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 R\$485



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 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.

- 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





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 anticollision applications on monorails
- Cornering also possibleLarge 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
- 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 .

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.

〕 senso**part**

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 \times 14.6 \times 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 $21.1 \times 14.6 \times 8$ 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 × 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 | |

5

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 | | Functions | | |
|---|---|---|---|--|
| Measurement range Resolution Linearity Repeatability Type of light Light spot size Laser class (IEC 60825-1) Resistance to ambient light | 10 70 mm ¹ 0.01 mm ± 0.2 0.8 mm (see characteristics) ² 0.01 0.2 mm (6 σ, see characteristics) ^{2.3} Laser, red, 655 nm 1 × 3 mm 1 ≤ 5000 Lux | Indicator LED, green Indicator LED, yellow Measurement range adjustment Adjustment possibilities Default settings | Operating voltage indicator Switching output indicator Via IO-Link 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 See selection table | |
| Electrical data | | Mechanical data | | |
| Operating voltage, +U _B No-load current, I ₀ Output current, Ie Q Protective circuits Protection Class Switching output, Q Output function Q Switching frequency, f (ti/tp 1:1) Q Response time Q Warm-up time Response time measurement value Averaging times Temperature-specific measure- ment deviation | 10 30V DC ≤ 12 mA ≤ 50 mA Reverse-polarity protection, U _g / short-circuit protection (Q) 2 1× Auto-Detect (PNP/NPN) ⁴ N.O./N.C. ≤ 1000 Hz 500 μs 10 min. 4 ms 4 / 40 / 80 / 120 / 160 / 200 / 240 / 280 / 320 / 360 / 400 ms (Default setting 4 ms) 0.01 mm/K (typ.) | Dimensions Enclosure rating Material, housing Material, front screen Type of connection Ambient temperature: operation Ambient temperature: storage Weight (cable device) Weight (pigtail) Resistance to vibrations and impacts | 21.1 × 14.6 × 8 mm IP 67 ⁵ PUR PMMA See selection table -20 +50 °C ⁶ -20 +60 °C 22 g 10 g EN 60947-5-2 | |

| COM 2 |
|------------|
| 2.7 ms |
| Compatible |
| Compatible |
| 24 Bit |
| 1.1 |
| |

¹ Reference material 5...90 % reflectivity be fixed ⁵ With connected IP 67 plug

⁶ UL : max. +30 °C

² Reference material 90 % reflectivity ³ Stationary object, ⁴ Auto-Detect: Automatic selection of PNP or NPN by the sensor, PNP or NPN can

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| 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 |







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

| Accessories | | | | |
|---------------------|----------------|--|--|--|
| Connection cables | From Page A-44 | | | |
| Brackets | From Page A-4 | | | |
| SensolO (901-01001) | From Page A-52 | | | |

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

CONTROBUTE CONTROLOGY CONTROLOGY

Sold & Serviced By:

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: $34 \times 12 \times 20 \text{ mm}$
- 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 $34 \times 12 \times 20$ 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, packagingand 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, 10-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



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 | | Functions | |
|--------------------------------------|-----------------------------|--------------------------------|---|
| Measurement range | 20 100 mm ¹ | Indicator LED, green | Operating voltage indicator |
| Resolution | 0.12 mm (12-bit) | Indicator LED, yellow | Switching output indicator |
| Linearity | ± 0.25 mm ² | Measurement range adjustment | Via Teach-in button |
| Repeatability | < 0.25 mm ^{2, 3} | Adjustment possibilities | Analogue measurement range Q |
| Type of light | Laser, red, 650 nm | | Invertible analogue characteristic |
| Light spot size | See diagram | | Switching output Q (window mode) |
| Laser class (IEC 60825-1) | 1 | | 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 | | Mechanical data | |
| Operating voltage, +U, | 13 30V DC | Dimensions | 34 x 20 x 12 mm |
| No-load current, I | ≤ 30 mA | Enclosure rating | IP 67 / IP 69 ⁵ |
| Output current, le Q | ≤ 100 mA | Material, housing | ABS |
| Protective circuits | Reverse-polarity protection | / Material, front screen | PMMA |
| | short-circuit protection (Q | Type of connection | See selection table |
| Protection Class | 2 | Ambient temperature: operation | -20 +60 °C ⁶ |
| Power On Delay | < 300 ms | Ambient temperature: storage | -20 +80 °C |
| Switching output, Q | 1x Auto-Detect (PNP/NP) | Weight (metal plug device) | 10 g |
| Output function | N.O./N.C. | Resistance to vibrations and | EN 60947-5-2 |
| Max. capacitive load | 10 nF | impacts | |
| Switching frequency, f (ti/tp 1:1) Q | ≤ 1000 Hz | | |
| Response time Q | 500 µs | IO-Link | |
| Analogue output Q _A | 1 10 V / max. 3 mA | | |
| Response time Q _A | 3.4 ms | Communication mode | COM 2 |
| Warm-up time | 10 min. | Min. cycletime | 2.7 ms |
| Temperature drift | < 0.1 mm/K | 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 10V | Auto-Detect | Metal plug, M8x1, 4-pin, IO-Link 🏽 | FT 25-RLA-80-PNSUL-M4M | 604-41013 |

Sold & Serviced By: **ELECTROMATE** Toll Free Phone (877) SERV098 www.electromate.com sales@electromate.com







¹ At constant ambient conditions

| Characteristics | Default settings | | |
|--|---|---|--|
| Q _A [V] ↑ 10 invertible & adjustable 551 | Analogue output Q _A (1 10V) Switching output Q (A1A2), N.O. | 20 100 mm 20 100 mm | |
| 1 | Accessories | | |
| Q High Low A, Distance [mm] | Connection cables Brackets SensolO (901-01001) | From Page A-44 From Page A-4 From Page A-52 | |

FT 25-RA

Miniature distance sensor



c LISTED

OIO-Link

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_ | |
| Type of light | LED, red, 632 nm | LED, red, 632 nm | 1 | Invertible analogue characteristic | |
| Light spot size | See diagram | See diagram | - | 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 | | | Mechanical data | | |
| Operating voltage, +U | 13 30V DC | | Dimensions | 34 x 20 x 12 mm | |
| No-load current, I | $\leq 30 \text{ mA}$ | | Enclosure rating | IP 67 / IP 69 ⁵ | |
| Output current, le Q | ≤ 100 mA | | Material, housing | ABS | |
| Protective circuits | Reverse-polarity protection, U _p / | | Material, front screen | PMMA | |
| | short-circuit protect | tion (Q) | Type of connection | See selection table | |
| Protection Class | 2 | | Ambient temperature: operation | -20 +60 °C ⁶ | |
| Power On Delay | < 300 ms | | Ambient temperature: storage | -20 +80 °C | |
| Switching output, Q | 1× Auto-Detect (PNP/NPN) ⁴ | | Weight (metal plug device ⁷) | 10 g | |
| Output function | N.O./N.C. | | Weight (pigtail) | 20 g | |
| Max. capacitive load, Q | 10 nF | | Resistance to vibrations and | EN 60947-5-2 | |
| Switching frequency, f (ti/tp 1:1), Q | ≤ 1000 Hz | | impacts | | |
| Response time, Q | 500 µs | | | | |
| Analogue output, Q _A | 1 10V / max. 3 m | ۱A | IO-Link | | |
| Response time, Q _A | 400 μs (FT 25-RA-60) 34 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) | SIO mode | Compatible | |
| · | < 0.2 mm/K(FT 25 | -RA-170) | l ength 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 10V | Auto-Detect | Metal plug, M8×1, 4-pin, IO-Link ⊗ | FT 25-RA-60-PNSUL-M4M | 604-41008 |
| 30 200 mm | 1 10V | Auto-Detect | Metal plug, M8×1, 4-pin, IO-Link � | FT 25-RA-170-PNSUL-M4M | 604-41009 |
| 20 80 mm | 1 10V | Auto-Detect | Pigtail, 500 mm with plug, M8 4-pin, IO-Link � | FT 25-RA-60-PNSUL-KM4-X15 | 604-41014 |
| 1 | | | | | |









| Characteristic output and analogue curves | Default settings | | |
|---|---|--|--|
| Q, [V] 10 Invertible & adjustable | FT 25-RA-60 FT 25-RA-170 | | |
| 1 | Analogue output Q _A (1 10V) 20 80 mm 30 200 mm Switching output Q (A1 A2), N.O. 20 80 mm 30 200 mm | | |
| | Accessories | | |
| High - 689 1 ow - 23 | Connection cables From Page A-44 | | |
| | Brackets From Page A-4 | | |
| Distance [mm] | SensolO (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 \leq 20 μ m / \leq 40 μ m
 - Linearity ≤ 0.6 mm / 1.5 mm
 - Resolution \leq 30µm / \leq 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 | 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 | | |
| Hysteresis ¹ | ≤ 1.2 mm | | window or switching point | | |
| Type of light | Laser, red 655 nm | | Setting of mean value at Q_A | | |
| Immunity to ambient light | ≤ 20,000 lux ² | | Auto-Detect / INPIN / PINP / Push-Pull Smart Eurotions (On-delay and drop-ou | | |
| Light spot size (w \times h) | 4 x 1 mm | | delay, counter, impulse, frequency) | | |
| Measurement frequency | 5 kHz ³ | | | | |
| Laser class (IEC 60825-1) | 1 / 2, see selection table | | | | |
| Electrical data | | | | | |
| Operating voltage +U _B | 15 30V DC | Load | ≤ 1 kOhm (2 10 mA) | | |
| Power consumption | ≤ 1.5 W | | ≤ 500 Ohm (4 20 mA) | | |
| Output current le Q | < 50 mA | | ≥ 2 kOhm (0 10V, 2 10V) | | |
| 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 O | N.O./N.C. | Response time Q _A | Update time Q_A + averaging time Q_A | | |
| Temperature drift Q, / digital | < 0.02 %/K / 0.01 %/K | Analogue output Q_A | 2 10 mA / 4 20 mA | | |
| Warm-up time | 20 min. | | 0 10V / 2 10V | | |
| 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 | | |
| | | | | | |

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 |



| Interface | Type of connection | Laser class | Part Number | Article number |
|-----------|-------------------------------|-------------|-----------------------------|----------------|
| IO-Link | Plug, M12×1, 5-pin, IO-Link � | 1 | FT 55-RLAM-480-PNSUIDL-L5M | 624-41004 |
| RS485 | Plug, M12×1, 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





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



 $^{\scriptscriptstyle 4}$ Repeatability 6 $\sigma, 5$... 90 %, homogenous object, not moving

| Default setting | | Accessories | | |
|--|--|--|--|--|
| 4 20 mA, Measurement range limits 280 mm, N.O. | Connection cable 8-pin to 4-pin for SensolO (L8/L4-2m-PUR / 902-51857) ⁵ | From Page A-44 | | |
| Switching output O | Further connection cables | From Page A-44 | | |
| | | From Page A-4 | | |
| | SensolO (901-01001) | From Page A-52 | | |
| | 4 20 mA, Measurement range limits 280 mm, N.O. 440 mm, N.O | Accessories 4 20 mA, Measurement range limits 280 mm, N.O. 440 mm, N.O Example Bracket SensoClip MBD F 55ST2 (579-50012) SensolO (901-01001) | | |

 $^{\rm 5}$ 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 | Optical data | | |
|-----------------------------------|---|--|--|
| 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_4, Q as switching |
| Hysteresis ¹ | ≤ 2 mm | | window or switching point |
| Type of light | Laser, red 655 nm | | Setting of mean value at Q_A |
| Immunity to ambient light | ≤ 20,000 lux ² | | Auto-Detect / INPIN / PINP / Push-Pull |
| Light spot size $(w \times h)$ | 4 × 1 mm | | delay, counter, impulse, frequency) |
| Measurement frequency | 5 kHz ³ | | |
| Laser class (IEC 60825-1) | 1 / 2, see selection table | | |
| Electrical data | | I | |
| Operating voltage +U _B | 15 30V DC | Load | ≤ 1 kOhm (2 10 mA) |
| Power consumption | ≤ 1.5 W | | ≤ 500 Ohm (4 20 mA) |
| Output current le Q | < 50 mA | | ≥ 2 kOhm (0 10V, 2 10V) |
| 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 O | 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, / digital | < 0.02 %/K / 0.01 %/K | Analogue output Q _A | 2 10 mA / 4 20 mA |
| Warm-up time | 20 min. | | 010V/210V |
| Mechanical data | | | |
| Dimensions | 50 × 50.5 × 25 mm | Ambient temperature: operation | -20 +50 °C ¹⁰ |
| Enclosure rating | IP 67 & IP 69° | 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 |
| | | | |

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 |



| Interface | Type of connection | Part Number | Article number |
|-----------|-------------------------------|-----------------------------|----------------|
| IO-Link | Plug, M12×1, 5-pin, IO-Link � | FT 55-RLAM-800-PNSUIDL-L5M | 624-41006 |
| RS485 | Plug, M12×1, 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 |





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





| Default setting | | Accessories | | |
|--|--|---|--|--|
| Analogue output Q _A Switching output Q ₁ Switching output Q ₂ | 4 20 mA, Measurement range limits 450 mm, N.O. 750 mm, N.O | Connection cable 8-pin to 4-pin for SensolO (L8/L4-2m-PUR / 902-51857) ⁵ Further connection cables Bracket SensoClip MBD F 55ST2 (579-50012) SensolO (901-01001) | From Page A-44 From Page A-44 From Page A-4 From Page A-4 From Page A-52 | |

 $^{\rm 5}$ 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 × 17 × 50 mm | 40 60 mm | Analogue output | 215 | | |
| FT 50 RLA-40 | 50 × 17 × 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 | | Functions | | |
|---|---|---|--|--|
| Operating range Measurement range Type of light Laser Class (IEC 60825-1) Resolution Linearity Light spot size Repeatability | 40 60 mm ¹ 20 mm Laser, red, 670 nm 1 40 μm / 7μm (see selection table) < 1 % < 1 mm at 50 mm < 0.1 mm / 0.05 mm (see selection table) | Indicator LED, green Indicator LED, red Scanning distance adjustment | Operating voltage indicator Contamination indicator Fixed setting | |
| Electrical data | | Mechanical data | | |
| Operating voltage, +U _B No-load current, I ₀ Protective circuits Protection Class Analogue output Limit frequency Temperature drift Rise time (10 to 90 %) Fall time (90 to 10 %) | $18 \dots 28 \text{V DC}$ $\leq 35 \text{ mA}$ Reverse-polarity protection, U _B / short-circuit protection, Q 2 0 \dots 10 \text{V} / max, 3 mA 400 Hz / 40 Hz (see selection table) 10 µm / K 3 ms / 30 ms (see selection table) 2 ms / 20 ms (see selection table) | Dimensions Enclosure rating Material, housing Material, front screen Type of connection Ambient temperature: operation Ambient temperature: storage Weight (plug device) Weight (cable device) Vibration and impact resistance | 50 x 50 x 17 mm IP 67 ² ABS, impact-resistant PMMA See selection table 0 +45 °C -20 +60 °C 40 g 260 g 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 |
| | | | | | | | |









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



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

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 Measurement range Type of light Laser Class (IEC 60825-1) Resolution Linearity Light spot size Repeatability | 45 85 mm ¹ 40 mm Laser, red, 670 nm 1 80 μm / 20 μm (see selection table) < 1 % < 0.8 mm at 65 mm < 0.2 mm / 0.1 mm (see selection table) | Indicator LED, green Indicator LED, red Scanning distance adjustment | Operating voltage indicator Contamination indicator Fixed setting |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B No-load current, I ₀ Protective circuits Protection Class Analogue output Limit frequency Temperature drift Rise time (10 to 90 %) Fall time (90 to 10 %) | $18 \dots 28 \text{V DC}$ $\leq 35 \text{ mA}$ Reverse-polarity protection, U _B / short-circuit protection, Q 2 0 \dots 10 \text{V (max. 3 mA)} 400 Hz / 40 Hz (see selection table) 18 µm / K 3 ms / 30 ms (see selection table) 2 ms / 20 ms (see selection table) | Dimensions Enclosure rating Material, housing Material, front screen Type of connection Ambient temperature: operation Ambient temperature: storage Weight (plug device) Weight (cable device) Vibration and impact resistance | 50 x 50 x 17 mm IP 67 ² ABS, impact-resistant PMMA See selection table 0 +45 °C -20 +60 °C 40 g 260 g 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, M12×1, 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 |
| | | | | | | | |









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

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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 | | Functions | |
|--|--|---|---|
| Operating range Measurement range Type of light Laser Class (IEC 60825-1) Resolution Linearity Repeatability | 30 100 mm / 70 170 mm / 80 300 mm ¹ 70 mm, 100 mm, 220 mm Laser, red, 650 nm 1 < 0.1 % of operating range end-value ² (see selection table) < 0.25 % of operating range end-value (see selection table) < 0.25 % of measurement value | Indicator LED, green Indicator LED, yellow Scanning distance adjustment Adjustment possibilities | Operating voltage indicator Switching output indicator Via Teach-in button and control input N.O. / N.C. via Teach-in button and control input Button lock via control input |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _R | 18 30V DC | Dimensions | 50 x 50 x 17 mm |
| No-load current, I ₀ | ≤ 40 mA | Enclosure rating | IP 67 ³ |
| Output current, le | ≤ 100 mA | Material, housing | ABS, impact-resistant |
| Protective circuits | Reverse-polarity protection, U _B / | Material, front screen | PMMA |
| | short-circuit protection, Q | Type of connection | See selection table |
| Protection Class | 2 | Ambient temperature: operation | -10 +60 °C |
| Power On Delay | < 300 ms | Ambient temperature: storage | -20 +80 °C |
| Switching output, Q | PNP | Weight | 43 g |
| Output function | N.O./N.C. | Vibration and impact resistance | EN 60947-2 |
| Max. capacitive load, Q | < 100 nF | <u>.</u> | |
| Analogue output | 4 20 mA | | |
| Temperature drift | < 0.02 % of operating range end-value / K | | |
| Load | \leq 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 | | |

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 |









| Accessories | | | | | |
|----------------|--|--|--|--|--|
| From Page A-44 | | | | | |
| From Page A-4 | | | | | |
| | | | | | |

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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 | | Functions | |
|---|---|--|--|
| Operating range Measurement range Type of light Laser Class (IEC 60825-1) Resolution Linearity Repeatability | 30 100 mm / 70 170 mm / 80 300 mm ¹ 70 mm, 100 mm, 220 mm Laser, red, 650 nm 1 < 0.1 % of operating range end-value (0.1 mm / 0.17 mm/ 0.3 mm) ² < 0.25 % of operating range end-value (0.25 mm / 0.42 mm / 0.75 mm) < 0.25 % of measurement value | Indicator LED, green Indicator LED, yellow Scanning distance adjustment Adjustment possibilities Default settings | Operating voltage indicator Switching output indicator Via Teach-in button and control input N.O. / N.C. via Teach-in button and control input Button lock via control input Max. scanning distance and N.O. |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B No-load current, I ₀ Output current, Ie Protective circuits Protection Class Power On Delay Switching output, Q ₁ / Q ₂ Output function Analogue output Temperature drift Load Switching frequency, f (ti/tp 1:1) Response time Serial interface | 18 30V DC \leq 40 mA \leq 100 mAReverse-polarity protection, U _B / short-circuit protection, Q (not Type S1)2 \leq 300 msPNPN.O./N.C.4 20 mA $<$ 0.02 % of operating range end-value / K \leq 500 Ω \leq 1000 Hz \geq 0.4 ms (when mean value formation = off) / 4 ms / 40 ms to end-valueSee selection table | Dimensions Enclosure rating Material, housing Material, front screen Type of connection Ambient temperature: operation Ambient temperature: storage Weight Vibration and impact resistance | 50 x 50 x 17 mm IP 67 ³ ABS, impact-resistant PMMA See selection table -10 +60 °C -20 +80 °C 43 g 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 30 100 mm 70 170 mm 80 300 mm | 70 mm 70 mm 100 mm 220 mm | 0,1 mm 0,1 mm 0,17 mm 0,3 mm | 0,25 mm 0,25 mm 0,42 mm 0,75 mm | – RS485 RS485 – | Plug, M12x1, 8-pin Plug, M12x1, 8-pin Plug, M12x1, 8-pin Plug, M12x1, 8-pin | FT 50 RLA-70-L8 FT 50 RLA-70-S1L8 FT 50 RLA-100-S1L8 FT 50 RLA-220-L8 | 574-41018 574-41019 574-41033 574-41014 |
| 80 300 mm | 220 mm | 0,3 mm | 0,75 mm | RS485 | Plug, M12×1, 8-pin | FT 50 RLA-220-S1L8 | 574-41015 |











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

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 a at long scanning distance Stable and precise distance Stable and precise distance Detection of all objects switching output High flexibility thanks to (Q_A) and window mod Easy installation and op Clearly visible laser light alignment and full eye set | control tasks with all object surfaces es nce measurement even with tilted highly reflective backgrounds in front of fixed backgrounds via p invertible analogue characteristic e (Q) eration via external teach-in t spot (laser class 1) for an easy afety |
| 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 |
| Linearity | ± 15 mm (see diagram) ² | | Invertible analogue characteristic |
| Repeatability | \leq 7 mm (6 σ , see diagram) ^{1,3} | | |
| | | | PNP via teach-in and control line, wide variety of adjustment possibilities for ser- vice and process data via IO-Link |
| | | | |

Electrical data

| Operating voltage +U _B | 18 30V DC | Response time Q | 2 ms |
|-------------------------------------|--|-------------------------------------|---|
| No-load current I ₀ | ≤ 60 mA | Load | ≤ 500 Ohm (4 20 mA) |
| Output current le Q | ≤ 100 mA | | ≥4 k Ohm (0 10 V) |
| Protection circuits | Reverse polarity protection U ₂ / | Analogue output Q _A | 4 20 mA / 0.1 10 V |
| | 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 × 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 ₈ = Teach-in / -U ₈ = button locked Open = normal operation |

Mechanical data

| Dimensions | 50 x 50.1 x 23 mm | Communication mode | COM 2 | |
|-------------------------------------|---------------------------|--------------------|------------|--|
| Enclosure rating | IP 67 & IP 69K⁵ | 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 | | | |
| | | | | |

IO-Link

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 | 010V | Auto-Detect | Plug, M12x1, 5-pin, IO-Link � | FT 55-RLAP-5-PNSUL-L5 | 622-21024 |





¹³The specified precision is achieved by teaching the distances

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

FT 55-RLAP2

Distance sensor with IO-Link measurement value output



@ IO-Link

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 | | Functions | |
|---|---|--|---|
| Scanning distance Type of light Laser class (IEC 60825-1) Resolution Hysteresis Linearity Repeatability | 0.06 5 m (see selection table) ¹ Laser, red 655 nm 1 < 5 mm 20 mm ± 15 mm (see diagram) ² ≤ 7 mm (6 σ, see diagram) ^{1,2,3} | Indicator LED 2 green Indicator LED 1 yellow Scanning distance adjustment Adjustment possibilities Default settings | Operating voltage indicator Switching output indicator Q Via Teach-in button and IO-Link 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 3 m, N.O., Auto-Detect |
| Electrical data | | Mechanical data | |
| Operating voltage +U _B No-load current I ₀ Output current le Q Protection circuits Protection class Power On Delay Switching output Q Output function Switching frequency f (ti/tp 1:1) Q | 18 30 V DC ≤ 60 mA ≤ 100 mA Reverse polarity protection U _B / short-circuit protection (Q) 2 < 500 ms 1 × Auto-Detect (PNP/NPN) ⁴ N.O./N.C. ≤ 250 Hz | Dimensions Enclosure rating Material, housing Material, front screen Type of connection Ambient temperature: operation Ambient temperature: storage Weight (plug device) Resistance to vibration and impacts | 50 x 50.1 x 23 mm IP 67 & IP 69K ⁵ ABS PMMA See selection table -40 +60 °C ⁶ -40 +80 °C 42 g EN 60947-5-2 |
| Response time Q Response time measurement value output | 1 ms Min. cycle time IO-Link | IO-Link | COM 2 |
| Iemperature drift Warm-up time Control input IN | < 1 mm / K 20 min. +U _B = Teach-in -U _B = button locked Open = normal operation | Min. cycle time SIO mode Process bit length Specification | 2.7 ms Compatible 24 Bit 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 × Auto-Detect | Plug, M12x1, 4-pin, IO-Link | FT 55-RLAP2-PNSL-L4 | 623-11035 |
| 0.06 5 m | 2 × Auto-Detect | | FT 55-RLAP2-2PNSL-L5 | 622-21022 |





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







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

| Reference material | Scanning distance | Accessories | |
|--|----------------------------------|-------------------------------|---------------------------------|
| White (90 %) Grey (18 %) Black (6 %) | 0.06 5 m 0.06 5 m 0.06 3 m | Connection cables Brackets | From Page A-44 From Page A-4 |

FR 55-RLAP

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



CE ECOLAB

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 | | Functions | | |
|-------------------------------------|---|-------------------------------------|--|--|
| Measurement range | 0.3 70 m ¹ | Indicator LED 1, green | Operating voltage indicator | |
| Resolution Q _A | 35 mm = 8 µA (11 Bit) ² | Indicator LED 2 yellow | Switching output indicator | |
| Resolution IO-Link | 1 mm | Setting measuring range / | Via Teach-in button, control input or | |
| Linearity Q_ | ± 0.5 % ^{1,3,4} | switching point | IO-Link | |
| Linearity IO-Link | 50 350 mm | Adjustment possibilities | Adjustable analogue measurement | |
| Repeatability | ≤ 6 mm ⁵ (see selection table) | | range Q_A , invertible analogue characte- | |
| Hysteresis | 60 mm | Software functions adjustable vie | | |
| Type of light | Laser, red 655 nm | IQ-Link (e.g. via SensolQ) | switching point, adjustable mean value | |
| Laser class (IEC 60825-1) | 1 | | filter, delay functions (on/off/pulse), | |
| | | | counter, signal quality output in percent | |
| | | | | |
| | | Default settings | See selection table | |
| Electrical data | | | | |
| Operating voltage +U | 18 30V DC | Temperature drift | < 1 mm/K | |
| No-load current I ₀ | ≤ 60 mA | Warm-up time | 20 min. | |
| Output current le Q | ≤ 100 mA | Control input IN | $+U_{R} =$ Teach-in / $-U_{R} =$ button locked | |
| Protection circuits | Reverse polarity protection $U_{_B}$ / | | Open = normal operation | |
| | short-circuit protection (Q) | | | |
| Protection class | 2 | IO-Link | | |
| Power On Delay | ≤ 100 ms | | COM 2 | |
| Switching output Q | 1× Auto-Detect (PNP/NPN) ⁶ | Communication mode | | |
| Output function | N.O./N.C. | Min. cycle time | 3 ms | |
| Switching frequency f (ti/tp 1:1) Q | ≤ 50 Hz | IO-Link profile | Smart Sensor V1.0 | |
| Response time Q | 10 ms | Resolution distance value | 1 mm | |
| Load | ≤ 500 Ohm (4 20 mA) | SIO mode | Compatible | |
| | ≥4 k Ohm (0 10V) | Data storage | Compatible | |
| Analogue output Q _A | 4 20 mA / 0 10 V ⁷ | Specification | <u>V1.1</u> | |
| Response time measured value | See table repeatibility | | | |
| Update rate Q _A | 10 ms ⁶ | | | |
| Mechanical data | | · · · · | | |
| Dimensions | 50 x 50.1 x 23 mm | Ambient temperature: operation | -30 +60 °C ⁹ | |
| Enclosure rating | IP 67 & IP 69K ⁸ | Ambient temperature: storage | -40 +80 °C | |
| Material, housing | ABS | Weight (plug device) | 42 g | |
| Material, front screen | PMMA | Resistance to vibration and impacts | EN 60947-5-2 | |
| Type of connection | See selection table | | | |
| | |] | | |

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 SensolO 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 × Auto-Detect | Plug, M12x1, 5-pin, IO-Link � | FR 55-RLAP-70-PNSIL-L5 | 621-11028 |

¹ Reference material: RF250 reflector





¹⁰ Linearity deviations can be positive or negative



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

| Default setting | Measurement range | Accessories | |
|--|--|--|---|
| Analogue output Q _A Switching output Q, N.O. Response time measured value (e. g. Q _A) | 2 6 m Switching window 2 6 m 10 ms | Mounting angle MA F 55 (579-50007) Connection cables (C L8FG-S-2m-PUR / 902-51830) Reflective foil RF 250 (599-91009) SensolO (901-01001) | From Page A-4 From Page A-44 From Page A-18 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 | | Functions | |
|--|---|---|---|
| Scanning distance Type of light Laser Class (IEC 60825-1) Resolution Repeatability Linearity | 0 6 m ¹ Infrared, 905 nm 1 ~ 1 mm ≤ 10 mm ± 70 mm | Indicator LED, green Indicator LED, red Scanning distance adjustment | Operating voltage indicator Switching output indicator Via control wire |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B No-load current, I ₀ Output current, Ie Protective circuits Protection Class Power On Delay Switching output, Q Output function Serial interface Control input E1 / banking | $\begin{array}{l} 18 \dots 30 \text{V DC}^2 \\ \leq 100 \text{ mA} \\ \leq 200 \text{ mA} \\ \text{Reverse-polarity protection, U_{\text{B}} / \\ \text{short-circuit protection (Q)} \\ \hline 2 \\ < 300 \text{ ms} \\ \hline 2 \\ < 300 \text{ ms} \\ \hline 3 \\ \text{See selection table} \\ \hline 3 \\ \text{See selection table} \\ \hline 3 \\ \text{See selection table} \\ \hline 3 \\ \text{RS485 / R = 1 K} \Omega^3 \\ \hline 3 \\ \hline 3 \\ \text{Close and remote switching} \\ -U_{\text{B}} (\text{low}) \\ \text{Q1 = switching point 1;} \\ \hline Q \\ \text{Q2 = switching point 2} \\ +U_{\text{g}} (\text{high}) \\ \hline Q \\ \text{Q1 = switching point 3;} \\ \hline Q \\ \text{Q2 = switching point 4} \\ \hline \end{array}$ | Dimensions Enclosure rating Material, housing Material, front screen Type of connection Ambient temperature: operation Ambient temperature: storage Weight | 145 x 85 x 80 mm IP 54 ⁴ ABS PMMA See selection table 0 +50 °C -20 +70 °C 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

Article number Interface Baud rate Suitable for control Type of connection Part 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. Plug, M12x1, 5-pin FR 85-2 ILLG-POL5 529-11010 Standard (e.g. Siemens)









| Reflector | Article number | Accessories | |
|-----------------|----------------|----------------------------------|----------------------------------|
| R10 / 2 (2×R10) | 904-51636 | Reflectors Connection cables | From Page A-18 From Page A-44 |
| | | Setup Box FR 85-2 ILLX 533-11016 | From Page A-50 |

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