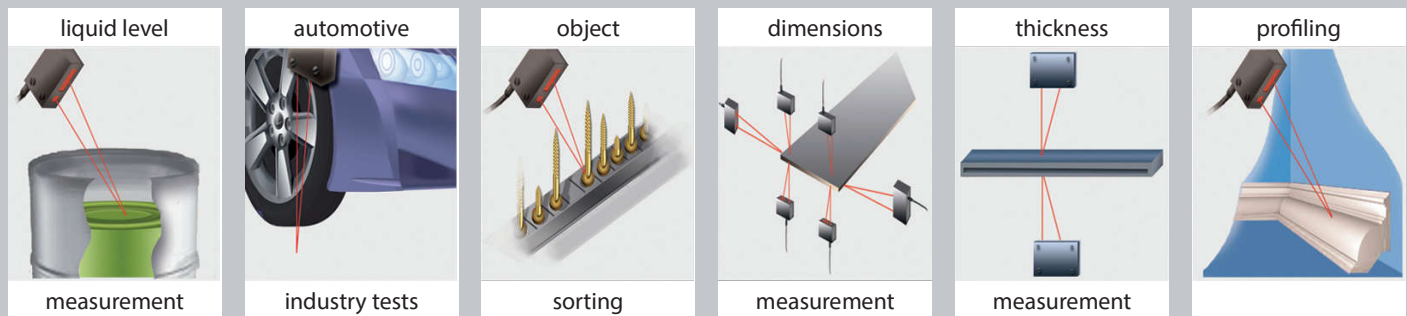


## MAIN FEATURES

- Measuring ranges from 2 to 2500 mm
- $\pm 1 \mu\text{m}$  accuracy
- Sampling rate up to 70 kHz
- RS232/RS485/Ethernet/CAN/ CANopen +4...20 mA/0...10V/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, MATLAB, LabVIEW

## MODELS

- RF603 — universal sensors
- RF603HS — high speed sensors
- RF600 / RF600HS — sensors with increased base distance and large measurement range. High speed sensors
- RF605 — compact sensors
- RF602 — super compact sensors
- RF607 — high-precision high-speed sensors
- RF609 / RF609Rt / RF609Wi-Fi — laser probes for inner surface control



PARAMETER		VALUE
Output interface	digital	RS232 (max. 460.8 kbit/s) or RS485 (max. 921.6 kbit/s) or RS232 and CAN V2.0B (max 1Mbit/s) or Ethernet and (RS32 or RS485)
	analog	4...20 mA ( $\leq 500 \Omega$ load) or 0...10 V
Synchronization input		2.4 – 5 V (CMOS, TTL)
Logic output		programmed functions, NPN: 100 mA max; 40 V max for output
Power supply, V		9 ...36
Power consumption, W		1.5..2
Environment resistance	Enclosure rating	IP67 ( for the sensors with cable connector only)
	Vibration	20g/10...1000Hz, 6 hours, for each of XYZ axes
	Shock	30 g / 6 ms
	Operation temperature, °C	-10...+60, (-30...+60 for the sensors with built-in heater), (-30...+120 for the sensors with built-in heater and air cooling housing)
	Permissible ambient light, lx	>30000
	Relative humidity	5-95% (no condensation)
Storage temperature, °C		-20...+70
Housing material		aluminum

# LASER TRIANGULATION SENSORS, RF60x SERIES

UNIVERSAL LASER SENSORS

RF603 Series

- Varied diode powers
- Binocular sensors
- Available with Red, Blue or IR laser diodes
- Accuracy  $\pm 0.05\%$  working range

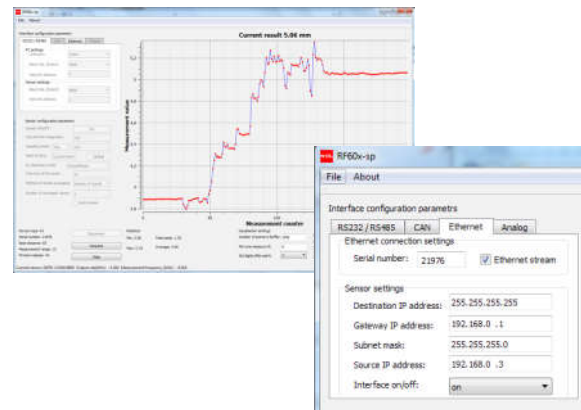
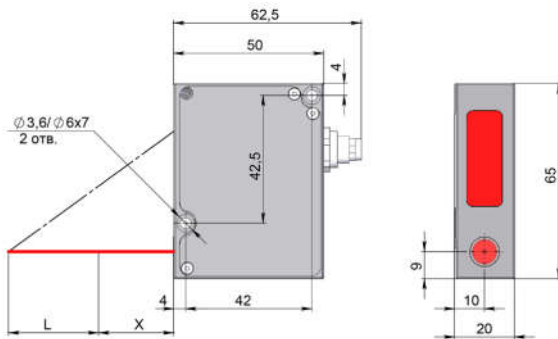


## OPTIONS

- 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

## SOFTWARE

- Setting sensor parameters
- Receiving, storage, visualization
- Speed and acceleration calculation

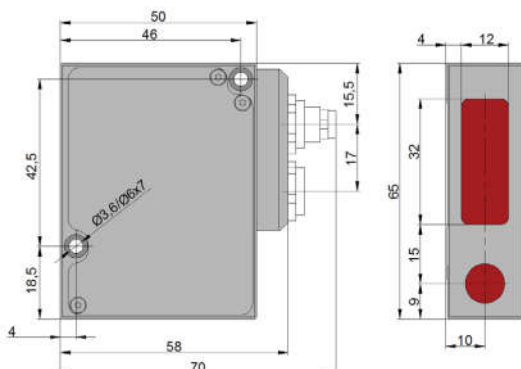


RF603-	R-X/4	X/2	X/5	X/10	X/15	X/25	X/30	X/50	X/100	X/250	X/500	X/750	X/1000	X/1250	
Base distance X, mm	39	15	15	15, 25 60	15, 30 65	25, 45 80	35, 55 95	45, 65 105	60, 90 140	80	125	145	245	260	
Measurement range, mm	4	2	5	10	15	25	30	50	100	250	500	750	1000	1250	
Linearity, %	$\pm 0.05$ of the range												$\pm 0.1$		
Resolution, %	0.01 of the range (for the digital output only)												0.02		
Temperature drift	0.02% of the range/°C														
Max. measurement frequency, Hz	9400														
Light source	red semiconductor laser, 660 nm wavelength or UV semiconductor laser 405/450 nm wavelength (BLUE version)														
Light source	model	<b>RF603</b>													
	output power	$\leq 0.2$	$\leq 3$ mW												
	laser safety Class	1	3R (IEC60825-1)												
	model	<b>RF603L</b>													
	output power	$\leq 0.95$ mW													
	laser safety Class	2 (IEC60825-1)													
Light source	model											<b>RF603P</b>			
	output power											$\leq 20$ 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.

HIGH SPEED SENSORS

RF603HS Series



- Universal high-speed compact laser sensors
- Sampling rate up to 70 kHz
- Available with Red and Blue laser diodes
- Ideal for registration of high speed events and vibration measurement

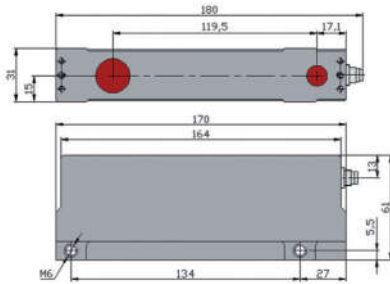
# LASER TRIANGULATION SENSORS, RF60x SERIES

RF603HS-	X/2	X/5	X/10	X/15	X/25	X/30	X/50	X/100	X/250	X/500	X/750	
Base distance X, mm	15	15	15, 25 60	15, 30 65	25, 45 80	35, 55 95	45, 65 105	60, 90 140	80	125	145	
Measurement range, mm	2	5	10	15	25	30	50	100	250	500	750	
Max. measurement frequency, kHz	70											
Linearity, %	±0.1 (70 kHz) of the range											
Resolution, %	0.01 (70 kHz) of the range											
Temperature drift	0.02% of the range/°C											
Light source	red semiconductor laser (660 nm wavelength) or blue semiconductor laser (405/450 nm wavelength)											
Output power	≤4.8 mW					≤20 mW			≤80 mW			
Laser safety Class	3R (IEC/EN 60825-1:2014)								3B (IEC/EN 60825-1:2014)			
Weight (without cable)	110											

## LARGE-BASE AND LONG RANGE SENSORS

## RF600 Series

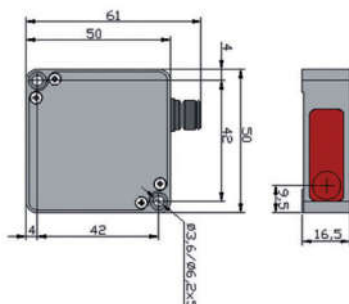
- High-precision measurement of the position of remote objects
- High-speed (70 kHz) sensors



RF600-	X/10	X/30	X/40	X/100	X/250	X/500	X/600	X/1000	X/1000	X/1500	X/2000	X/2500	X/20	X/50	
Base distance X, mm	230	300	330	500	230	300, 1000	230	1300	380	390	410	420	540	535	
Measurement range, mm	10	30	40	100	250	500	600	1000	1000	1500	2000	2500	20	50	
Max. measurement frequency	9.4 kHz, 70 kHz														
Linearity, % of the range	±0.05											±0.1		±0.05	
Resolution, % of the range	0.01 of the range (digital output only)											0.03		0.01	
Temperature drift	0.02% of the range/°C														
Light source	red semiconductor laser, 660 nm wavelength or UV semiconductor laser 405/450 nm wavelength (BLUE version)														
Output power	≤4.8 mW											80 mW			
Laser safety Class	3R (IEC60825-1)											3B (IEC60825-1)			
Weight (without cable)	500											2000			

## COMPACT LASER SENSORS

## RF605 Series



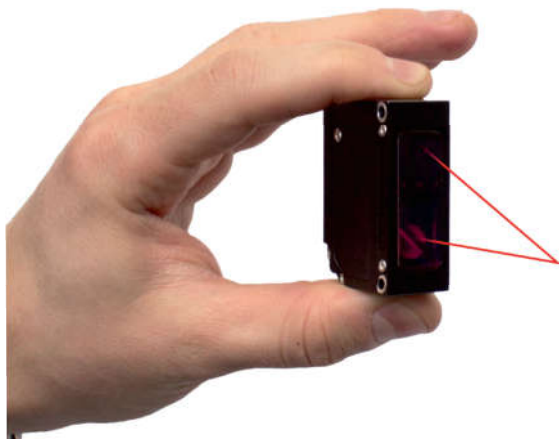
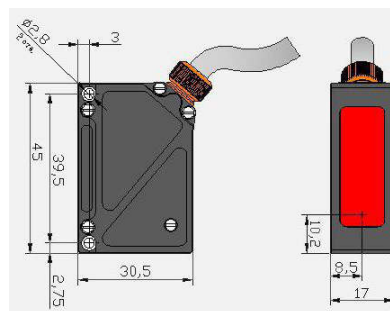
RF605-	25/50	45/100	65/250	105/500
Base distance X, mm	25	45	65	105
Measurement range, mm	50	100	250	500
Max. measurement frequency	2000 Hz			
Linearity, % of the range	±0.05			
Resolution, % of the range	0.01 (digital output only)			
Temperature drift	0.02% of the range/°C			
Light source	red semiconductor laser, 660 nm wavelength			
Output power	≤0.95 mW			
Laser safety Class	2 (IEC60825-1)			
Weight (without cable)	60			

# LASER TRIANGULATION SENSORS, RF60x SERIES

## SUPER COMPACT LASER SENSORS

## RF602 Series

- Unique combination of dimensions, performance and operating ranges






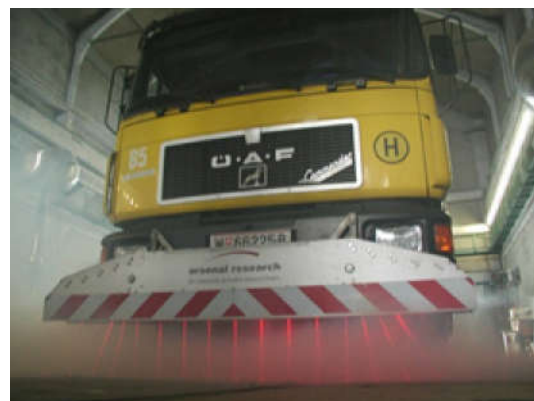
RF602-	20/10	20/25	30/50	50/100	65/250	105/500
Base distance X, mm	20	20	30	50	65	105
Measurement range, mm	10	25	50	100	250	500
Max. measurement frequency	9400 Hz					
Linearity, % of the range	±0.05					
Resolution, % of the range	0.01 (digital output only)					
Temperature drift	0.02% of the range/°C					
Light source	red semiconductor laser, 660 nm wavelength or UV semiconductor laser 405/450 nm wavelength (BLUE version)					
Output power, mW	≤0.95 mW					
Laser safety Class	2 (IEC60825-1)					
Weight (without cable), gram	40					

## SPECIALIZED LASER SENSORS FOR PAVEMENT PROFILE AND TEXTURE MEASUREMENT

## RF60i Series

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

MODEL	SPECIFIC FEATURES	ASSIGNMENT	
RF603P-125/500 RF603P-245/1000	<ul style="list-style-type: none"> <li>high resistance to solar radiation</li> <li>stable operation on wet surfaces</li> </ul>	Pavement profile measurement	
RF607-195/500	<ul style="list-style-type: none"> <li>70 kHz operating frequency</li> <li>round laser spot, diameter &lt;1 mm</li> </ul>		
RF607-210/230 RF607-230/250	<ul style="list-style-type: none"> <li>70 kHz operating frequency</li> <li>round laser spot, diameter &lt;0.8 mm</li> <li>accuracy ±0.03% of the range</li> </ul>	Pavement roughness (texture) measurement	
RF603Txt-30/30	<ul style="list-style-type: none"> <li>reduced triangulation angle</li> <li>round laser spot, diameter &lt;60 μm</li> <li>simultaneously obtaining profile and image of the surface</li> </ul>		



# LASER TRIANGULATION PROBES, RF60x SERIES

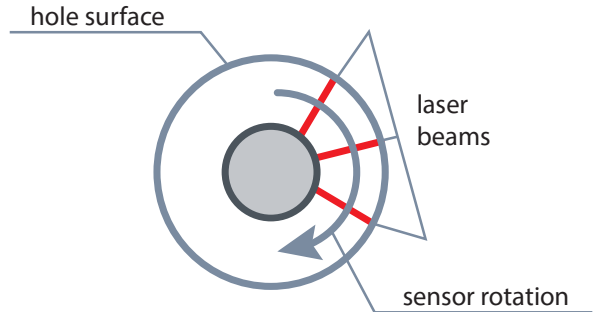
## LASER TRIANGULATION PROBES

## RF609, RF609Rt and RF609Wi-Fi Series

- Smallest triangulation sensor on the market
- Probe diameter — from 8.5 mm
- Measured inner diameter - from 9 mm
- Accuracy - from  $\pm 2 \mu\text{m}$
- Sampling rate - up to 9.4 kHz
- Probes with BLUE laser to control reflecting and semitransparent objects
- Probes with built-in slip ring
- Probes with Wi-Fi



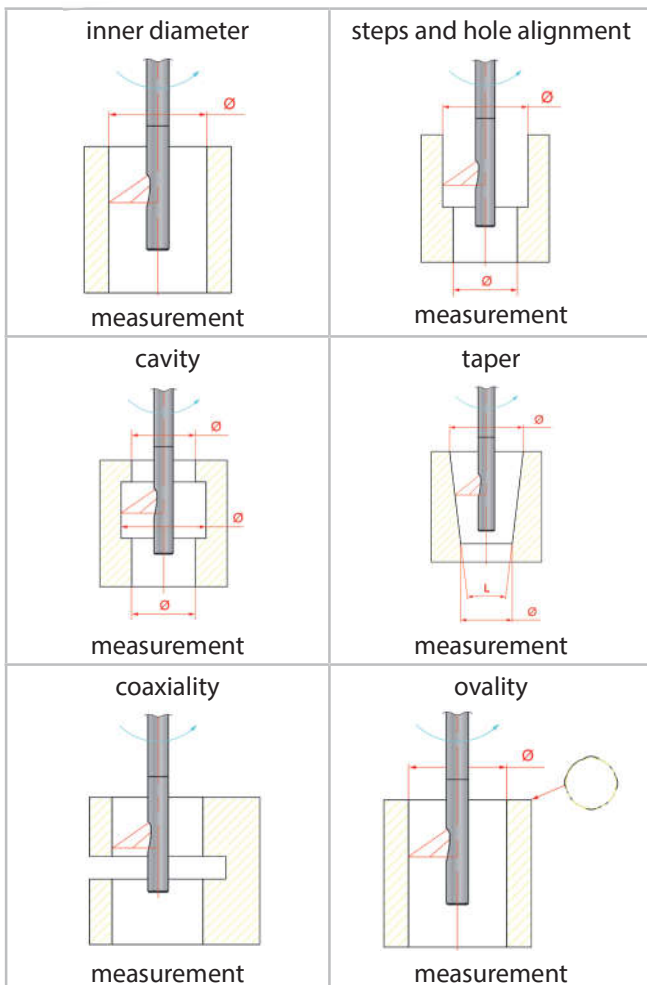
Contactless measurement of inner diameter, ovality, coaxiality, cylindricity and shape of holes, tubes, hosepipes, bushes, gun barrels, etc.



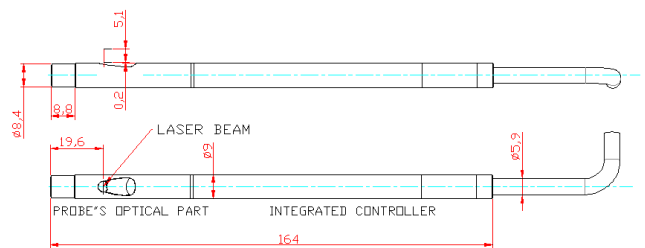
The probe is inserted into the hole and probe or sample is driven in rotation. Laser triangulation sensor built in the probe measures the distance to the hole wall synchronously with the rotation angle. The set of the polar surface coordinates allows to calculate the required parameters. Additional linear translation allows to build 3D model of the hole.

Parameter	RF609 (609Rt)-9/19	RF609 (609Rt)-16/48
Measured diameters, mm	9...19	16...48
Diameter measurement accuracy, $\mu\text{m}$	$\pm 2$	$\pm 10$
Sensor measurement frequency, Hz	9400	
Rotational speed for Rt version, no more rps	4	
Laser safety Class	2 (IEC60825-1)	
Interface	RS232 or RS485 or Ethernet or Wi-Fi	
Synchronization input: trigger, A-B encoder, V	2.4-24	
Minimal distance to the hole bottom, mm	20	
Hole depth, mm	by request	
Power supply, V	9...36	
Power consumption, W	1.5-2	

\* for other measured diameters and hole depth ranges please consult factory



### RF609-9/19



### RF609Rt-9/19

