Distance sensors

Measurement from 10 mm to 250 m

Optical distance sensors

from Page 197

FT 10 *IO-Link*

- *Operating range (scanning distance) from 10 mm to 70 mm*
- *Laser short-range distance sensors using the triangulation principle*
- *Minimal dimensions*
- *Measurement value output via IO-Link*

from Page 201

FT 25 *IO-Link*

- *Operating range (scanning distance) from 20 mm to 200 mm*
- *Laser- and LED short-range distance sensors using the triangulation principle*
- *Miniature housing for simple integration*
- *Analogue output 1 … 10 V and measurement value output via IO-Link*

from Page 207

FT 55-RLAM *IO-Link*

- *Operating range up to 1 m*
- *Excellent sensor qualities at long ranges*
- *Laser distance sensor using the triangulation principle*
- *Analogue output and digital output of meaurement values via IO-Link*

from Page 213

FT 50

- *Operating range from 30 to 300 mm*
- *Proven laser distance sensor using the triangulation principle*
- *High absolute accuracy*
- *Analogue output and digital output of meaurement values via RS485*

Rapid and precise measurement, accurate positioning, and detection of the most varied of materials – distance measurement is a central requirement in many areas of automation technology. Whether for checking the winding of coils with millimetre accuracy, the detection of double sheets, or the accurate positioning of storage and retrieval machines – distance sensors from SensoPart are reliable tools for many purposes in the following sectors:

- The automotive and supplier industries
- Mechanical engineering and special machine construction
- Assembly and handling
- The packaging industry
- Handling and warehousing systems
- The steel industry
- The textile and paper industries
- The wood industry

The technologies used are as varied as the applications.
Our optical sensors use the triangulation process for operating ranges below 1 m, and time-of-flight measurement for longer operating distances. Apart from optical sensors, ultrasonic sensors are also used for transparent or strongly reflective materials, in particular, and inductive sensors are employed for metal objects at close-range and in harsh operating conditions.

Determining the exact position of parts on an assembly line

Detection of double layers on printed-circuit boards

from Page 193

F 55

- *Laser distance sensors using the time-of-flight principle*
- *Scanner versions up to measurement distance of 5 m*
- *Reflector versions up to 70 m range*
- *Various interfaces (analogue and IO-Link)*

from Page 231

FR 85 Rail Pilot

- *Distance sensors using the time-of-flight principle*
- *Specialised solution for anti-collision applications on monorails*
- *Cornering also possible*
- *Large aperture angle, thus long detection range*

Ultrasonic distance sensors

from Page 565

- *Distance sensors using the ultrasonic time-of-flight principle*
- *Cubic and cylindrical housings*
- *Large portfolio for differing measurement ranges*
- *Reliable operation with all surfaces and colors – and especially with transparent objects*

Inductive distance sensors

from Page 615

- *Long switching distances up to 10 mm with accurate linear measurement range*
- *Distance measurement on metals according to the inductive principle*
- *Various housings*
- *High accuracy and long linear measurement range*

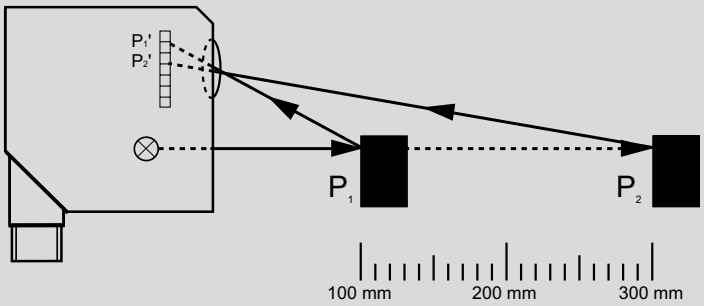
Distance sensors

System description

Distance measurement using triangulation

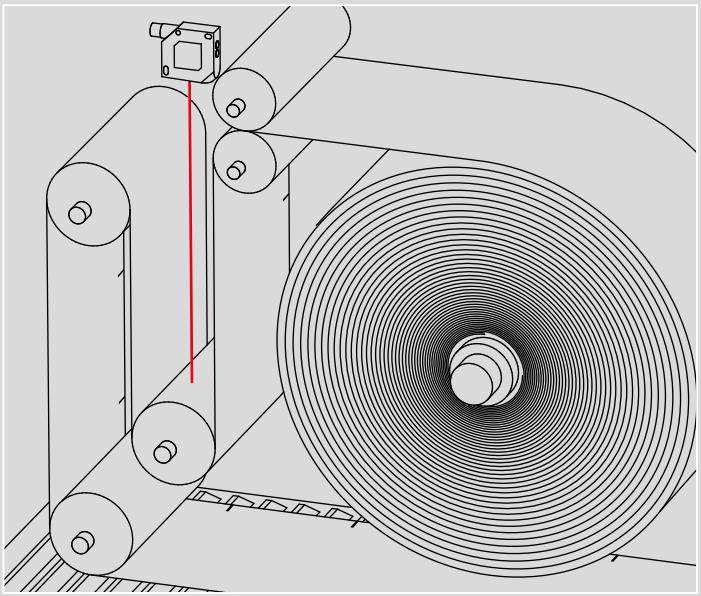
The measurement principle of optical triangulation is suitable for the precise determination of distances at close range. With the help of special receiver optics and a position-sensitive detector (e.g. a photodiode line), the sensor can determine the object distance regardless of its reflectivity (see illustration below). The color and surface properties (e.g. highly reflective) thus have practically no effect on measurement accuracy.

The FT 50 RLA laser distance sensor provides a signal proportional to the distance, transmitted via the analogue output (e.g. 4 ... 20 mA) or a serial RS485 interface. The switching range of the digital outputs can be set to any zone within the operating range using teach-in.



The triangulation process: with the help of a line-shaped position-sensitive detector, the distance sensor measures the distance to the object regardless of the quantity of light reflected.

The light reflected back from the object (P_1) hits the line at point P_1. The sensor determines the distance signal from this. The light correspondingly hits the detector at a different point (P_2) at object distance P_2.



Dancer roll control using the FT 50 RLA-220 laser distance sensor

Collision prevention sensors for monorails

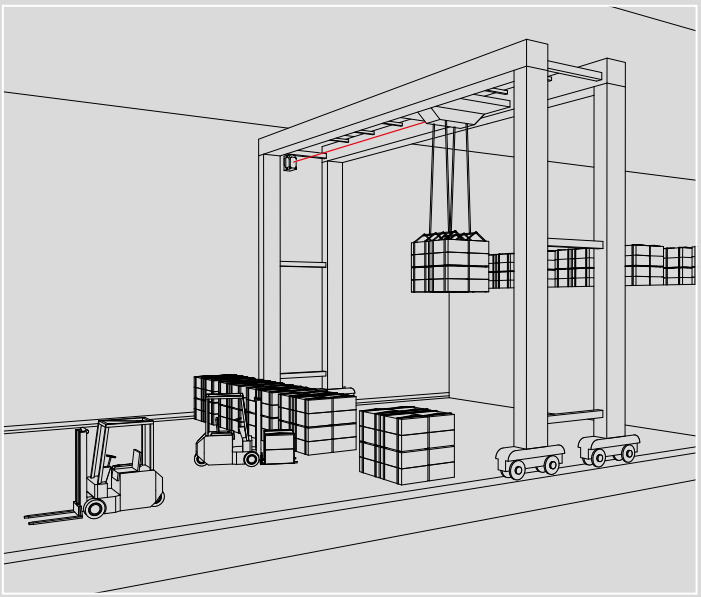
Collision prevention on monorail systems in car production is a special distance measurement task. The FR 85 series was specially developed for this application. These sensors provide excellent measurement results regardless of the reflectivity of the target object, and their comprehensive range of functions is impressive.

The FR 85 offers high measurement accuracy and immunity to ambient light because it is based on time-of-flight technology. A long measurement range (up to 6 m) and flexibly adjustable protection field geometries allow adaptation to the situation on site, even when cornering.

Distance measurement using time-of-flight

SensoPart uses time-of-flight technology to measure longer distances. The sensor emits pulsed laser light that is reflected by the target object. The distance to the object is determined by the time taken between emission and reception of the light.

The use of pulsed light provides reliable background suppression and very high immunity to ambient light. The distance sensors of the FT/FR 55-RLAP series, using time-of-flight technology, measure distances of up to 70 m with a high level of accuracy. The sensors are particularly suitable for use on production lines and in handling and warehousing systems due to their reliable detection and long ranges or scanning distances.



Crane positioning with FR 55-RLAP distance sensor

Inductive analogue sensors

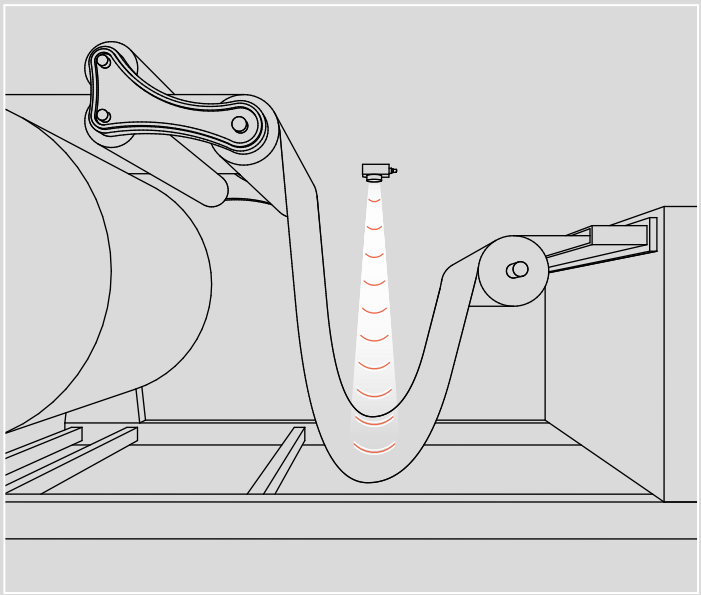
The reasonably priced solution for metallic objects. Compared to optical or ultrasonic sensors, inductive distance sensors have only limited ranges. They are still used under harsh conditions, in particular, as a result of their great robustness.

- Inductive distance sensors with analogue output of 4 … 20 mA
- Operating range of 0 … 6 mm to 4.5 … 12 mm
- Falling characteristic line on approach
- Robust metal housings

Ultrasonic sensors

Ultrasonic sensors are the right choice for materials with which optical systems cannot be reliably operated. Ultrasonic sensors work using the time-of-flight of sound. The sensor emits ultrasonic pulses. The target object reflects the sound. The sensor measures the time-of-flight of the pulse and calculates the distance value. This value is transmitted to the controller as a current or voltage signal.

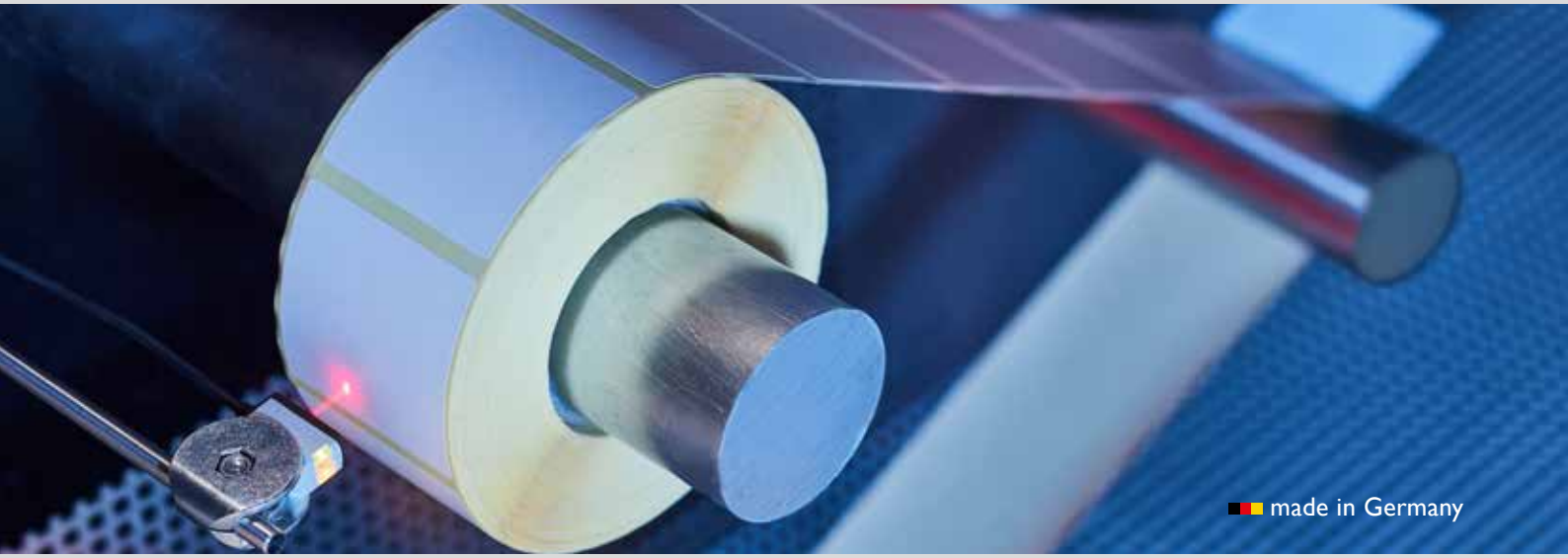
- Operating ranges from 20 … 6000 mm
- Operating range and analogue output adjustable via teach-in
- Analogue output 0 … 10 V / 4 … 20 mA



Monitoring throughput with the UT 20 ultrasonic sensor

FT 10-RLA – The smallest optical distance sensor in the world

Subminiature distance sensor for precision measurement tasks in confined spaces



When things get too cramped:
The **FT 10-RLA** demonstrates outstanding ability, even in extremely cramped installation conditions. As the smallest optical distance sensor on the market, it is ideally suited to challenging measurement tasks, e.g. during assembly of semi-conductor devices or in robotics applications.

Small but powerful
Measuring just 21.1 x 14.6 x 8 mm in size and only 10 grammes in weight, it is scarcely larger than the tip of your finger – and therefore ideal for cramped conditions.

TYPICAL FT 10-RLA

Minimum weight, ideal for robotics applications

- Also suited to smallest installation space thanks to minimal dimensions
- Measurement value output via IO-Link
- Excellent sensor characteristics with repeat accuracy and linearity
- Measuring range 10 to 70 mm
- Laser class 1 for optimum eye safety

Reduced to the smallest possible size and weight: Measuring just 21.1 x 14.6 x 8 mm and only approximately 10 g, SensoPart's new laser distance sensor is the smallest of its kind. Despite a subminiature design, it has excellent sensor capacities with particularly exceptional linearity and repeatability. The measuring range is 10 to 70 mm with only a tiny blind zone of 10 mm. The sharp rectangular light spot (1 x 3 mm), which is characteristic of laser sensors, guarantees reliable small part detection.

Examples of sectors and applications:

- Robotics, e.g. distance measurement on gripper
- Electronics production, e.g. double layer control on printed circuit boards or height check of components
- Assembly and handling technology, e.g. for checking accuracy of installation

FT 10-RLA – Product Overview			
	Operating range	Special features	Page
FT 10-RLA	10 … 70 mm	Laser, small housing, Measurement value output via IO-Link	199

FT 10-RLA

Sub-miniature laser distance sensor

PRODUCT HIGHLIGHTS

- Measurement value output via IO-Link
- Minimum weight
- Also suited to smallest installation spaces thanks to minimal dimensions
- Adjustable averaging times
- Laser class 1 for optimum eye safety

Optical data	
Measurement range	10 … 70 mm[1]
Resolution	0.01 mm
Linearity	± 0.2 ... 0.8 mm (see characteristics)[2]
Repeatability	0.01 ... 0.2 mm (6 σ, see characteristics)[2, 3]
Type of light	Laser, red, 655 nm
Light spot size	1 x 3 mm
Laser class (IEC 60825-1)	1
Resistance to ambient light	≤ 5000 Lux

Functions	
Indicator LED, green	Operating voltage indicator
Indicator LED, yellow	Switching output indicator
Measurement range adjustment	Via IO-Link
Adjustment possibilities	Button lock via control input N.O./N.C. and Auto-Detect / NPN / PNP via Teach-in button or IO-Link Smart functions and averaging times via IO-Link
Default settings	See selection table

Electrical data	
Operating voltage, $+U_B$	10 … 30 V DC
No-load current, I_0	≤ 12 mA
Output current, le Q	≤ 50 mA
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection (Q)
Protection Class	2
Switching output, Q	1x Auto-Detect (PNP/NPN)[4]
Output function Q	N.O./N.C.
Switching frequency, f (ti/tp 1:1) Q	≤ 1000 Hz
Response time Q	500 µs
Warm-up time	10 min.
Response time measurement value	4 ms
Averaging times	4 / 40 / 80 / 120 / 160 / 200 / 240 / 280 / 320 / 360 / 400 ms (Default setting 4 ms)
Temperature-specific measurement deviation	0.01 mm/K (typ.)

Mechanical data	
Dimensions	21.1 x 14.6 x 8 mm
Enclosure rating	IP 67[5]
Material, housing	PUR
Material, front screen	PMMA
Type of connection	See selection table
Ambient temperature: operation	-20 … +50 °C[6]
Ambient temperature: storage	-20 … +60 °C
Weight (cable device)	22 g
Weight (pigtail)	10 g
Resistance to vibrations and impacts	EN 60947-5-2

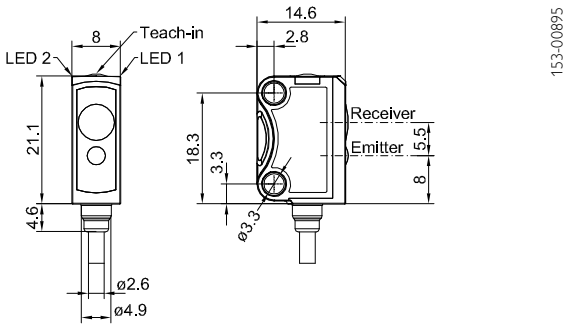
IO-Link	
Communication mode	COM 2
Min. cycletime	2.7 ms
SIO mode	Compatible
Data storage	Compatible
Length process data	24 Bit
Specification	1.1

[1] Reference material 5…90 % reflectivity [2] Reference material 90 % reflectivity [3] Stationary object, [4] Auto-Detect: Automatic selection of PNP or NPN by the sensor, PNP or NPN can be fixed [5] With connected IP 67 plug [6] UL : max. +30 °C

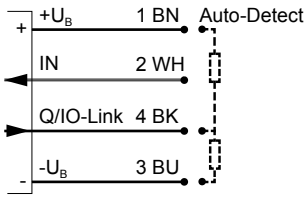
Version: 03/2020. Subject to changes; diagrams similar

Measurement range	Measurement value output	Switching output	Type of connection	Part number	Article number
10 ... 70 mm	IO-Link	Auto-Detect	Pigtail, 200 mm with plug, M8 4-pin, IO-Link	FT 10-RLA-60-PNSL-KM4	600-11175
10 ... 70 mm	IO-Link	Auto-Detect	Cable, 2 m, 4-wire, IO-Link	FT 10-RLA-60-PNSL-K4	600-11176

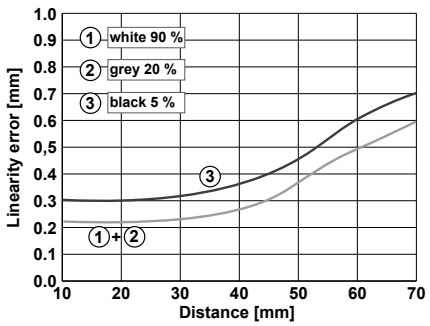
Cable connection



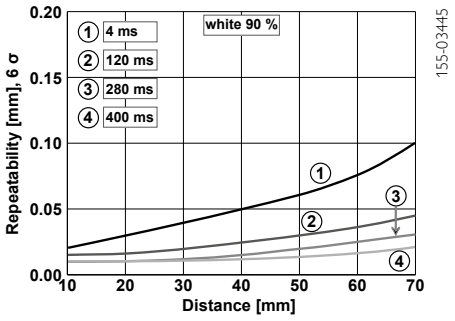
Connection, 4-pin, IO-Link

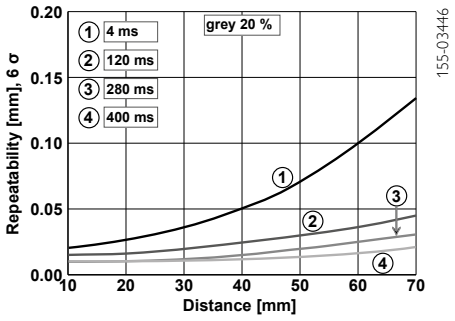


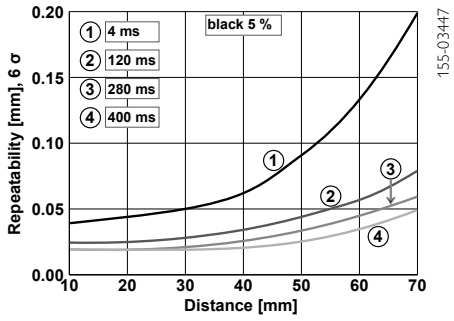
Linearity error (typ.)



Repeatability[1] (typ.)







[1] At constant ambient conditions, minimum distance between sensors 3 mm

Accessories

Connection cables	From Page A-44
Brackets	From Page A-4
SensoIO (901-01001)	From Page A-52

FT 25 – optical short-range distance sensors

The compact class for measurement and regulatory tasks

FT 25-R(L)A for dancer roll regulation
The precise control of the FT 25-R(L)A ensures a constant tension of the paper roll during unwinding.

TYPICAL FT 25-R(L)A

- Operating range: 20 ... 80 mm / 20 ... 100 mm / 30 ... 200 mm
- Distance sensor with 1 … 10 V analogue output
- Easily integratable ultra-compact ABS housing: 34 x 12 x 20 mm
- High precision and high repeatability – especially for control tasks
- Resolution: from 0.12 mm
- Two adjustable switching points as window mode for 2-point control
- Teach-in operation

In a miniature housing
The FT 25-R(L)A is also suitable for limited installation spaces thanks to its compact dimensions of 34 x 12 x 20 mm.

In addition to its analogue voltage output the small distance sensors also have a switching output and offer the possibility of defining a switching window by means of two switching points. Thanks to their easy operation, these sensors are particularly suitable for simple measurement and regulatory tasks at distances of up to 200 mm. Our laser and LED variants cover a very broad range of applications.

Key applications:

- Dancer roll regulation, sag monitoring (LED / laser)
- Determining the roll diameter of an unwinding machine (LED / laser)
- Stacking height measurement, double layer detection and height measurements in the wood processing, packaging- and handling industry (LED / laser)
- Distance measurement and positioning on robot grippers in „pick & place“ applications (LED / laser)
- Small part measurement, e.g. O-rings and electronic components (laser)
- Measurement on multicolored and high-contrast objects, e.g. packages (laser)

FT 25-R(L)A – Product Overview

	Operating range	Special features	Page
FT 25-RLA	20 … 100 mm	Laser, small housing, IO-Link	203
FT 25-RA	20 … 80 mm / 30 ... 200 mm	Small housing with long range, IO-Link	205

FT 25-RLA

Miniature laser distance sensor

IO-Link

PRODUCT HIGHLIGHTS

- Small laser light spot for reliable distance measurement of small objects part detection
- Miniature housing and low weight - suitable for robotic applications
- High linearity and high repeatability for precise control tasks
- Invertible analogue characteristic
- Window mode e.g. for two-step controls separately adjustable
- Measurement value output via IO-Link

Optical data	
Measurement range	20 … 100 mm[1]
Resolution	0.12 mm (12-bit)
Linearity	± 0.25 mm[2]
Repeatability	< 0.25 mm[2, 3]
Type of light	Laser, red, 650 nm
Light spot size	See diagram
Laser class (IEC 60825-1)	1

Functions	
Indicator LED, green	Operating voltage indicator
Indicator LED, yellow	Switching output indicator
Measurement range adjustment	Via Teach-in button
Adjustment possibilities	Analogue measurement range Q_A Invertible analogue characteristic Switching output Q (window mode) N.O. / N.C. via teach-in button Wide variety of adjustment possibilities of service and process data via IO-Link
Default settings	See Table

Electrical data	
Operating voltage, $+U_B$	13 … 30 V DC
No-load current, I_0	≤ 30 mA
Output current, le Q	≤ 100 mA
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection (Q)
Protection Class	2
Power On Delay	< 300 ms
Switching output, Q	1x Auto-Detect (PNP/NPN)[4]
Output function	N.O./N.C.
Max. capacitive load	10 nF
Switching frequency, f (ti/tp 1:1) Q	≤ 1000 Hz
Response time Q	500 µs
Analogue output Q_A	1 … 10 V / max. 3 mA
Response time Q_A	3.4 ms
Warm-up time	10 min.
Temperature drift	< 0.1 mm/K

Mechanical data	
Dimensions	34 x 20 x 12 mm
Enclosure rating	IP 67 / IP 69[5]
Material, housing	ABS
Material, front screen	PMMA
Type of connection	See selection table
Ambient temperature: operation	-20 … +60 °C[6]
Ambient temperature: storage	-20 … +80 °C
Weight (metal plug device)	10 g
Resistance to vibrations and impacts	EN 60947-5-2

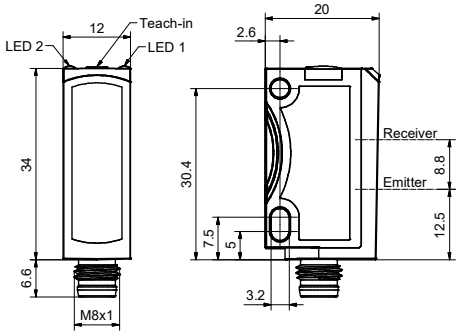
IO-Link	
Communication mode	COM 2
Min. cycletime	2.7 ms
SIO mode	Compatible
Length process data	24 Bit
Specification	1.1

[1] Reference material: 6 … 90 % reflectivity [2] Reference material, 18 % reflectivity [3] At 6 σ, at constant ambient conditions, typ. values see diagram [4] Auto-Detect: Automatic selection of PNP or NPN by the sensor, PNP or NPN can be fixed [5] With connected IP 67 / IP 69 plug [6] UL: -20 ... +50 °C

Measurement range	Analogue output	Switching output	Type of connection	Part number	Article number
20 ... 100 mm	1 ... 10 V	Auto-Detect	Metal plug, M8x1, 4-pin, IO-Link	FT 25-RLA-80-PNSUL-M4M	604-41013

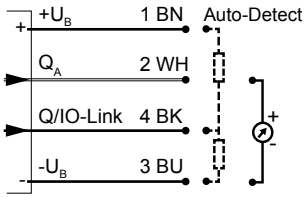
Version: 02/2019. Subject to changes; diagrams similar

Plug connection



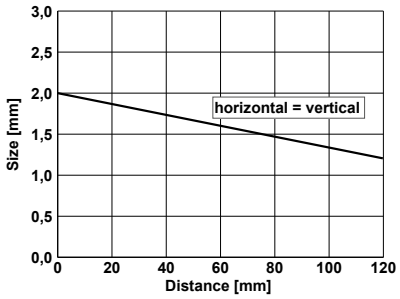
153-00934

Connection, 4-pin, IO-Link



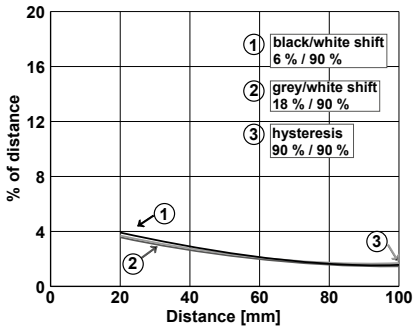
154-00575

Light spot size



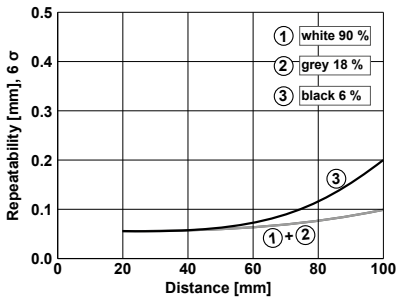
155-01394

Scanning properties



155-01966

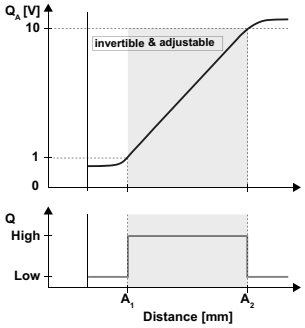
Repeatability[1] (typ.)



155-01968

[1] At constant ambient conditions

Characteristics



155-01661

155-01681

Default settings

Analogue output Q_A (1 ... 10 V)	20 ... 100 mm
Switching output Q (A1 ... A2), N.O.	20 ... 100 mm

Accessories

Connection cables	From Page A-44
Brackets	From Page A-4
SensoIO (901-01001)	From Page A-52

FT 25-RA

Miniature distance sensor

PRODUCT HIGHLIGHTS

- Miniature housing with measurement ranges up to 200 mm for an easy integration and high flexibility
- High linearity and high repeatability for precise control tasks
- Almost surface independant detection on homogeneous object surfaces
- Invertible analogue characteristic
- Window mode e.g. for two-step controls separately adjustable
- Measurement value output via IO-Link

Optical data			Functions	
Measurement range	20 … 80 mm[1]	30 … 200 mm[1]	Indicator LED, green	Operating voltage indicator
Resolution	0.12 mm (12-bit)	0.68 mm (12-bit)	Indicator LED, yellow	Switching output indicator
Linearity	± 0.4 mm[2]	± 2 mm[2]	Measurement range adjustment	Via Teach-in button and IO-Link
Repeatability	< 0.4 mm[2, 3]	< 1 mm[2, 3]	Adjustment possibilities	Analogue measurement range Q_A Invertible analogue characteristic Switching output Q (window mode) N.O./N.C. via teach-in button Wide variety of adjustment possibilities of service and process data via IO-Link
Type of light	LED, red, 632 nm	LED, red, 632 nm		
Light spot size	See diagram	See diagram	Default settings	See Table

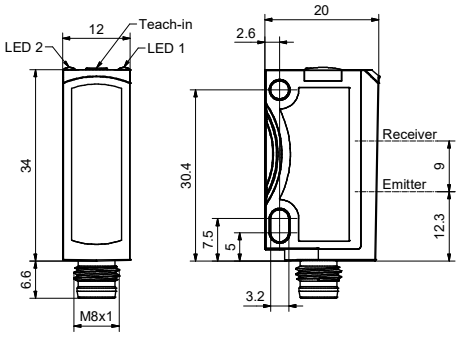
Electrical data		Mechanical data	
Operating voltage, $+U_B$	13 … 30 V DC	Dimensions	34 x 20 x 12 mm
No-load current, I_0	≤ 30 mA	Enclosure rating	IP 67 / IP 69[5]
Output current, Ie Q	≤ 100 mA	Material, housing	ABS
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection (Q)	Material, front screen	PMMA
Protection Class	2	Type of connection	See selection table
Power On Delay	< 300 ms	Ambient temperature: operation	-20 … +60 °C[6]
Switching output, Q	1x Auto-Detect (PNP/NPN)[4]	Ambient temperature: storage	-20 … +80 °C
Output function	N.O./N.C.	Weight (metal plug device[7])	10 g
Max. capacitive load, Q	10 nF	Weight (pigtail)	20 g
Switching frequency, f (ti/tp 1:1), Q	≤ 1000 Hz	Resistance to vibrations and impacts	EN 60947-5-2
Response time, Q	500 µs		
Analogue output, Q_A	1 … 10 V / max. 3 mA	**IO-Link**	
Response time, Q_A	400 µs (FT 25-RA-60) 3.4 ms (FT 25-RA-170)	Communication mode	COM 2
Warm-up time	10 min.	Min. cycletime	2.7 ms
Temperature drift	< 0.1 mm/K (FT 25-RA-60) < 0.2 mm/K (FT 25-RA-170)	SIO mode	Compatible
		Length process data	24 Bit
		Specification	1.1

[1] Reference material: 6 … 90 % reflectivity [2] Reference material grey, 18 % reflectivity [3] At constant ambient conditions [4] Auto-Detect, automatic PNP/NPN selection by the sensor, PNP or NPN fixed [5] With connected IP 67 / IP 69 plug [6] UL: -20 ... +50 °C [7] No Ecolab

Measurement range	Analogue output	Switching output	Type of connection	Part number	Article number
20 ... 80 mm	1 ... 10 V	Auto-Detect	Metal plug, M8x1, 4-pin, IO-Link	FT 25-RA-60-PNSUL-M4M	604-41008
30 ... 200 mm	1 ... 10 V	Auto-Detect	Metal plug, M8x1, 4-pin, IO-Link	FT 25-RA-170-PNSUL-M4M	604-41009
20 ... 80 mm	1 ... 10 V	Auto-Detect	Pigtail, 500 mm with plug, M8 4-pin, IO-Link	FT 25-RA-60-PNSUL-KM4-X15	604-41014

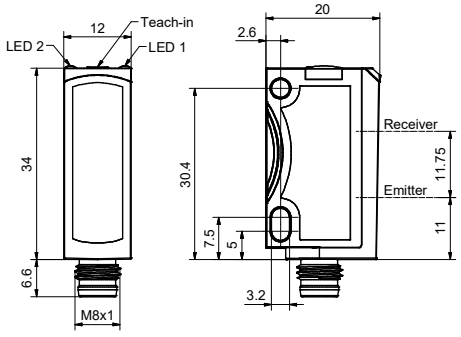
Version: 02/2019. Subject to changes; diagrams similar

Plug connection (20 ... 80 mm)



153-00839

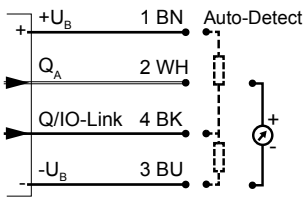
Plug connection (30 ... 200 mm)



153-00837

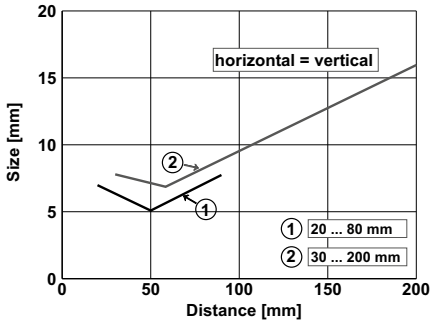
5

Connection, 4-pin, IO-Link



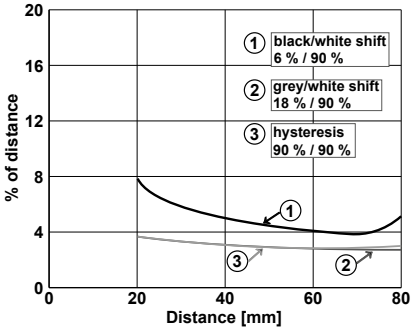
154-00575

Light spot size



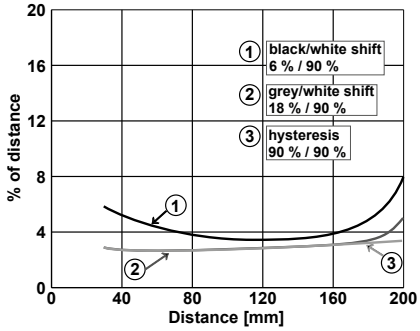
155-01663

Scanning properties FT 25-RA-60



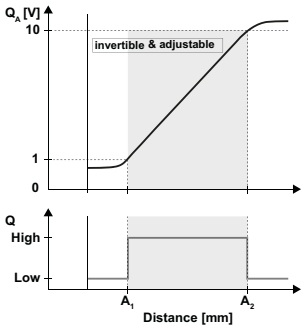
155-01666

Scanning properties FT 25-RA-170



155-01667

Characteristic output and analogue curves



155-01661

155-01681

Default settings

	FT 25-RA-60	FT 25-RA-170
Analogue output Q_A (1 ... 10 V)	20 ... 80 mm	30 ... 200 mm
Switching output Q (A1 ... A2), N.O.	20 ... 80 mm	30 ... 200 mm

Accessories

Connection cables	From Page A-44
Brackets	From Page A-4
SensoIO (901-01001)	From Page A-52

FT 55-RLAM

Precise laser triangulation sensor for a wide range of applications

Precise measurements easily adjustable

The new FT 55-RLAM compact distance sensor from Senso-Part is a true allrounder, reliably detecting surfaces from black to shiny. Offering extensive connectivity, the triangulation sensor is equipped with an analogue output, two switching outputs, an **IO-Link** interface and optional RS485 interface. The laser class 1 sensor comes with an innovative and user-friendly operating concept including a large LCD display, unusual in this performance category.

Determining the position of a package so that it can be gripped by a robotic arm

TYPICAL FT 55-RLAM

- Stable processes thanks to excellent sensor qualities across the entire operating range
  - Operating range up to 600 mm / 1000 mm
  - Repeatability ≤ 20 µm / ≤ 40 µm
  - Linearity ≤ 0.6 mm / 1.5 mm
  - Resolution ≤ 30µm / ≤ 50 µm at Q_A or 1 µm via IO-Link
- IO-Link – a future-proof interface that meets the demands of Industry 4.0
- Laser class 1 – for optimum security (Variant with laser class 2 for measurements on very dark objects optional)
- Simple and fast setup using the intuitive LCD display
- Robust metal housing – sensor durability even in challenging processes
- Thickness or parallel differential measurement in master-slave mode

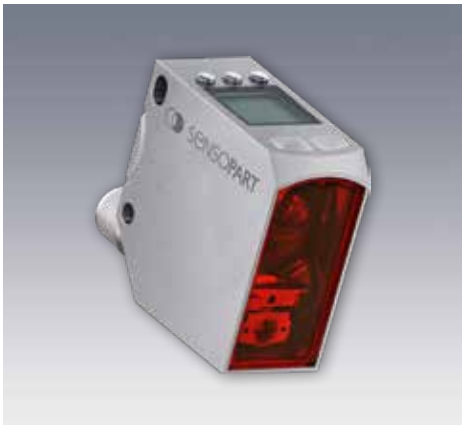
Well-equipped with FT 55-RLAM

This unique combination of characteristics makes the FT 55-RLAM sensor ideally suited for diverse sectors and applications, for example precise positioning in robotics tasks, measuring coil diameters or monitoring the tension of web materials. Thanks to the master-slave function, the sensor can also be used for width or thickness measurements. One sensor – countless applications!

FT 55-RLAM – Product Overview				
	Operating distance			Page
FT 55-RLAM-480	120 … 600 mm	Scanning on object	Analogue measurement value output or IO-Link, display, Variants with laser class 1 or laser class 2	209
FT 55-RLAM-800	200 ... 1000 mm	Scanning on object	Analogue measurement value output or IO-Link, display, Variants with laser class 1 or laser class 2	211

FT 55-RLAM-480

Distance sensor for a wide range of applications



PRODUCT HIGHLIGHTS

- Operating range up to 600 mm enables versatile applications in which precision at large distances is required
- Precise measurements thanks to repeatability up to ≤ 20 µm
- Switching hysteresis of 1.2 enables smart part detection even at large distances up to 600 mm
- Variant with laser class 2 for measurements on very dark objects

Optical data		Functions	
Operating range[1]	120 … 600 mm	Indicator LED 1, green	Operating voltage indicator
Resolution (14 Bit)	30 µm	Indicator LED 2, yellow	Status indicator Q_1 / Q_2
Linearity (typ.)[1]	± 0.6 mm	Measurement range adjustment	Via display or IO-Link
Repeatability[1]	20 … 200 µm, see illustration repeatability	Adjustment possibilities	Teach-in Q_1, Q_2, Q_A, Q as switching window or switching point Setting of mean value at Q_A Auto-Detect / NPN / PNP / Push-Pull Smart Functions (On-delay and drop-out delay, counter, impulse, frequency)
Hysteresis[1]	≤ 1.2 mm		
Type of light	Laser, red 655 nm		
Immunity to ambient light	≤ 20,000 lux[2]		
Light spot size (w x h)	4 x 1 mm		
Measurement frequency	5 kHz[3]		
Laser class (IEC 60825-1)	1 / 2, see selection table		

Electrical data			
Operating voltage $+U_B$	15 … 30 V DC	Load	≤ 1 kOhm (2 ... 10 mA) ≤ 500 Ohm (4 … 20 mA) ≥ 2 kOhm (0 … 10 V, 2 ... 10 V)
Power consumption	≤ 1.5 W		
Output current Ie Q	< 50 mA		
Protection circuits	Reverse polarity protection U_B / short-circuit protection (Q)	Switching frequency f (ti/tp 1:1) Q	≤ 1000 Hz[5]
Protection class	2	Response time Q	600 µs[6]
Power On Delay	< 300 ms	Update time Q_A	400 us[7]
Switching output Q	Auto-Detect[4] / PNP / NPN / Push-Pull	Averaging time Q_A[8]	1 ms, 10 ms, 100 ms, 1000 ms
Output function Q	N.O./N.C.	Response time Q_A	Update time Q_A + averaging time Q_A
Temperature drift Q_A / digital	< 0.02 %/K / 0.01 %/K	Analogue output Q_A	2 … 10 mA / 4 … 20 mA 0 … 10 V / 2 … 10 V
Warm-up time	20 min.		

Mechanical data			
Dimensions	50 x 50.5 x 25 mm	Ambient temperature: operation	-20 … +50 °C[10]
Enclosure rating	IP 67 & IP 69[9]	Ambient temperature: storage	-20 … +60 °C
Material, housing	Zinc die-cast, matt chrome	Weight (plug device)	185 g
Material, front screen / Display	PMMA	Resistance to vibration and impacts	EN 60947-5-2
Type of connection	See selection table	Display	LCD, with background illumination

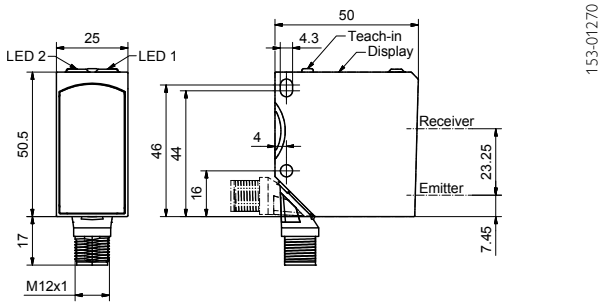
[1] 5 ... 90 %; homogenous object, not moving [2] Laser class 2: 3000 Lux [3] Laser class 2: 2.5 kHz [4] Auto-Detect: Automatic selection of PNP or NPN by the sensor, PNP or NPN can be fixed [5] Laser class 2: 500 Hz [6] Laser class 2: 1 ms [7] Laser class 2: 800 µs [8] Scalable [9] With connected IP 67 / IP 69 plug [10] UL: max. +45 °C

IO-Link			
Communication mode	COM 2	Length process data	32 Bit
Min. cycletime	3 ms	Data Storage	compatible
SIO mode	Compatible	Specification	1.1

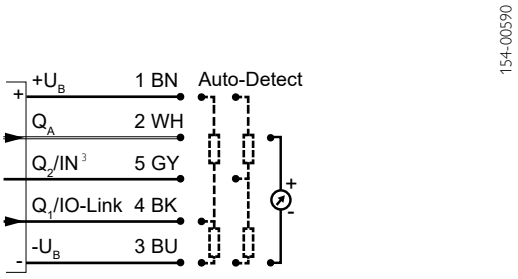
Version: 05/2020. Subject to changes; diagrams similar

Interface	Type of connection	Laser class	Part Number	Article number
IO-Link	Plug, M12x1, 5-pin, IO-Link	1	FT 55-RLAM-480-PNSUIDL-L5M	624-41004
RS485	Plug, M12x1, 8-pin	1	FT 55-RLAM-480-PNSUID-S1L8M	624-41005
IO-Link	Plug, M12x1, 5-pin, IO-Link	2	FT 55-RL2AM-480-PNSUIDL-L5M	624-41008

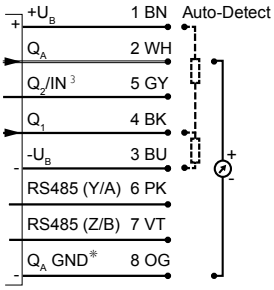
Plug connection and optical axis



Connection, 5-pin, Auto-Detect[1,2]



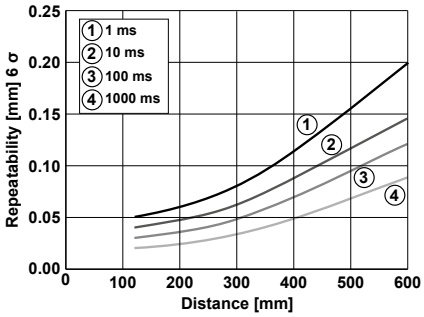
Connection, 8-pin, Auto-Detect[1,2]



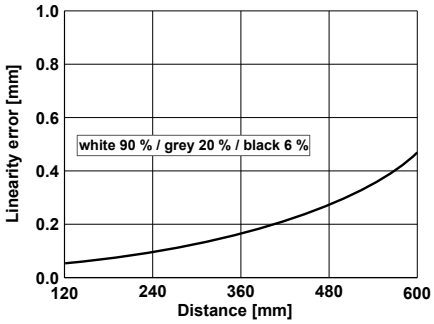
*8 PIN fonctionnant avec un cable de norme DIN EN 60947-5-5 / IEC = 2007

[1] In IO-Link mode, a 4-pin cable must be used [2] For analogue transmisson of measured values we recommend shielded cables [3] Can be used as output or input

Repeatability (typ.)[4]



Linearity error (typ.)



[4] Repeatability 6 σ, 5 ... 90 %, homogenous object, not moving

Default setting

Analogue output Q$_A$	4 ... 20 mA, Measurement range limits
Switching output Q$_1$	280 mm, N.O.
Switching output Q$_2$	440 mm, N.O

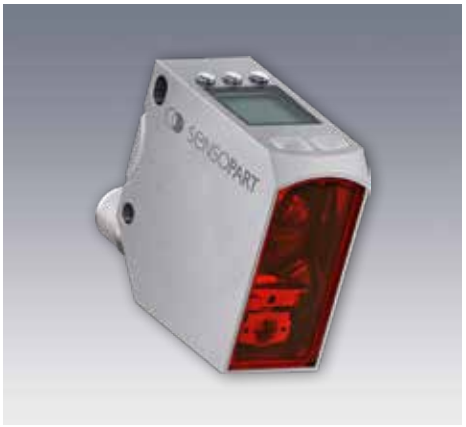
Accessories

Connection cable 8-pin to 4-pin for SensoIO (L8/L4-2m-PUR / 902-51857)[5]	From Page A-44
Further connection cables	From Page A-44
Bracket SensoClip MBD F 55ST2 (579-50012)	From Page A-4
SensoIO (901-01001)	From Page A-52

[5] For 8-pin versions, use DIN EN 60947-5-2 / IEC = 2007 compliant cables, see From Page A-44

FT 55-RLAM-800

Distance sensor for a wide range of applications



PRODUCT HIGHLIGHTS

- Operating range up to 1 m enables versatile applications in which precision at large distances is required
- Precise measurements thanks to repeatability up to ≤ 40 µm
- Switching hysteresis of 2 mm enables smart part detection even at large distances up to 1000 mm
- Variant with laser class 2 for measurements on very dark objects

Optical data		Functions	
Operating range[1]	200 … 1000 mm	Indicator LED 1, green	Operating voltage indicator
Resolution (14 Bit)	50 µm	Indicator LED 2, yellow	Status indicator Q_1 / Q_2
Linearity (typ.)[1]	± 1.5 mm	Measurement range adjustment	Via display or IO-Link
Repeatability[1]	40 … 820 µm, see illustration repeatability	Adjustment possibilities	Teach-in Q_1, Q_2, Q_A, Q as switching window or switching point Setting of mean value at Q_A Auto-Detect / NPN / PNP / Push-Pull Smart Functions (On-delay and drop-out delay, counter, impulse, frequency)
Hysteresis[1]	≤ 2 mm		
Type of light	Laser, red 655 nm		
Immunity to ambient light	≤ 20,000 lux[2]		
Light spot size (w x h)	4 x 1 mm		
Measurement frequency	5 kHz[3]		
Laser class (IEC 60825-1)	1 / 2, see selection table		

Electrical data			
Operating voltage $+U_B$	15 … 30 V DC	Load	≤ 1 kOhm (2 ... 10 mA) ≤ 500 Ohm (4 … 20 mA) ≥ 2 kOhm (0 … 10 V, 2 ... 10 V)
Power consumption	≤ 1.5 W		
Output current Ie Q	< 50 mA		
Protection circuits	Reverse polarity protection U_B / short-circuit protection (Q)	Switching frequency f (ti/tp 1:1) Q	≤ 1000 Hz[5]
Protection class	2	Response time Q	600 µs[6]
Power On Delay	< 300 ms	Update time Q_A	400 µs[7]
Switching output Q	Auto-Detect[4] / PNP / NPN / Push-Pull	Averaging time Q_A[8]	1 ms, 10 ms, 100 ms, 1000 ms
Output function Q	N.O./N.C.	Response time Q_A	Update time Q_A + averaging time Q_A
Temperature drift Q_A / digital	< 0.02 %/K / 0.01 %/K	Analogue output Q_A	2 … 10 mA / 4 … 20 mA 0 … 10 V / 2 … 10 V
Warm-up time	20 min.		

Mechanical data			
Dimensions	50 x 50.5 x 25 mm	Ambient temperature: operation	-20 … +50 °C[10]
Enclosure rating	IP 67 & IP 69[9]	Ambient temperature: storage	-20 … +60 °C
Material, housing	Zinc die-cast, matt chrome	Weight (plug device)	185 g
Material, front screen / Display	PMMA	Resistance to vibration and impacts	EN 60947-5-2
Type of connection	See selection table	Display	LCD, with background illumination

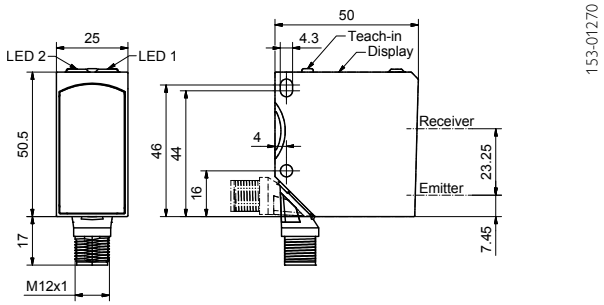
[1] 5 ... 90 %; homogenous object, not moving [2] Laser class 2: 3000 Lux [3] Laser class 2: 2.5 kHz [4] Auto-Detect: Automatic selection of PNP or NPN by the sensor, PNP or NPN can be fixed [5] Laser class 2: 500 Hz [6] Laser class 2: 1 ms [7] Laser class 2: 800 µs [8] Scalable [9] With connected IP 67 / IP 69 plug [10] UL: max. +45 °C

IO-Link			
Communication modus	COM 2	Length process data	32 Bit
Min. cycletime	3 ms	Data Storage	compatible
SIO mode	Compatible	Specification	1.1

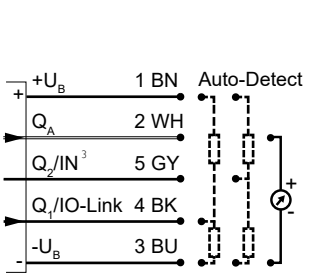
Version: 05/2020. Subject to changes; diagrams similar

Interface	Type of connection	Part Number	Article number
IO-Link	Plug, M12x1, 5-pin, IO-Link	FT 55-RLAM-800-PNSUIDL-L5M	624-41006
RS485	Plug, M12x1, 8-pin	FT 55-RLAM-800-PNSUID-S1L8M	624-41007
IO-Link	Plug, M12x1, 5-pin, IO-Link	FT 55-RL2AM-800-PNSUIDL-L5M	624-41009

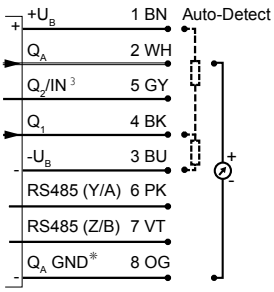
Plug connection and optical axis



Connection, 5-pin, Auto-Detect[1,2]



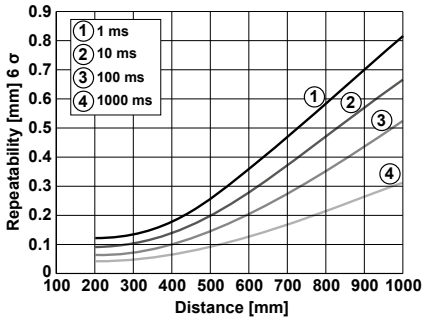
Connection, 8-pin, Auto-Detect[1,2]



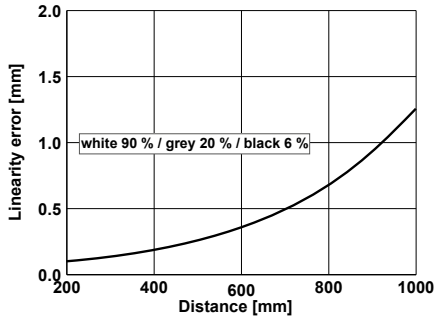
*8 PIN fonctionnant avec un cable de norme DIN EN 60947-5-5 / IEC = 2007

[1] In IO-Link mode, a 4-pin cable must be used [2] For analogue transmisson of measured values we recommend shielded cables [3] Can be used as output or input

Repeatability (typ.)[4]



Linearity error (typ.)



[4] Repeatability 6 σ, 5 ... 90 %, homogenous object, not moving

Default setting

Analogue output Q_A	4 ... 20 mA, Measurement range limits
Switching output Q_1	450 mm, N.O.
Switching output Q_2	750 mm, N.O

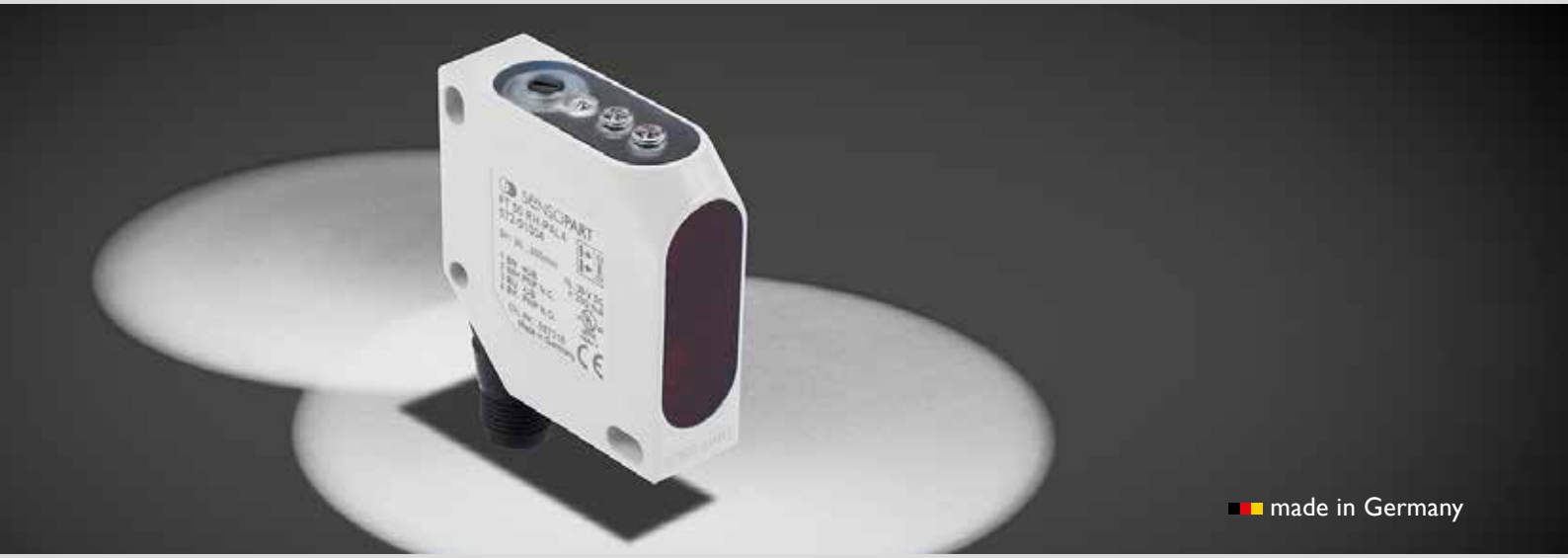
Accessories

Connection cable 8-pin to 4-pin for SensoIO (L8/L4-2m-PUR / 902-51857)[5]	From Page A-44
Further connection cables	From Page A-44
Bracket SensoClip MBD F 55ST2 (579-50012)	From Page A-4
SensoIO (901-01001)	From Page A-4
	From Page A-52

[5] For 8-pin versions, use DIN EN 60947-5-2 / IEC = 2007 compliant cables, see From Page A-44

FT 50 – laser distance sensors

Precise and rapid measurement with many extras



Independent of reflectivity
These highly precise triangulation sensors are predestined for the detection of differing materials thanks to their high contrast-independence.

TYPICAL FT 50

- Laser distance sensors with a variety of measurement ranges
- Shape and color of the target object is largely irrelevant
- High accuracy and resolutions up to 7 µm
- Rapid response time up to 1 kHz
- Intelligent teach-in user concept
- 2 switching outputs
- Analogue output: 4 … 20 mA / 0 … 10 V
- Variants with serial interface for measuring differences and thicknesses in master/slave mode
- ABS housing with rotatable plug

These distance sensors are particularly easy to commission thanks to their fixed operating distances. Voltage rises linearly with increasing distance.

Regardless of the reflectivity of the target object, these sensors provide excellent measurement results and their comprehensive range of functions is impressive.

The optional serial interface allows user-friendly configuration via PC, providing visualisation of measurement values.

FT 50 / FT 80 – Product Overview				
	Housing dimensions	Operating range	Special features	Page
FT 50 RLA-20	50 x 17 x 50 mm	40 … 60 mm	Analogue output	215
FT 50 RLA-40	50 x 17 x 50 mm	45 … 85 mm	Analogue output	217
FT 50 RLA-70 -100 -220	50 x 17 x 50 mm	30 … 100 mm 70 … 170 mm 80 … 300 mm	Analogue output, switching outputs, simple teach-in of measurement ranges; RS485 interface	219

FT 50 RLA 20

Distance sensor

PRODUCT HIGHLIGHTS

- High resolution and small laser light spot
- Operating range: 40 … 60 mm
- Small, easily visible laser light spot
- No adjustments necessary
- Resolution: 7 µm / 40 µm
- Analogue output: 0 … 10 V
- Device plug rotatable through 270°

Optical data	
Operating range	40 … 60 mm[1]
Measurement range	20 mm
Type of light	Laser, red, 670 nm
Laser Class (IEC 60825-1)	1
Resolution	40 µm / 7µm (see selection table)
Linearity	< 1 %
Light spot size	< 1 mm at 50 mm
Repeatability	< 0.1 mm / 0.05 mm (see selection table)

Functions	
Indicator LED, green	Operating voltage indicator
Indicator LED, red	Contamination indicator
Scanning distance adjustment	Fixed setting

Electrical data	
Operating voltage, $+U_B$	18 … 28 V DC
No-load current, I_0	≤ 35 mA
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection, Q
Protection Class	2
Analogue output	0 … 10 V / max. 3 mA
Limit frequency	400 Hz / 40 Hz (see selection table)
Temperature drift	10 µm / K
Rise time (10 to 90 %)	3 ms / 30 ms (see selection table)
Fall time (90 to 10 %)	2 ms / 20 ms (see selection table)

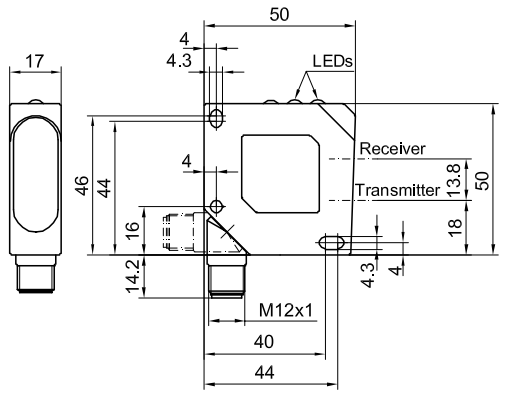
Mechanical data	
Dimensions	50 x 50 x 17 mm
Enclosure rating	IP 67[2]
Material, housing	ABS, impact-resistant
Material, front screen	PMMA
Type of connection	See selection table
Ambient temperature: operation	0 … +45 °C
Ambient temperature: storage	-20 … +60 °C
Weight (plug device)	40 g
Weight (cable device)	260 g
Vibration and impact resistance	EN 60947-2

[1] Reference material: Kodak grey, 18 % [2] With connected IP 67 plug

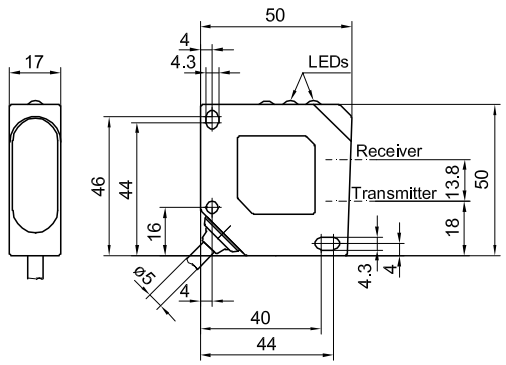
Resolution	Repeatability	Rise time	Fall time	Limit frequency	Type of connection	Part number	Article number
40 µm	< 0.1 mm	3 ms	2 ms	400 Hz	Plug, M12x1, 4-pin	FT 50 RLA-20-F-L4S	574-41005
7 µm	< 0.05 mm	30 ms	20 ms	40 Hz	Plug, M12x1, 4-pin	FT 50 RLA-20-S-L4S	574-41007
40 µm	< 0.1 mm	3 ms	2 ms	400 Hz	Cable, 6 m, 4-wire	FT 50 RLA-20-F-K5	574-41004
7 µm	< 0.05 mm	30 ms	20 ms	40 Hz	Cable, 6 m, 4-wire	FT 50 RLA-20-S-K5	574-41006

Version: 10/2020. Subject to changes; diagrams similar

Plug connection

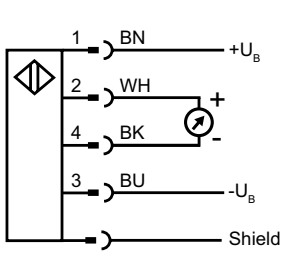


Cable connection

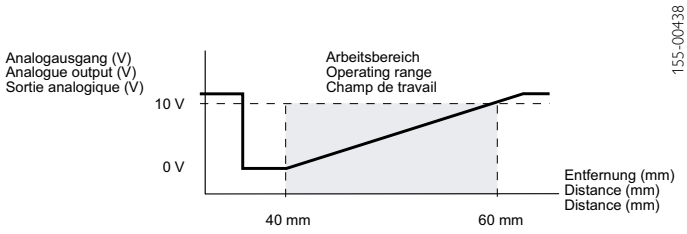


5

Connection, 4-pin



Characteristic output curve



Accessories

Connection cables	From Page A-44
Brackets	From Page A-4

FT 50 RLA 40

Distance sensor

PRODUCT HIGHLIGHTS

- High resolution and small light spot
- Operating range: 45 … 85 mm
- Laser red light (670 nm)
- Small, easily visible light spot
- No adjustments necessary
- Resolution: 0.02 mm / 0.08 mm
- Analogue output: 0 … 10 V
- Device plug rotatable through 270°

Optical data		Functions	
Operating range	45 … 85 mm[1]	Indicator LED, green	Operating voltage indicator
Measurement range	40 mm	Indicator LED, red	Contamination indicator
Type of light	Laser, red, 670 nm	Scanning distance adjustment	Fixed setting
Laser Class (IEC 60825-1)	1		
Resolution	80 µm / 20 µm (see selection table)		
Linearity	< 1 %		
Light spot size	< 0.8 mm at 65 mm		
Repeatability	< 0.2 mm / 0.1 mm (see selection table)		

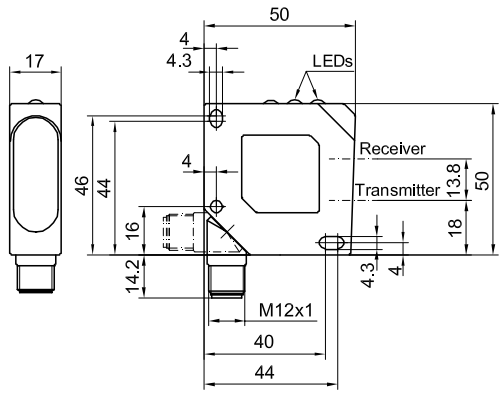
Electrical data		Mechanical data	
Operating voltage, $+U_B$	18 … 28 V DC	Dimensions	50 x 50 x 17 mm
No-load current, I_0	≤ 35 mA	Enclosure rating	IP 67[2]
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection, Q	Material, housing	ABS, impact-resistant
		Material, front screen	PMMA
Protection Class	2	Type of connection	See selection table
Analogue output	0 … 10 V (max. 3 mA)	Ambient temperature: operation	0 … +45 °C
Limit frequency	400 Hz / 40 Hz (see selection table)	Ambient temperature: storage	-20 … +60 °C
Temperature drift	18 µm / K	Weight (plug device)	40 g
Rise time (10 to 90 %)	3 ms / 30 ms (see selection table)	Weight (cable device)	260 g
Fall time (90 to 10 %)	2 ms / 20 ms (see selection table)	Vibration and impact resistance	EN 60947-2

[1] Reference material: Kodak grey, 18 % [2] With connected IP 67 plug

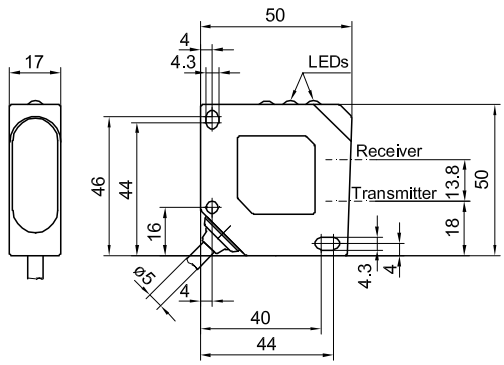
Resolution	Repeatability	Rise time	Fall time	Limit frequency	Type of connection	Part number	Article number
80 µm	< 0.2 mm	3 ms	2 ms	400 Hz	Plug, M12x1, 4-pin	FT 50 RLA-40-F-L4S	574-41001
20 µm	< 0.1 mm	30 ms	20 ms	40 Hz	Plug, M12x1, 4-pin	FT 50 RLA-40-S-L4S	574-41003
80 µm	< 0.2 mm	3 ms	2 ms	400 Hz	Cable, 6 m, 4-wire	FT 50 RLA-40-F-K5	574-41000
20 µm	< 0.1 mm	30 ms	20 ms	40 Hz	Cable, 6 m, 4-wire	FT 50 RLA-40-S-K5	574-41002

Version: 10/2020. Subject to changes; diagrams similar

Plug connection

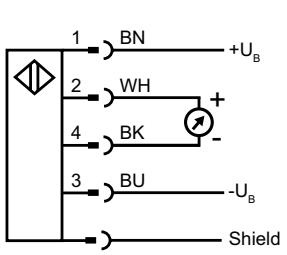


Cable connection

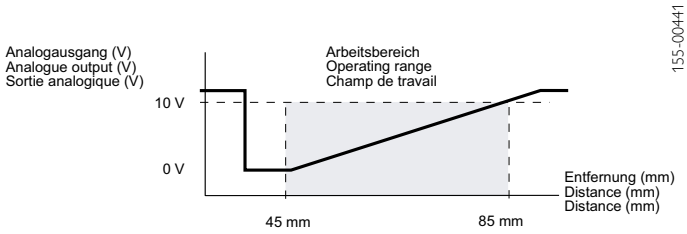


5

Connection, 4-pin



Characteristic output curve



Accessories

Connection cables	From Page A-44
Brackets	From Page A-4

FT 50 RLA 70 / 100 / 220

Distance sensor

PRODUCT HIGHLIGHTS

- Precise distance measurement
- Largely independent of target object reflectivity (highly reflective and glossy objects)
- High long-term stability and low temperature effects
- High resolution
- Very high update rate of analogue output (response time)
- One switching output, one analogue output 4 ... 20 mA
- Simple adjustment via teach-in button

Optical data	
Operating range	30 … 100 mm / 70 … 170 mm / 80 … 300 mm[1]
Measurement range	70 mm, 100 mm, 220 mm
Type of light	Laser, red, 650 nm
Laser Class (IEC 60825-1)	1
Resolution	< 0.1 % of operating range end-value[2] (see selection table)
Linearity	< 0.25 % of operating range end-value (see selection table)
Repeatability	< 0.25 % of measurement value

Functions	
Indicator LED, green	Operating voltage indicator
Indicator LED, yellow	Switching output indicator
Scanning distance adjustment	Via Teach-in button and control input
Adjustment possibilities	N.O. / N.C. via Teach-in button and control input Button lock via control input

Electrical data	
Operating voltage, $+U_B$	18 … 30 V DC
No-load current, I_0	≤ 40 mA
Output current, Ie	≤ 100 mA
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection, Q
Protection Class	2
Power On Delay	< 300 ms
Switching output, Q	PNP
Output function	N.O./N.C.
Max. capacitive load, Q	< 100 nF
Analogue output	4 … 20 mA
Temperature drift	< 0.02 % of operating range end-value / K
Load	≤ 500 Ω (recommended)
Switching frequency, f (ti/tp 1:1)	≤ 1 kHz (speed mode) ≤ 10 Hz (averaging mode)
Response time	0.4 ms (speed mode) 40 ms (averaging mode)
Control input, IN	When High ($+U_B$) = laser disable When Low ($-U_B$) = button lock When open = free-running

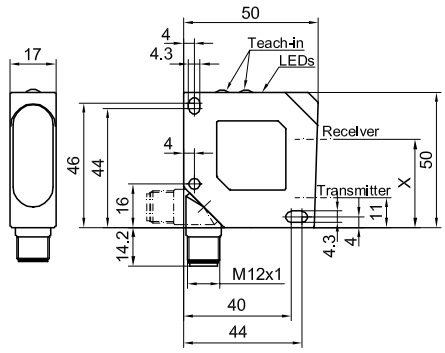
Mechanical data	
Dimensions	50 x 50 x 17 mm
Enclosure rating	IP 67[3]
Material, housing	ABS, impact-resistant
Material, front screen	PMMA
Type of connection	See selection table
Ambient temperature: operation	-10 … +60 °C
Ambient temperature: storage	-20 … +80 °C
Weight	43 g
Vibration and impact resistance	EN 60947-2

[1] Reference material: Kodak grey, 18 % [2] Smallest measurable change [3] With connected IP 67 plug

Operating range	Measurement range	Resolution	Linearity	Type of connection	Part number	Article number
30 … 100 mm	70 mm	0.1 mm	0.25 mm	Plug, M12x1, 5-pin	FT 50 RLA-70-PL5	574-41027
70 … 170 mm	100 mm	0.17 mm	0.42 mm	Plug, M12x1, 5-pin	FT 50 RLA-100-PL5	574-41032
80 … 300 mm	220 mm	0.3 mm	0.75 mm	Plug, M12x1, 5-pin	FT 50 RLA-220-PL5	574-41029

Version: 10/2020. Subject to changes; diagrams similar

Plug connection



153-00716

Type

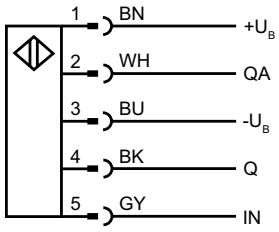
FT 50 RLA 70
FT 50 RLA 100
FT 50 RLA 220

X (distance, receiver)

29.4 mm
32.5 mm
32.5 mm

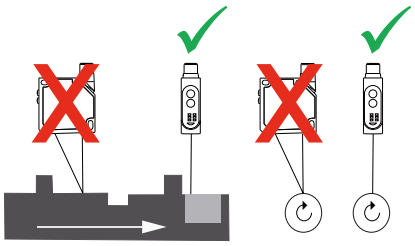
5

Connection, 5-pin

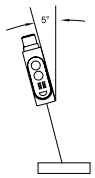


154-00176

Installation



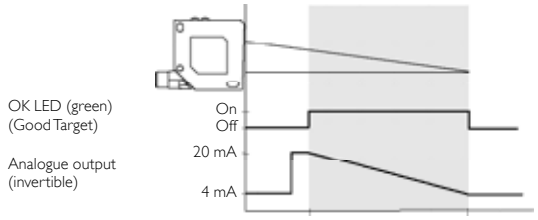
155-00270



155-00274

Characteristic analogue curve

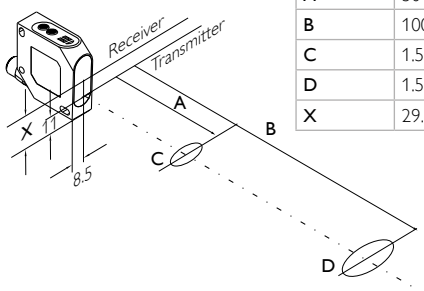
Operating range (default setting)



FT 50 RLA 70	30 mm	100 mm
FT 50 RLA 100	70 mm	170 mm
FT 50 RLA 220	80 mm	300 mm

155-00271

Light spot geometry



FT 50 RLA	70 …	100 …	220 …
A	30	70	80
B	100	170	300
C	1.5 x 3	1.5 x 3.5	1.5 x 3.5
D	1.5 x 3.25	1.7 x 3.9	2 x 4.5
X	29.4	32.5	32.5

155-00269

Accessories

Connection cables	From Page A-44
Brackets	From Page A-4

FT 50 RLA 70 / 100 / 220

Distance sensor with RS485 interface

PRODUCT HIGHLIGHTS

- Largely independent of target object reflectivity (highly reflective and glossy objects)
- RS485 interface for parameterisation and measurement value output
- High resolution
- Rapid response time
- 2 switching outputs, 1 analogue output 4 ... 20 mA
- High long-term stability and low temperature effects

Optical data	
Operating range	30 … 100 mm / 70 … 170 mm / 80 … 300 mm[1]
Measurement range	70 mm, 100 mm, 220 mm
Type of light	Laser, red, 650 nm
Laser Class (IEC 60825-1)	1
Resolution	< 0.1 % of operating range end-value (0.1 mm / 0.17 mm/ 0.3 mm)[2]
Linearity	< 0.25 % of operating range end-value (0.25 mm / 0.42 mm / 0.75 mm)
Repeatability	< 0.25 % of measurement value

Functions	
Indicator LED, green	Operating voltage indicator
Indicator LED, yellow	Switching output indicator
Scanning distance adjustment	Via Teach-in button and control input
Adjustment possibilities	N.O. / N.C. via Teach-in button and control input Button lock via control input
Default settings	Max. scanning distance and N.O.

Electrical data	
Operating voltage, $+U_B$	18 … 30 V DC
No-load current, I_0	≤ 40 mA
Output current, Ie	≤ 100 mA
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection, Q (not Type S1)
Protection Class	2
Power On Delay	≤ 300 ms
Switching output, Q_1 / Q_2	PNP
Output function	N.O./N.C.
Analogue output	4 … 20 mA
Temperature drift	< 0.02 % of operating range end-value / K
Load	≤ 500 Ω
Switching frequency, f (ti/tp 1:1)	≤ 1000 Hz
Response time	≥ 0.4 ms (when mean value formation = off) / 4 ms / 40 ms to end-value
Serial interface	See selection table

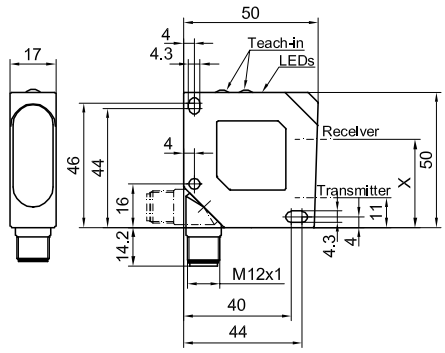
Mechanical data	
Dimensions	50 x 50 x 17 mm
Enclosure rating	IP 67[3]
Material, housing	ABS, impact-resistant
Material, front screen	PMMA
Type of connection	See selection table
Ambient temperature: operation	-10 … +60 °C
Ambient temperature: storage	-20 … +80 °C
Weight	43 g
Vibration and impact resistance	EN 60947-2

[1] Reference material: Kodak grey, 18 % [2] Smallest measurable change [3] With connected IP 67 plug

Scanning distance	Measurement range	Resolution	Linearity	Serial interface	Type of connection	Part number	Article number
30 … 100 mm	70 mm	0,1 mm	0,25 mm	–	Plug, M12x1, 8-pin	FT 50 RLA-70-L8	574-41018
30 … 100 mm	70 mm	0,1 mm	0,25 mm	RS485	Plug, M12x1, 8-pin	FT 50 RLA-70-S1L8	574-41019
70 … 170 mm	100 mm	0,17 mm	0,42 mm	RS485	Plug, M12x1, 8-pin	FT 50 RLA-100-S1L8	574-41033
80 … 300 mm	220 mm	0,3 mm	0,75 mm	–	Plug, M12x1, 8-pin	FT 50 RLA-220-L8	574-41014
80 … 300 mm	220 mm	0,3 mm	0,75 mm	RS485	Plug, M12x1, 8-pin	FT 50 RLA-220-S1L8	574-41015

Version: 10/2020. Subject to changes; diagrams similar

Plug connection

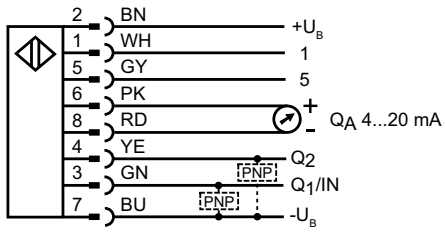


153-00716

Type	X (distance, receiver)
FT 50 RLA 70	29,4 mm
FT 50 RLA 100	32,5 mm
FT 50 RLA 220	32,5 mm

5

Connection, 8-pin

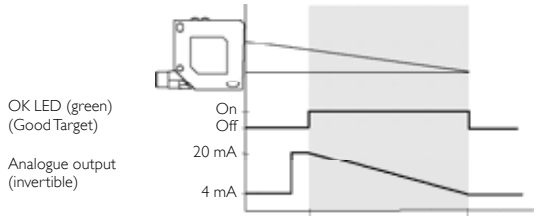


154-00127

Type	Pin 1	Pin 5
FT 50 RLA -S1L8. FT 50 RLA -L8.	RS485 Y/A –	RS485 Z/B –

Characteristic analogue curve

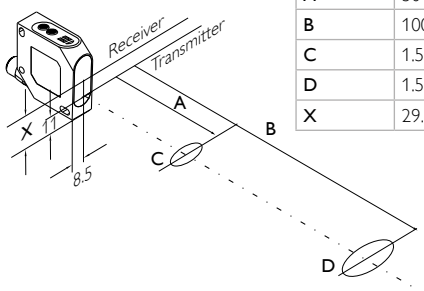
Operating range (default setting)



FT 50 RLA 70	30 mm	100 mm
FT 50 RLA 100	70 mm	170 mm
FT 50 RLA 220	80 mm	300 mm

155-00271

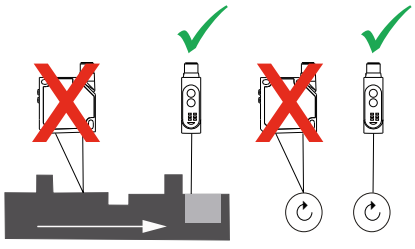
Light spot geometry



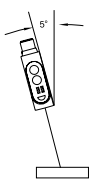
FT 50 RLA	70 …	100 …	220 …
A	30	70	80
B	100	170	300
C	1.5 x 3	1.5 x 3.5	1.5 x 3.5
D	1.5 x 3.25	1.7 x 3.9	2 x 4.5
X	29.4	32.5	32.5

155-00269

Installation



155-00270



155-00274

Accessories

Connection cables	From Page A-44
Brackets	From Page A-4

F 55 – Time-of-flight sensors with long scanning range

Compact sensors for precision measuring tasks and reliable object detection

Reliable object detection:
Even objects with highly reflective metal surfaces and at critical measurement angles are reliably detected.

Precise fine adjustment:
The clever mounting and adjustment concept has been specially developed for FT 55 distance sensors. Small changes in angle allow precise alignment of the light spot, even at long distances.

TYPICAL F 55

- Long ranges and scanning distances (up to 5 m on light objects and 3 m on dark ones)
- Reliable object detection against any backgrounds thanks to light time-of-flight process
- High switching frequency (500/250 Hz) for rapid processes
- High repeatability in the mm range
- Laser class 1 – for optimum security
- Glass-fibre reinforced, hermetically-sealed plastic housing (IP67/IP69K)
- Simple mounting and use (dovetail, teach-in)
- IO-Link with 2 switching outputs, smart functions and measured value output

Measuring or switching – the right variant for every application

Measuring distances: laser distance sensors with analogue output

The distance sensors that function according to the time-of-flight principle measure distances ranging from 60 mm to 5 m with utmost precision. They provide a signal that is proportional to the distance via the integrated analogue output (4…20 mA/0… 10 V, invertible characteristics) and also have a switching output with switching window function that is adjustable independently of the analogue measurement range. The measuring distance sensor with analogue output is used, for example, for inspecting the diameter of coils, positioning robots or measuring filling levels and stack heights.

Object detection: laser proximity sensor with background suppression

The proximity sensor variants of type FT 55-RLHP2 are available with one or two digital switching outputs and offer reliable object detection at long distances (up to 5 m on white objects and 3 m on black objects). Dependable detection of the target object is also guaranteed in front of interfering backgrounds regardless of the color, shape, structure and alignment of the object. The light time-of-flight scanners are used, for example, for inspecting the mounting of rubber and plastic components during car production, for checking the occupancy of shelves in high-bay warehouses, or for inspecting the position of logs.

F 55 – Product Overview

	Operating distance	Functional principle	Special features	Page
FT 55-RLAP	0.1 … 5 m	Scanning on object	Compact design, high flexibility, IO-Link	225
FT 55-RLAP2	0.06 … 5 m	Scanning on object	Compact design, IO-Link	227
FR 55-RLAP	0.3 … 70 m	Reflector	1 analogue output 4 ... 20 mA, 1 switching output, external teach input, compact design, high flexibility, IO-Link	223

FT 55-RLAP

Distance sensor for large distances – Time-of-flight technology

PRODUCT HIGHLIGHTS

- For measurement and control tasks with all object surfaces at long scanning distances
- Stable and precise distance measurement even with tilted objects and with bright, highly reflective backgrounds
- Detection of all objects in front of fixed backgrounds via switching output
- High flexibility thanks to invertible analogue characteristic (Q_A) and window mode (Q)
- Easy installation and operation via external teach-in
- Clearly visible laser light spot (laser class 1) for an easy alignment and full eye safety

Optical data		Functions	
Measurement range	0.1 ... 5 m (see selection table)[1]	Indicator LED 2, green	Operating voltage indicator
Type of light	Laser, red 655 nm	Indicator LED 2, yellow	Status indicator analogue output
Laser class (IEC 60825-1)	1	Indicator LED 1 yellow	Switching output indicator
Resolution	< 5 mm	Measurement range adjustment	Via Teach-in button or control input
Hysteresis	20 mm	Adjustment possibilities	Analogue measurement range Q_A Invertible analogue characteristic Switching output Q (window mode) N.O. / N.C. and Auto-Detect / NPN / PNP via teach-in and control line, wide variety of adjustment possibilities for service and process data via IO-Link
Linearity	± 15 mm (see diagram)[2]		
Repeatability	≤ 7 mm (6 σ, see diagram)[1,3]		
		Default settings	See selection table

Electrical data			
Operating voltage $+U_B$	18 … 30 V DC	Response time Q	2 ms
No-load current I_0	≤ 60 mA	Load	≤ 500 Ohm (4 ... 20 mA) ≥ 4 k Ohm (0 … 10 V)
Output current Ie Q	≤ 100 mA	Analogue output Q_A	4 … 20 mA / 0.1 … 10 V
Protection circuits	Reverse polarity protection U_B / short-circuit protection (Q)	Update time Q_A	2 / 20 ms
Protection class	2	Factors averaging time[8]	1 / 10 / 20 / 30 / 40 / 50 / 60 / 70 / 80 / 90 / 100
Power On Delay	< 500 ms	Response time Q_A	2 / 20 ms x factor averaging time
Switching output Q	Auto-Detect (PNP/NPN)[4]	Temperature drift	< 1 mm / K
Output function	N.O./N.C.	Warm-up time	20 min.
Switching frequency f (ti/tp 1:1) Q	≤ 250 Hz	Control input IN	$+U_B$ = Teach-in / $-U_B$ = button locked Open = normal operation

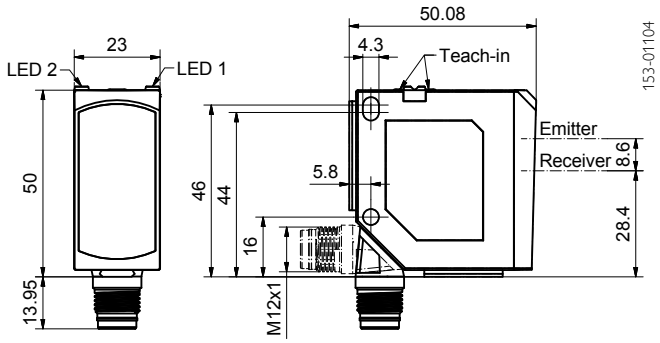
Mechanical data		IO-Link	
Dimensions	50 x 50.1 x 23 mm	Communication mode	COM 2
Enclosure rating	IP 67 & IP 69K[5]	Min. cycle time	2.7 ms
Material, housing	ABS	SIO mode	Compatible
Material, front screen	PMMA	Process bit length	24 Bit
Type of connection	See selection table	Specification	1.1
Ambient temperature: operation	-40 … +60 °C[6,7]		
Ambient temperature: storage	-40 … +80 °C		
Weight (plug device)	42 g		
Resistance to vibration and impacts	EN 60947-5-2		

[1] Reference material 90 % reflectivity [2] 20 ... 90 % [3] At 50 Hz [4] Auto-Detect: Automatic selection of PNP or NPN by the sensor, PNP or NPN can be fixed
[5] With connected IP 67 / IP 69K plug [6] Up to +50 °C with current output 4 ... 20 mA [7] UL: max. +45 °C [8] adjustable via IO-Link, e. g. with SensoIO

Measurement range[1]	Analogue output	Switching output	Type of connection	Part Number	Article number
0.1… 5 m	4 … 20 mA	Auto-Detect	Plug, M12x1, 5-pin, IO-Link	FT 55-RLAP-5-PNSIL-L5	622-21023
0.1 … 5 m	0 … 10 V	Auto-Detect	Plug, M12x1, 5-pin, IO-Link	FT 55-RLAP-5-PNSUL-L5	622-21024

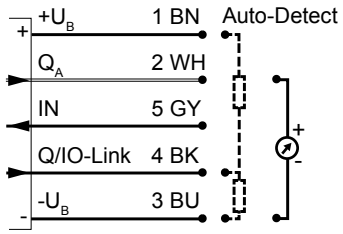
Version: 02/2021. Subject to changes; diagrams similar

Plug connection



153-01104

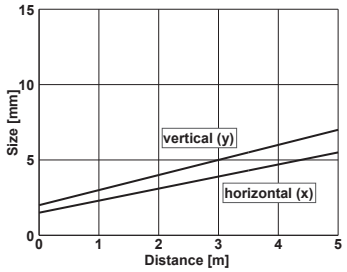
Connection, 5-pin, Auto-Detect



154-00567

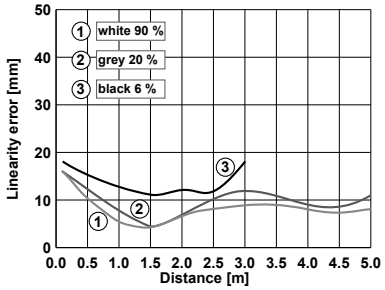
5

Light spot size



155-01741

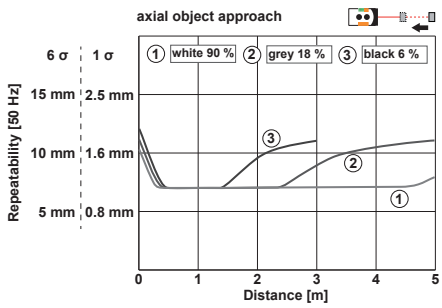
Linearity error (typ.)[9, 10]



155-03528

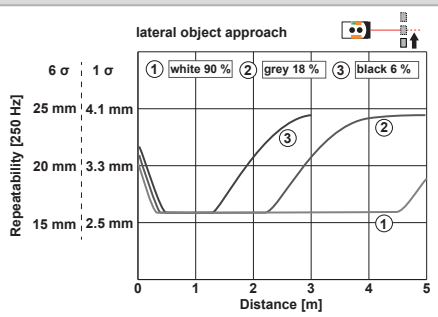
[9] Output via IO-Link [10] Deviation linearity error Q_A < 5 mm from digital value

Repeatability[11] (50 Hz)



155-01839

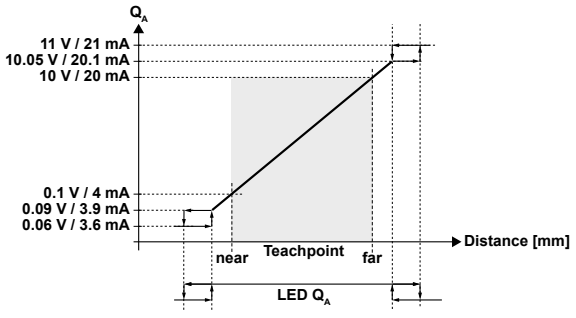
Repeatability[11] (250 Hz[12])



155-01843

[11] At constant ambient conditions [12] Automatic adjustment to 50 Hz at constant distance

Characteristic analogue curve



155-03336

155-01681

Reference material	Measurement range
White (90 %)	0.1 … 5 m
Grey (18 %)	0.1 … 5 m
Black (6 %)	0.1 … 3 m

Default setting[13]

Analogue output Q_A (4…20 mA / 0.1 … 10 V)	0.3 … 3 m
Switching output Q (A_1…A_2), N.O., Auto-Detect	0.3 … 3 m

Accessories

Connection cables	From Page A-44
Brackets	From Page A-4
SensoIO (901-01001)	From Page A-52

[13] The specified precision is achieved by teaching the distances

FT 55-RLAP2

Distance sensor with IO-Link measurement value output

PRODUCT HIGHLIGHTS

- Measurement value output via IO-Link
- For detection tasks with all object surfaces at high scanning distances
- Reliable object detection even with tilted objects and with bright, highly reflective or shiny backgrounds
- Compact housing for an easy integration
- Simple teach-in
- Clearly visible laser light spot (laser class 1) for an easy alignment and full eye safety

Optical data	
Scanning distance	0.06 … 5 m (see selection table)[1]
Type of light	Laser, red 655 nm
Laser class (IEC 60825-1)	1
Resolution	< 5 mm
Hysteresis	20 mm
Linearity	± 15 mm (see diagram)[2]
Repeatability	≤ 7 mm (6 σ, see diagram)[1,2,3]

Functions	
Indicator LED 2 green	Operating voltage indicator
Indicator LED 1 yellow	Switching output indicator Q
Scanning distance adjustment	Via Teach-in button and IO-Link
Adjustment possibilities	N.O. / N.C. and Auto-Detect / NPN / PNP via teach-in and control line, wide variety of adjustment possibilities for service and process data via IO-Link
Default settings	3 m, N.O., Auto-Detect

Electrical data	
Operating voltage $+U_B$	18 … 30 V DC
No-load current I_0	≤ 60 mA
Output current Ie Q	≤ 100 mA
Protection circuits	Reverse polarity protection U_B / short-circuit protection (Q)
Protection class	2
Power On Delay	< 500 ms
Switching output Q	1 x Auto-Detect (PNP/NPN)[4]
Output function	N.O./N.C.
Switching frequency f (ti/tp 1:1) Q	≤ 250 Hz
Response time Q	1 ms
Response time measurement value output	Min. cycle time IO-Link
Temperature drift	< 1 mm / K
Warm-up time	20 min.
Control input IN	$+U_B$ = Teach-in $-U_B$ = button locked Open = normal operation

Mechanical data	
Dimensions	50 x 50.1 x 23 mm
Enclosure rating	IP 67 & IP 69K[5]
Material, housing	ABS
Material, front screen	PMMA
Type of connection	See selection table
Ambient temperature: operation	-40 … +60 °C[6]
Ambient temperature: storage	-40 … +80 °C
Weight (plug device)	42 g
Resistance to vibration and impacts	EN 60947-5-2

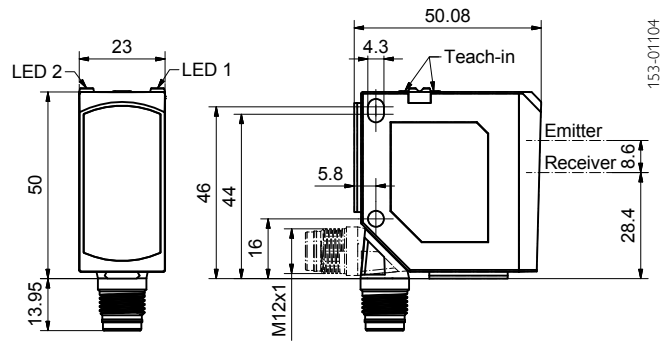
IO-Link	
Communication mode	COM 2
Min. cycle time	2.7 ms
SIO mode	Compatible
Process bit length	24 Bit
Specification	1.1

[1] Reference material 90 % reflectivity [2] 20 ... 90 % [3] 50 Hz [4] Auto-Detect: Automatic selection of PNP or NPN by the sensor, PNP or NPN can be fixed
[5] With connected IP 67 / IP 69K plug [6] UL: max. +45 °C

Scanning distance	Switching output	Type of connection	Part Number	Article number
0.06 ... 5 m	1 x Auto-Detect	Plug, M12x1, 4-pin, IO-Link	FT 55-RLAP2-PNSL-L4	623-11035
0.06 ... 5 m	2 x Auto-Detect	Plug, M12x1, 5-pin, IO-Link	FT 55-RLAP2-2PNSL-L5	622-21022

Version: 02/2021. Subject to changes; diagrams similar

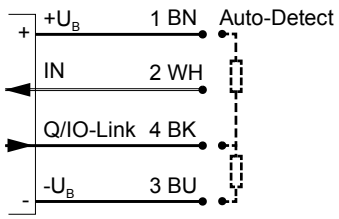
Plug connection[7]



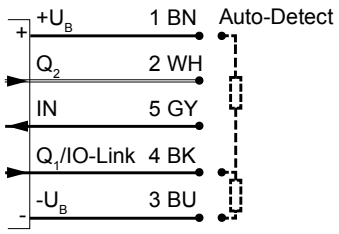
[7] FT 55-RLAP2...L4 with one button I FT 55-RLAP2...L5 with two buttons

5

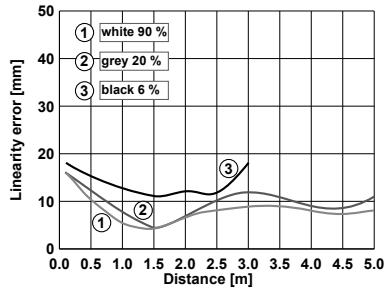
Connection, 4-pin, IO-Link



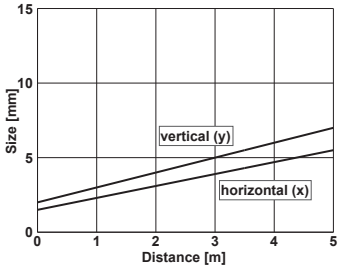
Connection, 5-pin, IO-Link



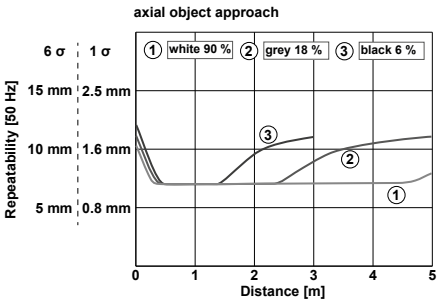
Linearity error (typ.)



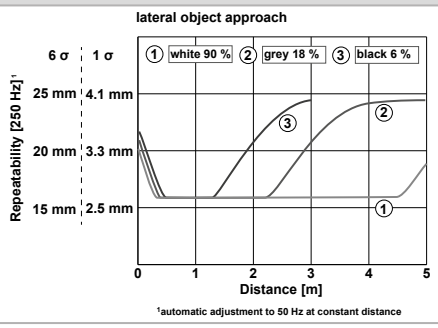
Light spot size



Repeatability[8] (50 Hz)



Repeatability[8] (250 Hz[9])



[8] At constant ambient conditions [9] Automatic adjustment to 50 Hz at constant distance

Reference material	Scanning distance
White (90 %)	0.06 … 5 m
Grey (18 %)	0.06 … 5 m
Black (6 %)	0.06 … 3 m

Accessories	
Connection cables	From Page A-44
Brackets	From Page A-4

FR 55-RLAP

Distance sensor with a reflector for large distances – Time-of-flight technology

PRODUCT HIGHLIGHTS

- Sensor with large range for anticollision and positioning applications
- IO-Link with many functions for an individual application customisation
- Compact design for an easy integration
- Easy installation and operation via external teach-in
- Clearly visible laser light spot (laser class 1) for a precise alignment and full eye safety

Optical data

Measurement range	0.3 ... 70 m[1]
Resolution Q_A	35 mm = 8 µA (11 Bit)[2]
Resolution IO-Link	1 mm
Linearity Q_A	± 0.5 %[1, 3, 4]
Linearity IO-Link	50 ... 350 mm
Repeatability	≤ 6 mm[5] (see selection table)
Hysteresis	60 mm
Type of light	Laser, red 655 nm
Laser class (IEC 60825-1)	1

Functions

Indicator LED 1, green	Operating voltage indicator
Indicator LED 2 yellow	Switching output indicator
Setting measuring range / switching point	Via Teach-in button, control input or IO-Link
Adjustment possibilities	Adjustable analogue measurement range Q_A, invertible analogue characteristic, adjustable switching output Q
Software functions adjustable via IO-Link (e.g. via SensoIO)	Window mode, hysteresis mode or switching point, adjustable mean value filter, delay functions (on/off/pulse), counter, signal quality output in percent via IO-Link
Default settings	See selection table

Electrical data

Operating voltage $+U_B$	18 … 30 V DC
No-load current I_0	≤ 60 mA
Output current Ie Q	≤ 100 mA
Protection circuits	Reverse polarity protection U_B / short-circuit protection (Q)
Protection class	2
Power On Delay	≤ 100 ms
Switching output Q	1x Auto-Detect (PNP/NPN)[6]
Output function	N.O./N.C.
Switching frequency f (ti/tp 1:1) Q	≤ 50 Hz
Response time Q	10 ms
Load	≤ 500 Ohm (4 … 20 mA) ≥ 4 k Ohm (0 … 10 V)
Analogue output Q_A	4 … 20 mA / 0 … 10 V[7]
Response time measured value	See table repeatability
Update rate Q_A	10 ms[6]

Temperature drift	< 1 mm/K
Warm-up time	20 min.
Control input IN	$+U_B$ = Teach-in / $-U_B$ = button locked Open = normal operation

IO-Link

Communication mode	COM 2
Min. cycle time	3 ms
IO-Link profile	Smart Sensor V1.0
Resolution distance value	1 mm
SIO mode	Compatible
Data storage	Compatible
Specification	V1.1

Mechanical data

Dimensions	50 x 50.1 x 23 mm
Enclosure rating	IP 67 & IP 69K[8]
Material, housing	ABS
Material, front screen	PMMA
Type of connection	See selection table

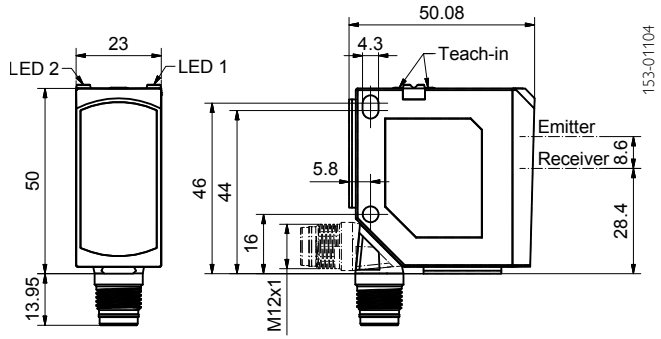
Ambient temperature: operation	-30 … +60 °C[9]
Ambient temperature: storage	-40 … +80 °C
Weight (plug device)	42 g
Resistance to vibration and impacts	EN 60947-5-2

[1] Reference material: RF250 reflector [2] For a max. measurement range of 70 m [3] 0.5 % of the set measurement range, for load 500 Ω [4] Min. linearity error 50 mm
[5] The set measuring range is < 10 m, for futher values see diagram [6] Auto-Detect: Automatic selection of PNP or NPN by the sensor, PNP or NPN can be fixed
[7] adjustable via IO-Link, e. g. with SensoIO [8] With connected IP 67 / IP 69K plug [9] UL: max. +45 °C

Measurement range[1]	Analogue output	Switching output	Type of connection	Part Number	Article number
0.3 … 70 m	4 … 20 mA	1 x Auto-Detect	Plug, M12x1, 5-pin, IO-Link	FR 55-RLAP-70-PNSIL-L5	621-11028

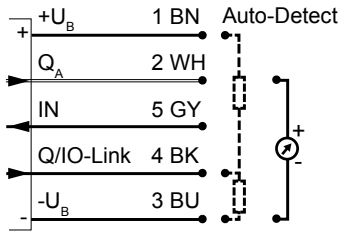
[1] Reference material: RF250 reflector

Plug connection



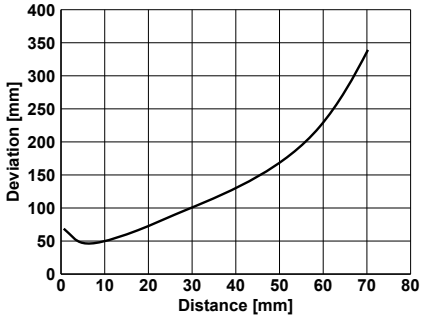
153-01104

Connection, 5-pin, Auto-Detect



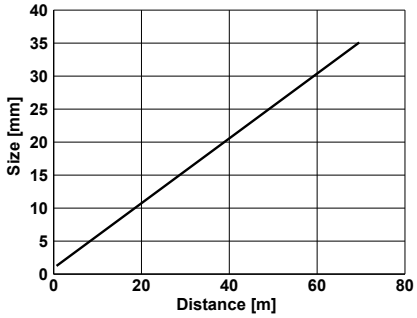
154-00567

Linearity Q_A / digital (typ.)[10]



155-03457

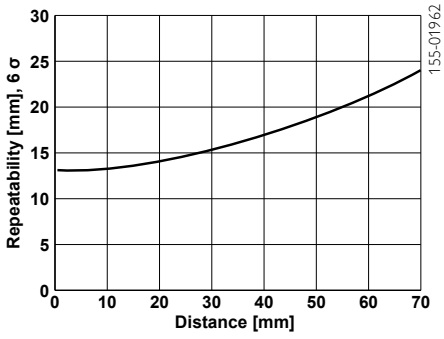
Light spot size



155-01963

[10] Linearity deviations can be positive or negative

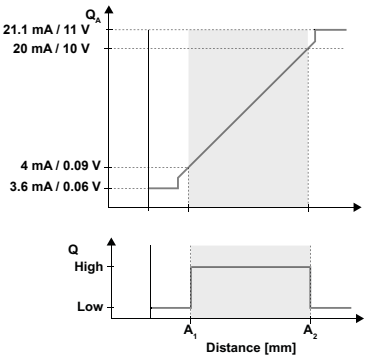
Repeatability Q_A (typ.)[11]



155-01962

Averaging time	Repeatability[4] [mm], typ.
10 ms	≤ 13
100 ms	≤ 12
200 ms	≤ 11
.	.
900 ms	≤ 7
1000 ms	≤ 6

Characteristic analogue curve



155-01742

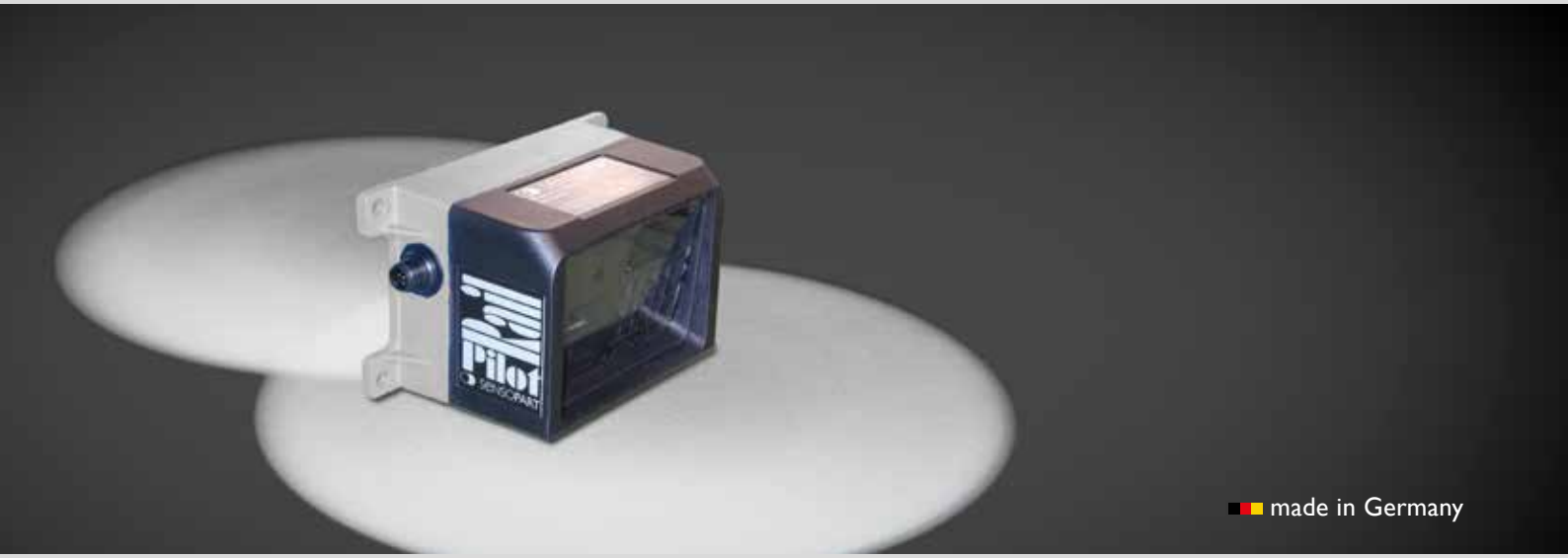
155-01681

[11] Constant ambient conditions, 6 σ static object, reflector RF 250 (599-91009)

Default setting	Measurement range	Accessories	
Analogue output Q_A	2 … 6 m	Mounting angle MA F 55 (579-50007)	From Page A-4
Switching output Q, N.O.	Switching window 2 ... 6 m	Connection cables (C L8FG-S-2m-PUR / 902-51830)	From Page A-44
Response time measured value (e. g. Q_A)	10 ms	Reflective foil RF 250 (599-91009)	From Page A-18
		SensoIO (901-01001)	From Page A-52

FR 85 RailPilot – optical collision protection sensors

Safe movement on monorail systems



Monorail system with car bodies in the automotive industry

TYPICAL FR 85 RAILPILOT

- Retro-reflective laser sensor for preventing collisions on monorail systems
- Operating range: 0 … 6 m
- Large optics aperture angle and thus long detection range
- 1 input and 2 PNP outputs
- RS485 interface
- Detection range adjustable externally
- Reliable suppression of foreign objects (girders, pillars)
- ABS housing: 145 x 85 x 80 mm

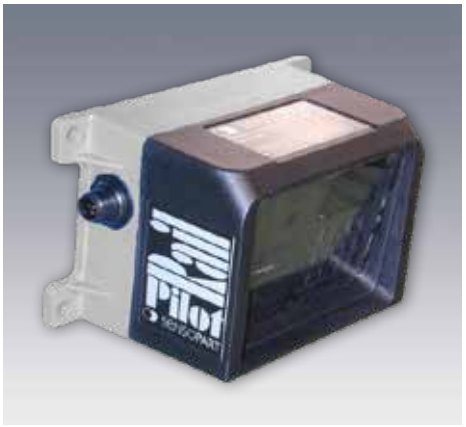
The sensor's task is to prevent collisions between vehicles on monorail systems. The Rail Pilot achieves this reliably. The distances to be maintained, and the braking distances of the monorail vehicles, depend on the load transported and on the speed – this is taken into account by means of flexibly adjustable switching distances.

Even constantly changing objects in the vicinity of the vehicles and sensors have no effect on the reliable functioning of collision prevention.

FR 85 RailPilot – Product Overview			
	Operating range	Special features	Page
FR 85 RailPilot	0 … 6 m	RS485 interface or PNP switching outputs	233

FR 85 RailPilot

Distance sensor for collision prevention



PRODUCT HIGHLIGHTS

- Measurement range: 0 … 6 m
- Wide detection cone
- 2x2 detection zones
- 1 input
- 2 PNP outputs
- RS485 interface
- Detection zone adjustable externally
- Reliable suppression of foreign objects (girders, pillars)

Optical data	
Scanning distance	0 … 6 m[1]
Type of light	Infrared, 905 nm
Laser Class (IEC 60825-1)	1
Resolution	~ 1 mm
Repeatability	≤ 10 mm
Linearity	± 70 mm

Functions	
Indicator LED, green	Operating voltage indicator
Indicator LED, red	Switching output indicator
Scanning distance adjustment	Via control wire

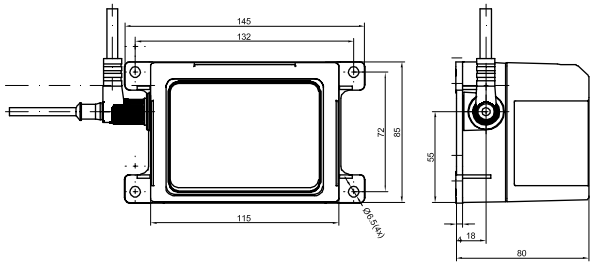
Electrical data	
Operating voltage, $+U_B$	18 … 30 V DC[2]
No-load current, I_0	≤ 100 mA
Output current, Ie	≤ 200 mA
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection (Q)
Protection Class	2
Power On Delay	< 300 ms
Switching output, Q	See selection table
Output function	See selection table
Serial interface	RS485 / R = 1 KΩ[3]
Control input E1 / banking	Close and remote switching $-U_B$ (low) Q1 = switching point 1; Q2 = switching point 2 $+U_B$ (high) Q1 = switching point 3; Q2 = switching point 4

Mechanical data	
Dimensions	145 x 85 x 80 mm
Enclosure rating	IP 54[4]
Material, housing	ABS
Material, front screen	PMMA
Type of connection	See selection table
Ambient temperature: operation	0 … +50 °C
Ambient temperature: storage	-20 … +70 °C
Weight	340 g

[1] Reference material: R10/2 reflector [2] 10 % ripple, within U_B [3] Type FR 85 … S1L5 [4] With connected IP 54 plug

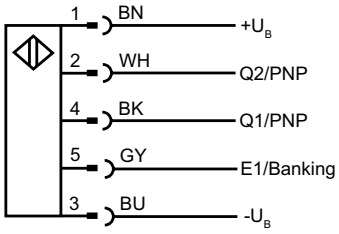
Interface	Baud rate	Suitable for control	Type of connection	Part number	Article number
RS485	57.6 kB	SEW / Lenze / DETO	Plug, M12x1, 5-pin	FR 85-2 ILLG-S1L5	529-11008
RS485	57.6 kB	Standard (e.g. Siemens)	Plug, M12x1, 5-pin	FR 85-2 ILLG2-S1L5	529-11009
RS485	62.5 kB	LJU	Plug, M12x1, 5-pin	FR 85-2 ILLG-S1L5-62,5 kB	529-11014
2 switching outputs Q (PNP) N.C.	-	Standard (e.g. Siemens)	Plug, M12x1, 5-pin	FR 85-2 ILLG-POL5	529-11010

Plug connection

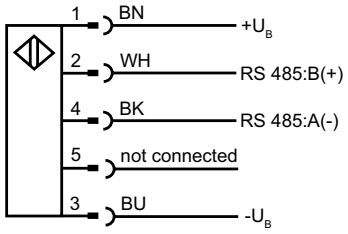


5

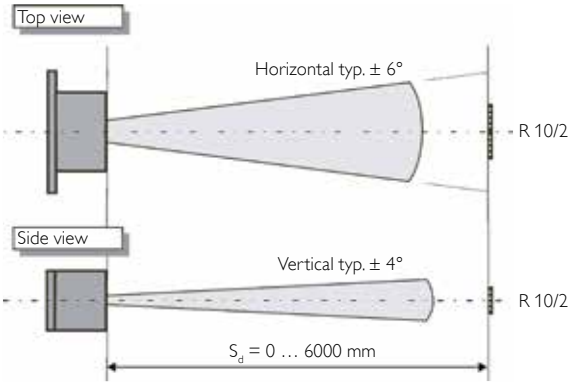
Connection, 5-pin: FR 85-2 ILLG-POL5



Connection, 5-pin: FR 85-2 ILLG(x)-S1L5



Detection cone



Reflector	Article number
R10 / 2 (2xR10)	904-51636

Accessories	
Reflectors	From Page A-18
Connection cables	From Page A-44
Setup Box FR 85-2 ILLX 533-11016	From Page A-50