

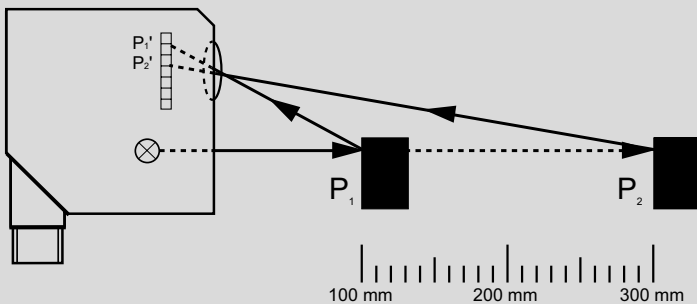
Distance sensors

System description

Distance measurement using triangulation

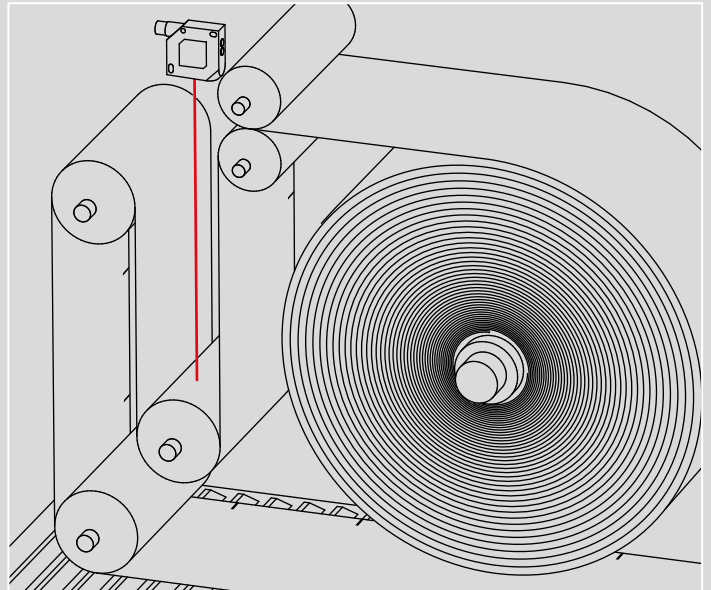
The measurement principle of optical triangulation is suitable for the precise determination of distances at close range. With the help of special receiver optics and a position-sensitive detector (e.g. a photodiode line), the sensor can determine the object distance regardless of its reflectivity (see illustration below). The colour 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 amount 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

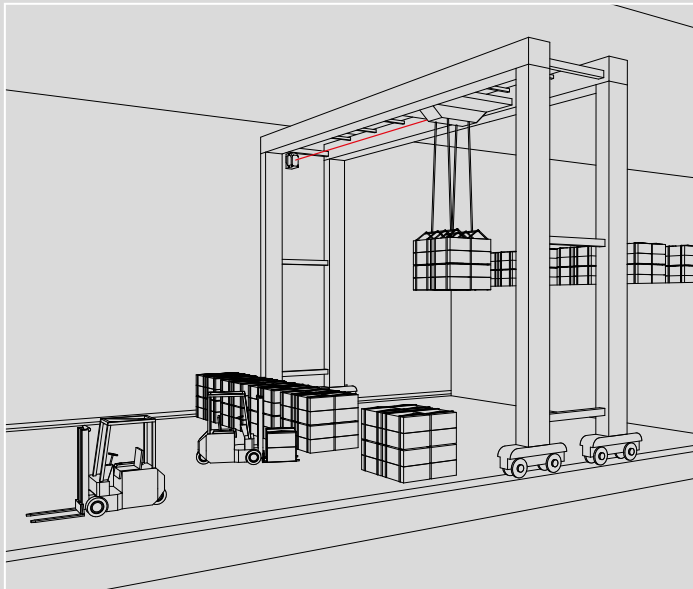
Collision prevention on monorail systems in car production is a special distance measurement task. The FR 85 series was specially developed for this application. These sensors provide excellent measurement results regardless of the reflectivity of the target object, and their comprehensive range of functions 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 (up to 250 m). 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 F 90 series, using time-of-flight technology, measure distances of up to 250 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 92 distance sensor

Inductive analogue sensors

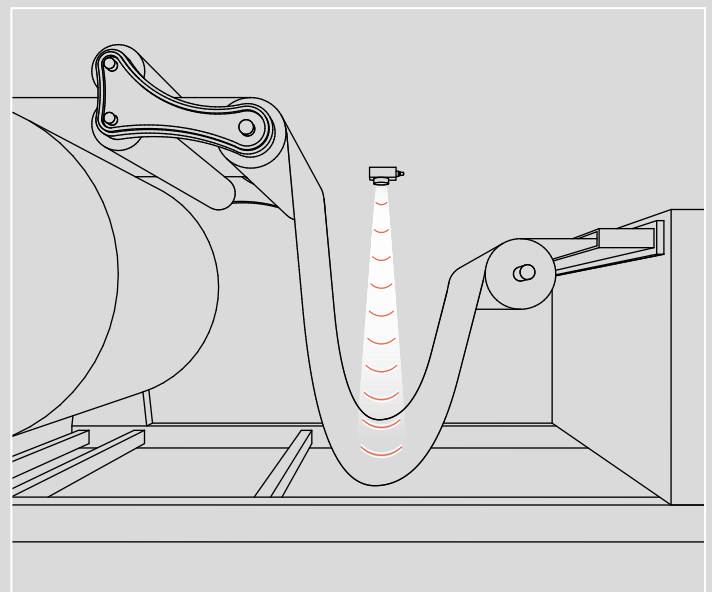
The reasonably priced solution for metallic objects. Compared to optical or ultrasonic sensors, inductive distance sensors have only limited ranges. They are still used under harsh conditions, in particular, as a result of their great robustness.

- 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

F 55 / F 90 / F 91 / F 92 –

Laser distance sensors for long distances

Far-sighted with time-of-flight technology



 made in Germany



Indicator

The distance is directly indicated in mm by the F 90 and F 91 devices, and can even be directly read off from the device in the dark – thanks to the Indicator's background illumination.



Coil diameter

The FT 55-RLA measures the distance to the coil surface in order to activate roll changes.

TYPICAL F 55 / F 90 / F 91 / F 92

- Laser distance sensor using time-of-flight technology
- Largely independent of target object's colour and properties
- Operating range: scanner up to 10 m, with reflector up to 250 m
- Variants with analogue output and switching output
- Interfaces for maximum compatibility, SSI-compatible, RS422 (PROFIBUS and DeviceNet via gateway)
- High repeatability and high measurement rates
- Compact housings from 50 x 50 x 23 mm
- Version with IO-Link


With a reflector these devices can achieve ranges of up to 250 m (FR 90 ILA).

Ranges of up to 10 m can be achieved with the scanner versions (FT 90 ILA).

Pilot laser

Correct adjustment of the F 90 at long distances is considerably simplified by using the pilot laser. This can be switched off so that no-one is irritated by it during running operation.

Long ranges of up to 250 m are no problem with time-of-flight technology – and ideal in handling and warehousing systems.

F 55 / F 90 / F 91 / F 92 – Product Overview				
	Operating distance	Functional principle	Special features	Page
FT 55-RLAP	0,1 ... 5 m	Scanning on object	Compact design, high flexibility	212
FT 55-RLAP2	0,06 ... 5 m	Scanning on object	Compact design, IO-Link 	214
FT 90 ILA	0,5 ... 10 m	Scanning on object	2 switching outputs, RS422 interface, SSI-compatible, switchable red-light pilot laser	216
FT 91 ILA	0,5 ... 6 m	Scanning on object	2 switching outputs, RS422 interface, SSI-compatible, switchable red-light pilot laser	218
FT 92 ILA/RLA	0,2 ... 6 m	Scanning on object	2 switching outputs, 1 analogue output, switchable red-light pilot laser	220
FR 55-RLAP	0,3 ... 70 m	Reflector	1 analogue output 4 ... 20 mA, 2 switching outputs, compact design, high flexibility	222
FR 55-RLP	0,3 ... 70 m	Reflector	2 switching outputs, compact design, high flexibility	224
FR 90 ILA	0,5 ... 250 m	Reflector	2 switching outputs, RS422 interface, SSI-compatible, switchable red-light pilot laser	226
FR 91 ILA	0,5 ... 50 m	Reflector	2 switching outputs, RS422 interface, SSI-compatible, switchable red-light pilot laser	228
FR 92 ILA	0,2 ... 30 m	Reflector	2 switching outputs, 1 analogue output, switchable red-light pilot laser	230

FT 55-RLAP

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



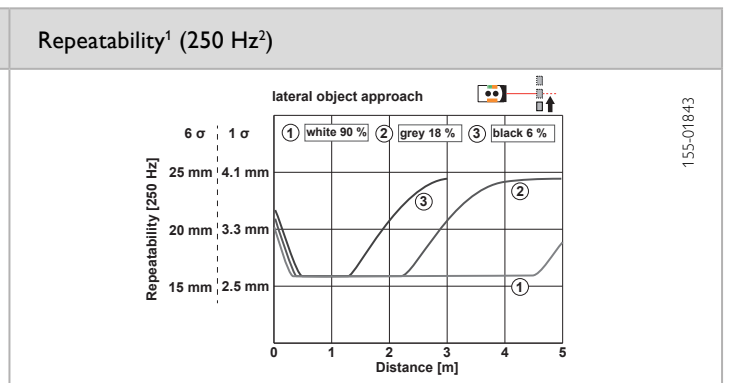
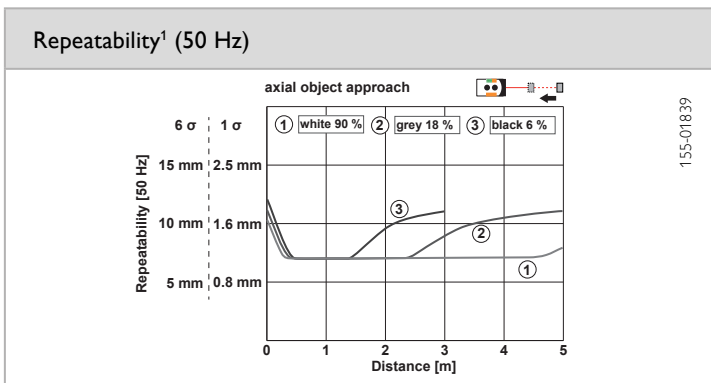
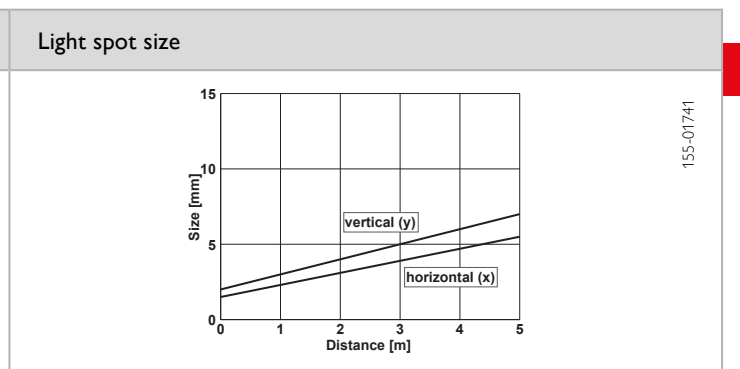
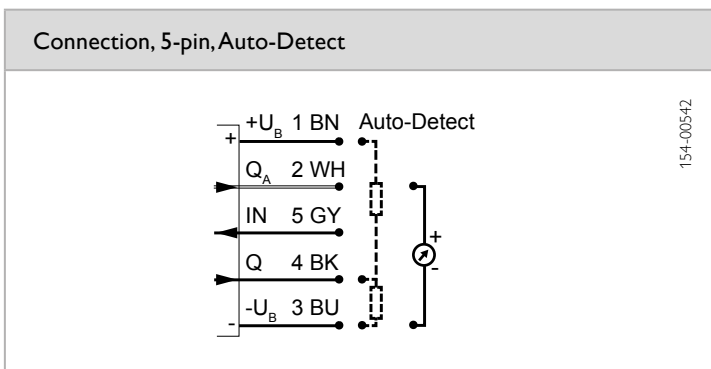
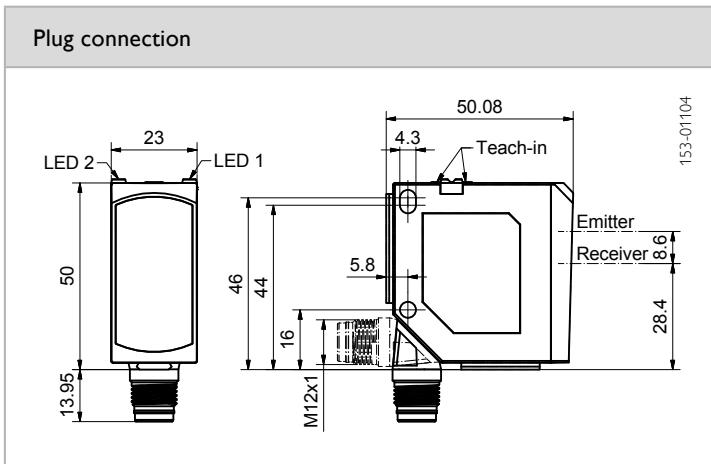
PRODUCT HIGHLIGHTS

- 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 or shiny backgrounds
- Compact design for an easy integration
- 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
Resolution	< 5 mm (12-bit)	Indicator LED 2, yellow	Status indicator analogue output
Linearity	± 30 mm ^{1,2}	Indicator LED 1 yellow	Switching output indicator
Repeatability	1.2 mm ^{1,2,3}	Measurement range adjustment	Via Teach-in button or control input
Hysteresis	20 mm	Adjustment possibilities	Analogue measurement range Q_A
Type of light	Laser, red 655 nm		Invertible analogue characteristic
Laser class (IEC 60825-1)	1		Switching output Q (window mode)
			N.O. / N.C. and Auto-Detect / NPN / PNP via teach-in and control line
			Button lock via control input
		Default settings	See Selection Table
Electrical data			
Operating voltage $+U_B$	18 ... 30V DC	Response time Q	2 ms
No-load current I	≤ 60 mA	Load	≤ 500 Ohm (4 ... 20 mA) ≥ 4 k Ohm (0 ... 10 V)
Output current I _e Q	≤ 100 mA	Analogue output Q_A	4 ... 20 mA / 0 ... 10 V
Protection circuits	Reverse polarity protection U_B / short-circuit protection (Q)	Update rate Q_A	2 ms
Protection class	2	Temperature drift	< 2 mm / K
Power On Delay	< 5 s	Warm-up time	20 min.
Switching output Q	Auto-Detect (PNP/NPN) ⁴	Control input IN	$+U_B$ = Teach-in $-U_B$ = Button locked Open = normal operation
Output function	N.O. / N.C.		
Switching frequency f (ti/tp 1:1) Q	≤ 250 Hz		
Mechanical data			
Dimensions	50 x 50.1 x 23 mm	Ambient temperature: operation	-40 ... +60 °C ^{6,7}
Enclosure rating	IP 67 & IP 69K ⁵	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 90 % reflectivity ² At 50 Hz ³ For 1 σ , see diagram for further values 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

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	FT 55-RLAP-5-PNSI-L5	622-21018
0.1 ... 5 m	0 ... 10V	Auto-Detect	Plug, M12x1, 5-pin	FT 55-RLAP-5-PNSU-L5	622-21021



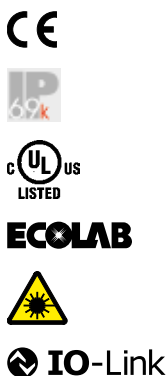
¹ At constant ambient conditions ² Automatic adjustment to 50 Hz at constant distance

Characteristic analogue curve	Reference material	Measurement range
	White (90 %)	0.1 ... 5 m
	Grey (18 %)	0.1 ... 5 m
	Black (6 %)	0.1 ... 3 m
	Default setting³	
	Analogue output Q_A (4...20 mA / 0,09 ... 10V)	0.3 ... 3 m
	Switching output Q (A_1, \dots, A_2), N.O., Auto-Detect	0.3 ... 3 m
	Accessories	
	Connection cables	From Page A-38
	Brackets	From Page A-4

³The 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		Functions	
Scanning distance	0 ... 5 m (see Selection Table) ¹	Indicator LED 2 green	Operating voltage indicator
Hysteresis	20 mm	Indicator LED 1 yellow	Switching output indicator Q
Black/white shift (6%/90%)	≤ ± 40 mm	Scanning distance adjustment	Via Teach-in Button and IO-Link
Grey value shift (18%/90%)	≤ ± 40 mm	Adjustment possibilities	N.O. / N.C. via Teach-in Button and IO-Link, wide variety of adjustment possibilities for service and process data via IO-Link
Type of light	Laser, red 655 nm	Default settings	3 m, N.O.
Laser class (IEC 60825-1)	1		
Resolution	< 5 mm		
Linearity	± 30 mm		
Repeatability	1.2 mm		
Electrical data		Mechanical data	
Operating voltage +U _B	18 ... 30V DC	Dimensions	50 x 50.1 x 23 mm
No-load current I ₀	≤ 60 mA	Enclosure rating	IP 67 & IP 69K ³
Output current I _{e Q}	≤ 100 mA	Material, housing	ABS
Protection 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	< 5 s	Ambient temperature: operation	-40 ... +60 °C ⁴
Switching output Q	1 x Auto-Detect (PNP/NPN) ²	Ambient temperature: storage	-40 ... +80 °C
Output function	N.O. / N.C.	Weight (plug device)	42 g
Switching frequency f (ti/tp 1:1) Q	≤ 500 Hz	Resistance to vibration and impacts	EN 60947-5-2
Response time Q	1 ms		
Temperature drift	< 2 mm / K		
Warm-up time	20 min.		
		IO-Link	
		Communication mode	COM 2
		Min. cycle time	3 ms
		SIO mode	compatible
		Process bit length	16 Bit
		Specification	1.1

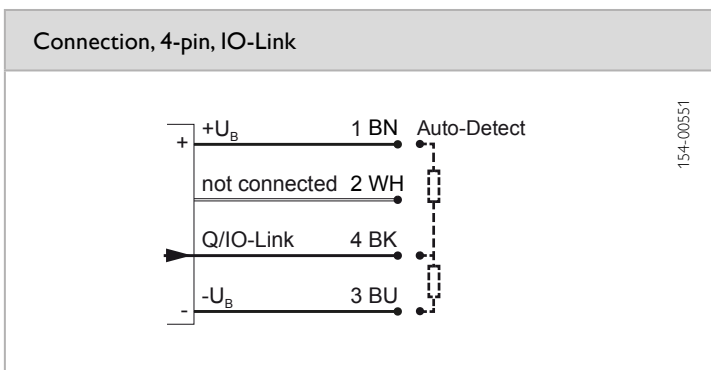
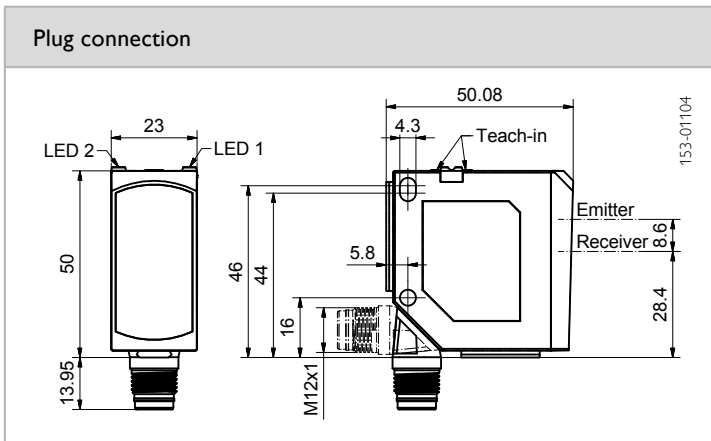
¹ Reference material 90 % reflectivity

² Auto-Detect: Automatic selection of PNP or NPN by the sensor, PNP or NPN can be fixed

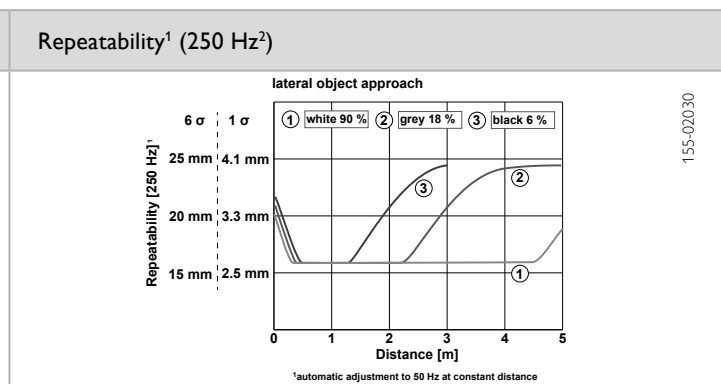
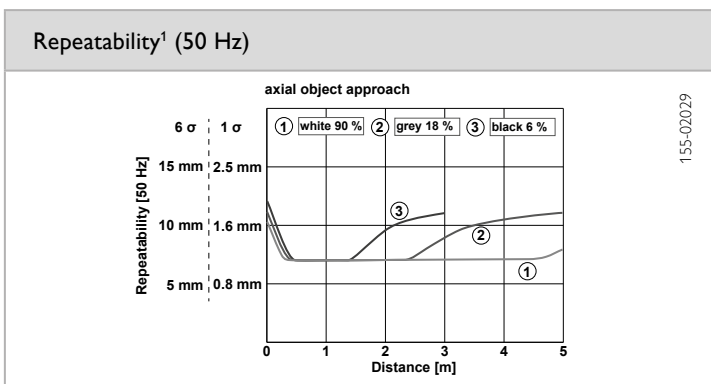
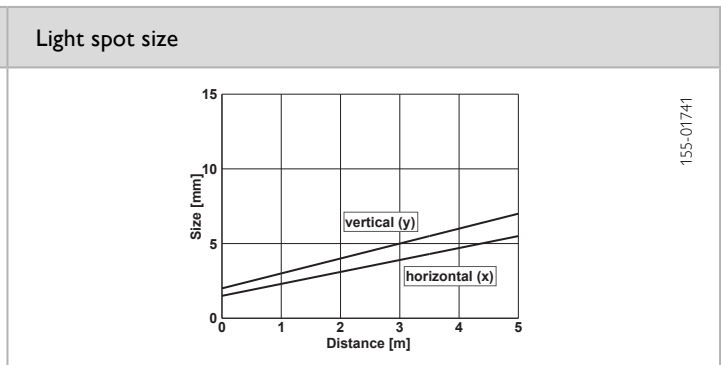
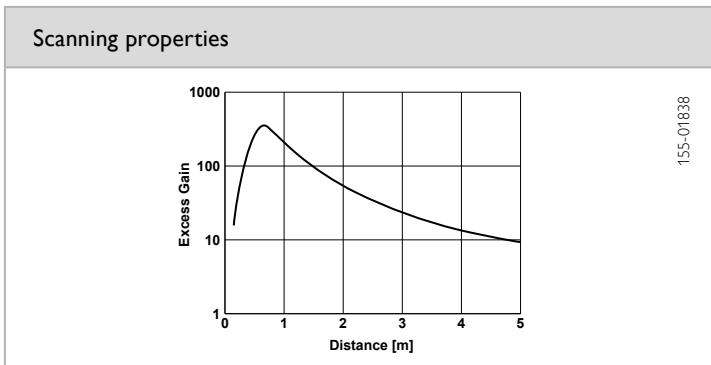
³ With connected IP 67 / IP 69K plug

⁴ 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



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¹ At constant ambient conditions ² Automatic adjustment to 50 Hz at constant distance

Reference material	Scanning distance	Accessories	
White (90 %)	0.06 ... 5 m	Connection cables	From Page A-38
Grey (18 %)	0.06 ... 5 m		
Black (6 %)	0.06 ... 3 m		
		Brackets	From Page A-4

FT 90 ILA

Distance sensor



PRODUCT HIGHLIGHTS

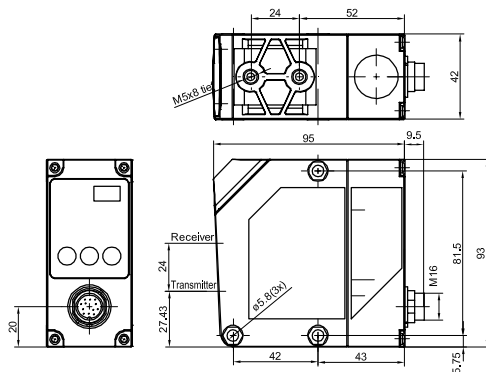
- Long scanning distance (up to 10 m on white objects)
- High repeatability
- High measurement rates
- Open interfaces ensure maximum compatibility (SSI-compatible, RS422)
- Profibus and DeviceNet via gateway
- Switchable red-light pilot laser
- 2 switching outputs

Optical data		Functions	
Operating range	0.5 ... 10 m ¹	Indicator LED, green	Operating voltage indicator
Measurement range	9.5 m	Indicator LED, yellow	Switching output indicator
Type of light	Infrared, 905 nm (measurement laser) Laser, red, 650 nm (pilot laser)	Scanning distance adjustment	Via Teach-in button and control input
Laser Class (IEC 60825-1)	1 (measurement laser) 1 (pilot laser)		
Resolution	0.1 mm or 0.125 mm		
Linearity	± 8 mm		
Repeatability	± 4 mm		
Electrical data		Mechanical data	
Operating voltage, +U _b	18 ... 30V DC ²	Dimensions	93 × 93 × 42 mm
Output current, I _e	≤ 100 mA	Enclosure rating	IP 67 ³
Plausibility output, Q _p	50 mA	Material, housing	ABS, impact-resistant
Service output, Q _s	50 mA	Material, front screen	PMMA
Protective circuits	Reverse-polarity protection, U _b / short-circuit protection, Q	Type of connection	See Selection Table
Protection Class	2	Ambient temperature: operation	-10 ... +50 °C (-20 ... +50 °C in continuous operation)
Power On Delay	≤ 12 ms	Ambient temperature: storage	-30 ... +75 °C
Switching output, Q ₁ / Q ₂	PNP	Weight	230 g
Output function	N.O.	Vibration and impact resistance	EN 60947-5-2
Switching frequency f (ti/tp 1:1) Q	≤ 300 Hz		
Analogue output	4 ... 20 mA		
Response time Q _A	10 ms		
Temperature drift	< ± 5 mm absolute		
Serial interface	RS422 or SSI-compatible (GREY / BINARY) adjustable		
Bus interface	Profibus or DeviceNet, each via gateway (accessory)		
Cable length / m	< 25 / < 50 / < 100 / < 200 / < 400		
Cycle rate	< 500 kHz / < 400 kHz / < 300 kHz / < 200 kHz / < 100 kHz		

¹ Reference material: Kodak white, 90 % ² 10 % ripple, within U_b ³ With connected IP 67 plug

Type of connection	Part number	Article number
Plug, M16x1, 12-pin	FT 90 ILA-S2-Q12	591-91000

Plug connection



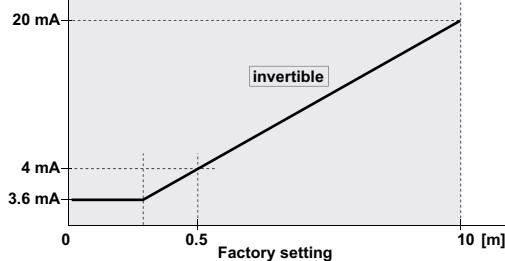
153-00457

Connection, 12-pin

Pin	Name	Cable Type 1 (12-pin) colour	Cable Type 2 (5-pin) colour	Description
A	TX+	White		RS422: transmission data / SSi: Data+
B	Q1	Brown	Black	Switching output, Q1
C	RX+	Green		RS422: receiver data / SSi: clock+
D	analog	Yellow		Analogue output 4 ... 20 mA (only FT9X)
E	Qs	Grey	Orange	Service output, Qs
F	Qp	Pink		Plausibility output, Qp
G	U _b	Red	Brown	U _b + 18 ... 30V
H	RX-	Black		RS422: receiver data / SSi: clock
J	NC	Violet		
K	TX-	Grey/pink		RS422: transmitter data / SSi: Data-
L	Q2	Red/blue	White	Switching output, Q2
M	CND	Blue	Blue	0V (GND)

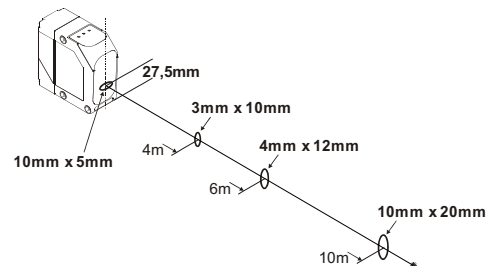
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Characteristic analogue curve



155-01406

Light spot geometry



155-01808

Scanning distance

White 90 %	0.5 ... 10 m
Grey 10 %	0.5 ... 7 m
Black 6 %	0.5 ... 3 m

Accessories

Connection cables	From Page A-38
Brackets	From Page A-4
AS F 90 Aligning aid	From Page A-4
MSP F 90 A Fine adjustment	From Page A-4
Converters and adapter cables	From Page A-38

FT 91 ILA

Distance sensor



PRODUCT HIGHLIGHTS

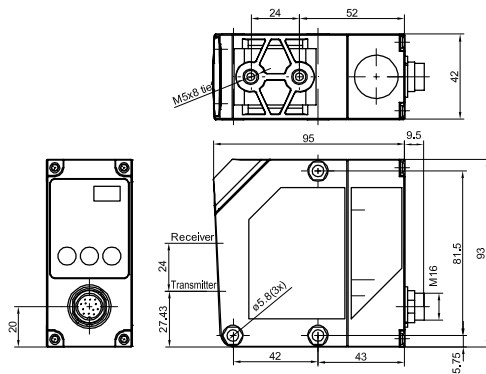
- Long scanning distance (up to 10 m on white objects)
- High repeatability
- High measurement rates
- Open interfaces ensure maximum compatibility (SSI-compatible, RS422)
- Profibus and DeviceNet via gateway
- Switchable red-light pilot laser
- 2 switching outputs

Optical data		Functions	
Operating range	0.5 ... 6 m ¹	Indicator LED, green	Operating voltage indicator
Type of light	Infrared, 905 nm (measurement laser) Laser, red, 650 nm (pilot laser)	Indicator LED, yellow	Switching output indicator
Laser Class (IEC 60825-1)	1 (measurement laser) 1 (pilot laser)	Scanning distance adjustment	Via Teach-in button and control input
Resolution	0.1 mm or 0.125 mm		
Linearity	± 10 mm		
Repeatability	± 5 mm		
Electrical data		Mechanical data	
Operating voltage, +U _b	18 ... 30V DC ²	Dimensions	93 × 93 × 42 mm
Output current, I _e	≤ 100 mA	Enclosure rating	IP 67 ³
Plausibility output, Q _p	50 mA	Material, housing	ABS, impact-resistant
Service output, Q _s	50 mA	Material, front screen	PMMA
Protective circuits	Reverse-polarity protection, U _b / short-circuit protection, Q	Type of connection	See Selection Table
Protection Class	2	Ambient temperature: operation	-10 ... +50 °C (-20 ... +50 °C in continuous operation)
Power On Delay	≤ 12 ms	Ambient temperature: storage	-30 ... +75 °C
Switching output, Q ₁ / Q ₂	PNP	Weight	230 g
Output function	N.O.	Vibration and impact resistance	EN 60947-5-2
Switching frequency f (ti/tp 1:1) Q	≤ 300 Hz		
Analogue output	4 ... 20 mA		
Response time Q _A	10 ms		
Temperature drift	< 0.5 mm / K		
Serial interface	RS422 or SSI-compatible (GREY / BINARY) adjustable		
Bus interface	Profibus or DeviceNet, each via gateway (accessory)		
Cable length / m	< 25 / < 50 / < 100 / < 200 / < 400		
Cycle rate	< 500 kHz / < 400 kHz / < 300 kHz / < 200 kHz / < 100 kHz		

¹ Reference material: Kodak white, 90 % ² 10 % ripple, within U_b ³ With connected IP 67 plug

Type of connection	Part number	Article number
Plug, M16, 12-pin	FT 91 ILA-S2-Q12	591-91003

Plug connection



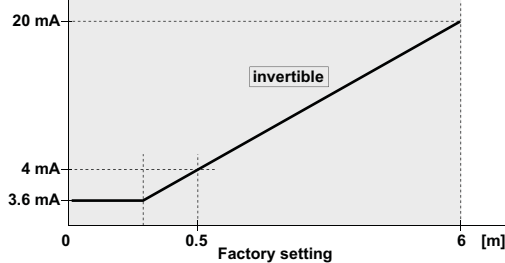
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Connection, 12-pin

Pin	Name	Cable Type 1 (12-pin) colour	Cable Type 2 (5-pin) colour	Description
A	TX+	White		RS422: transmission data / SSI: Data+
B	Q1	Brown	Black	Switching output, Q1
C	RX+	Green		RS422: receiver data / SSI: clock+
D	analog	Yellow		Analogue output 4 ... 20 mA (only FT9X)
E	Qs	Grey	Orange	Service output, Qs
F	Qp	Pink		Plausibility output, Qp
G	U _b	Red	Brown	U _b + 18 ... 30V
H	RX-	Black		RS422: receiver data / SSI: clock
J	NC	Violet		
K	TX-	Grey/pink		RS422: transmitter data / SSI: Data-
L	Q2	Red/blue	White	Switching output, Q2
M	CND	Blue	Blue	0V (GND)

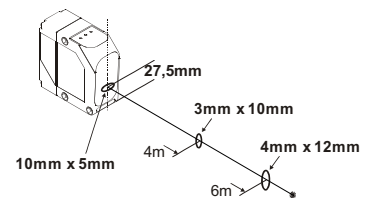
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Characteristic analogue curve



155-01809

Light spot geometry



155-01810

Scanning distance

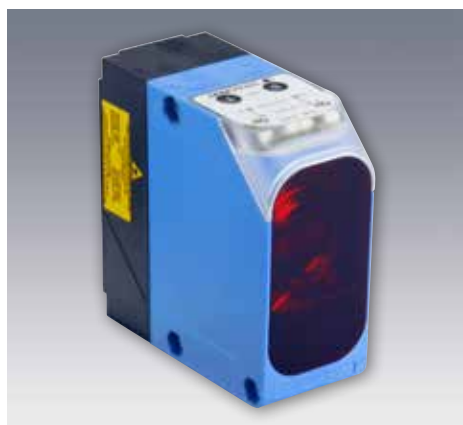
White 90 %	0.5 ... 6 m
Grey 10 %	0.5 ... 4 m
Black 6 %	0.5 ... 2 m

Accessories

Connection cables	From Page A-38
Brackets	From Page A-4
AS F 90 Aligning aid	From Page A-4
MSP F 90 A Fine adjustment	From Page A-4
Converters and adapter cables	From Page A-38

FT 92 ILA / IRLA

Distance sensor



PRODUCT HIGHLIGHTS

- Long scanning distance and range
- High repeatability
- High measurement rates
- Very good price/performance ratio
- Switchable red-light pilot laser
- 2 PNP switching outputs
- 1 analogue output: 4 ... 20 mA
- All outputs in measurement range freely adjustable
- Standard M12 plug

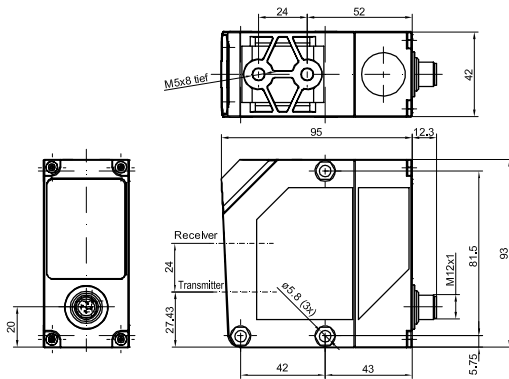
Optical data		Functions	
Scanning distance	0.2 ... 6 m ¹	Indicator LED, green	Operating voltage indicator
Type of light	Infrared, 905 nm (measurement laser) Laser, red, 650 nm (pilot laser)	Indicator LED, yellow	2 x switching output indicator
Laser Class (IEC 60825-1)	1 (measurement laser) 1 (pilot laser)	Indicator LED, orange	Operating mode
Repeatability Fast/Slow	< ± 15 / 10 mm ²	Indicator LED, red	Menu Indicator
Linearity	≤ ± 40 mm ²	Scanning distance adjustment	Via Teach-in button
		Default settings	Max. scanning distance and N.O.
Electrical data		Mechanical data	
Operating voltage, +U _B	18 ... 30V DC ³	Dimensions	95 x 93 x 42 mm
No-load current, I ₀	≤ 125 mA	Enclosure rating	IP 67 ⁴
Output current, I _e	≤ 100 mA	Material, housing	ABS, impact-resistant
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 ... +50 °C
Switching frequency f (ti/tp 1:1) Q	≤ 300 Hz	Ambient temperature: storage	-40 ... +80 °C
Switching output, Q ₁ / Q ₂	PNP / NPN 100 mA (see Selection Table)	Weight	200 g
Analogue output	4 ... 20 mA	Vibration and impact resistance	EN 60947-5-2
Response time Q _A	10 ms		
Temperature drift	≤ 1.2 mm / K		
Load	≤ 500 Ω		

¹ With RL250 reflector ² Data apply after a minimum switch-on time of 30 min ³ 10 % ripple, within U_B ⁴ With connected IP 67 plug

Switching output	Type of connection	Part number	Article number
PNP	Plug, M12, 5-pin	FT 92 ILA-PSL5	591-91005
NPN	Plug, M12, 5-pin	FT 92 ILA-NSL5	591-91008
PNP	Plug, M12, 5-pin	FT 92 IRLA-PSL5 ⁵	591-91013

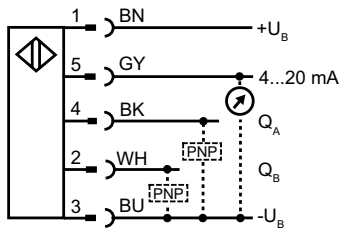
⁵ Pilot laser (red) on permanently

Plug connection



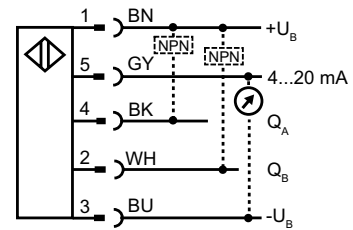
153-00346

Connection, 5-pin (PNP)



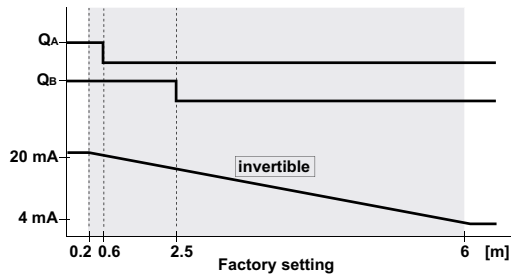
154-00125

Connection, 5-pin (NPN)



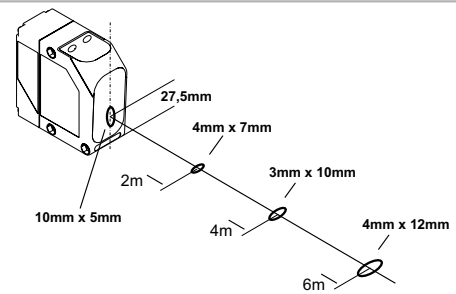
154-00472

Characteristic analogue curve



155-01373

Light spot geometry



155-00141

Scanning distance

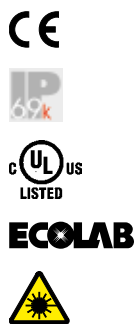
White 90 %	0.2 ... 6 m
Grey 18 %	0.2 ... 6 m
Black 6 %	0.2 ... 2.5 m

Accessories

Connection cables	From Page A-38
Brackets	From Page A-4
AS F 90 Aligning aid	From Page A-4
MSP F 90 A Fine adjustment	From Page A-4
Converters and adapter cables	From Page A-38

FR 55-RLAP

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



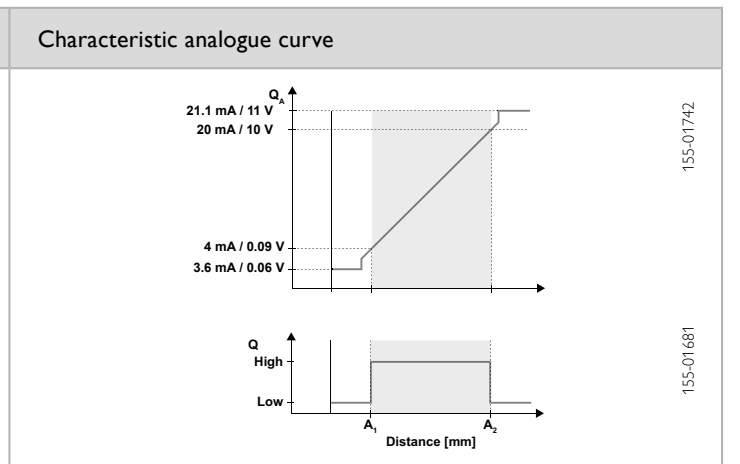
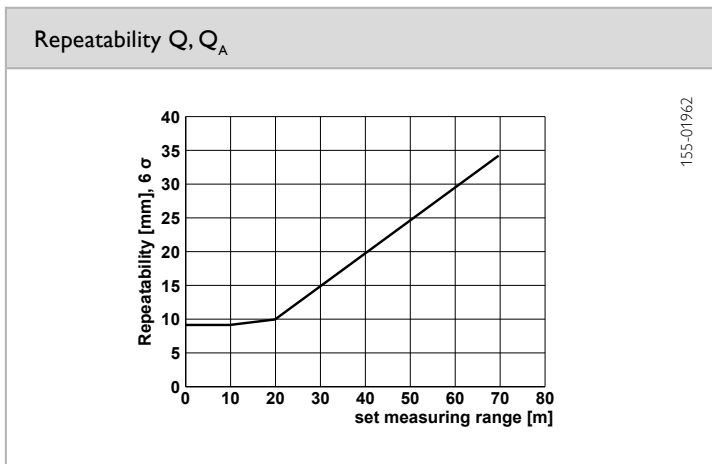
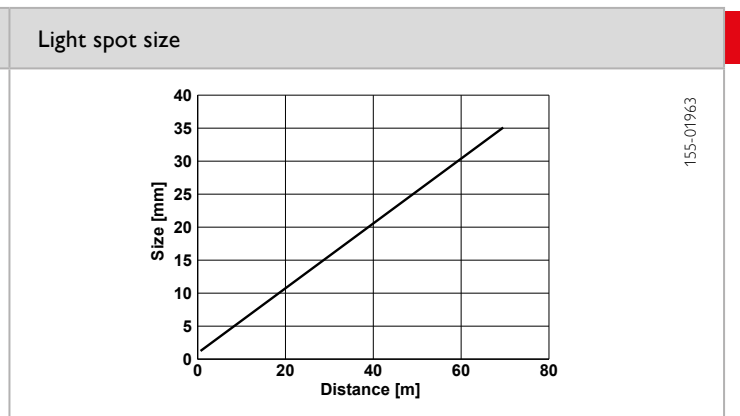
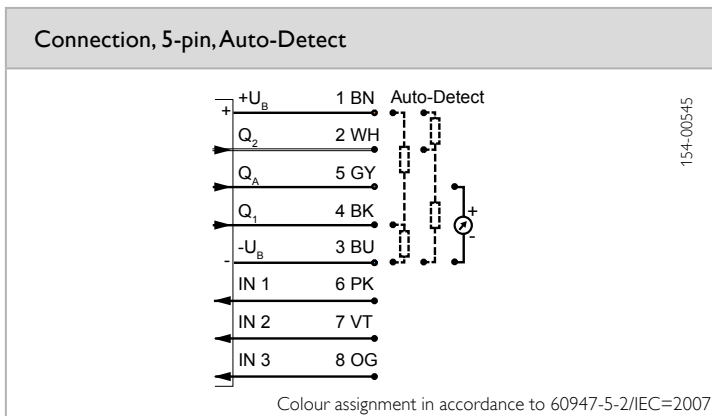
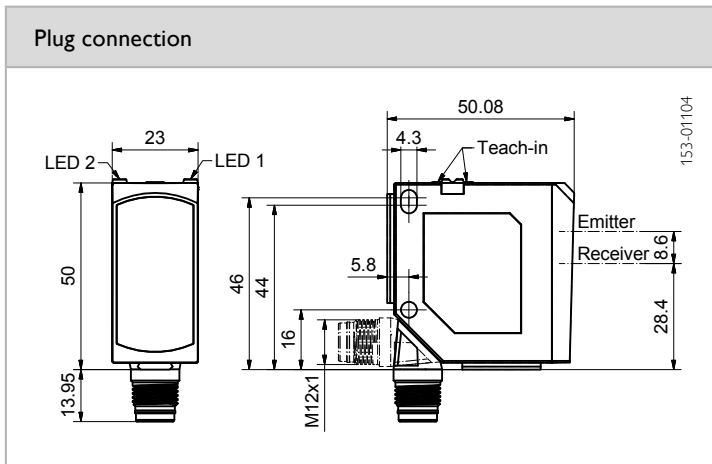
PRODUCT HIGHLIGHTS

- Sensor with large range for anticollision and positioning applications
- High flexibility thanks to adjustable analogue characteristic (Q_A)
- 4 distance positions with 2 switching outputs, adjustable via window function
- Q_1/Q_2 switchable to Q_1/\bar{Q}_1 as antivalent outputs
- 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
- Laser can be switched off via control line

Optical data		Functions	
Measurement range	0.3 ... 70 m ¹	Indicator LED 1, green	Operating voltage indicator
Resolution	8 μ A	Indicator LED 1, yellow	Switching output indicator
Linearity	$\pm 0.5\%$ ^{1,2}	Indicator LED 2 yellow	Switching output indicator
Repeatability Q	1.5 mm ³	Measurement range adjustment	Via Teach-in button or control input
Hysteresis	60 mm	Adjustment possibilities	Analogue measurement range Q_A Invertible analogue characteristic Switching output Q (window mode) N.O. / N.C. / antivalent Q_1/\bar{Q}_1 and Auto-Detect / NPN / PNP via teach-in and control line
Type of light	Laser, red 655 nm		Button lock via control input
Laser class (IEC 60825-1)	1		See Selection Table
		Default settings	
Electrical data			
Operating voltage $+U_B$	18 ... 30V DC	Response time Q	10 ms
No-load current I_0	≤ 60 mA	Load	≤ 500 Ohm (4 ... 20 mA)
Output current I_e Q	≤ 100 mA	Analogue output Q_A	4 ... 20 mA
Protection circuits	Reverse polarity protection U_B / short-circuit protection (Q)	Update rate Q_A	10 ms
Protection class	2	Temperature drift	< 1 mm / K
Power On Delay	< 5 s	Warm-up time	20 min.
Switching output Q	Auto-Detect (PNP/NPN) ⁴	Control input IN 1 und IN 2	$+U_B$ = Teach-in $-U_B$ = Button locked Open = normal operation
Output function	N.O. / N.C. / antivalent Q_1/\bar{Q}_1	Control input IN 3	$+U_B$ = Laser off $-U_B$ = Laser on offen = Laser on
Switching frequency f (ti/tp 1:1) Q	≤ 50 Hz		
Mechanical data			
Dimensions	50 x 50.1 x 23 mm	Ambient temperature: operation	-30 ... +60 °C ⁶
Enclosure rating	IP 67 & IP 69K ⁵	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 Of set measuring range ³ For 1 σ , the set measuring range is < 20 m, for further 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 69K plug ⁶ 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	2 x Auto-Detect	Plug, M12x1, 8-pin	FR 55-RLAP-70-2PNSI-L8	621-11026

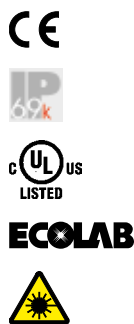


¹ At constant ambient conditions

Default setting	Measurement range	Accessories	
Analogue output Q_A (4...20 mA)	2 ... 6 m	Mounting angle MA F 55 (579-50007)	From Page A-4
Switching output Q (A_1 ... A_2), N.O., Auto-Detect	2 ... 6 m	Further brackets	From Page A-4
Switching output Q_2 (A_1 ... A_2), N.O., Auto-Detect	2 ... 6 m	Connection cables (C L8FG-S-2m-PUR / 902-51830)	From Page A-38
		Further connection cables	From Page A-38
		Reflective foil RF 250 (599-91009)	From Page A-18
		Further reflectors	From Page A-18

FR 55-RLP

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



PRODUCT HIGHLIGHTS

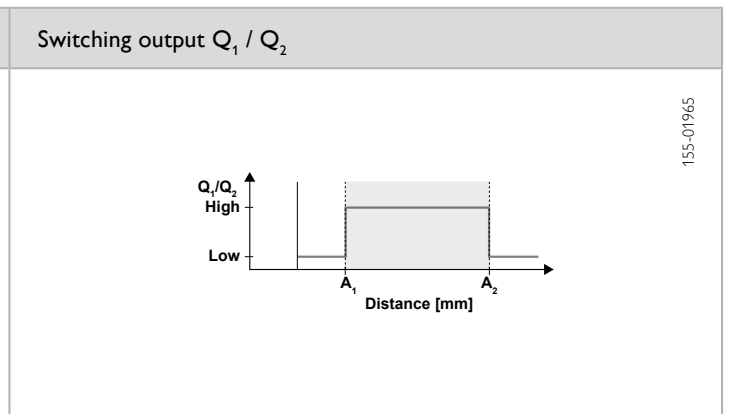
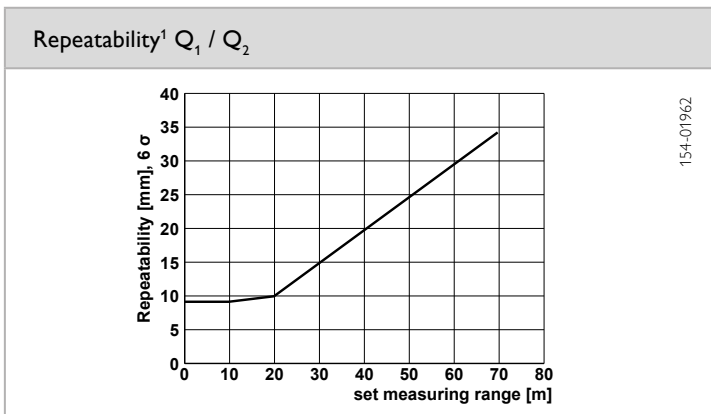
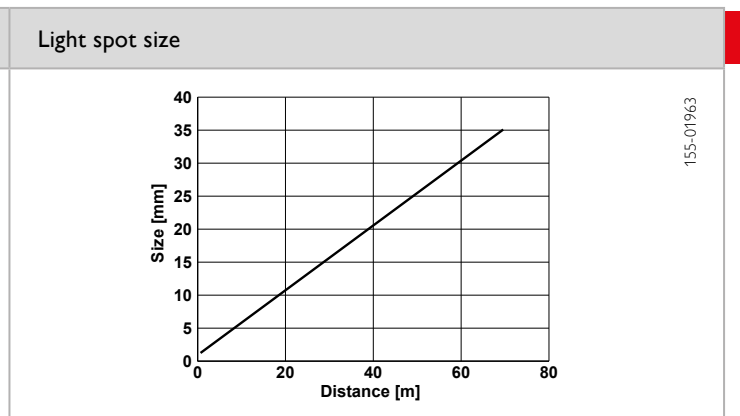
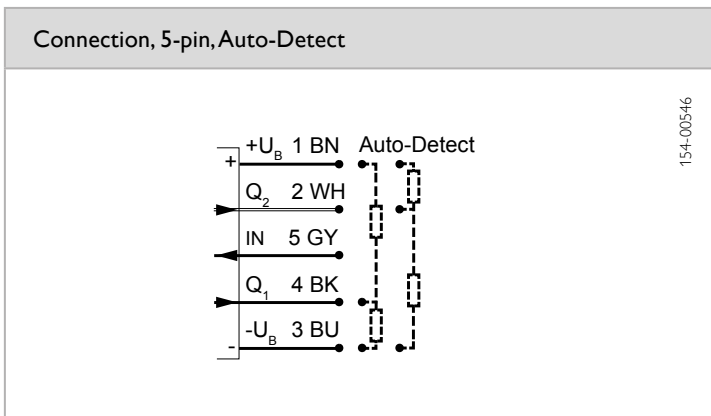
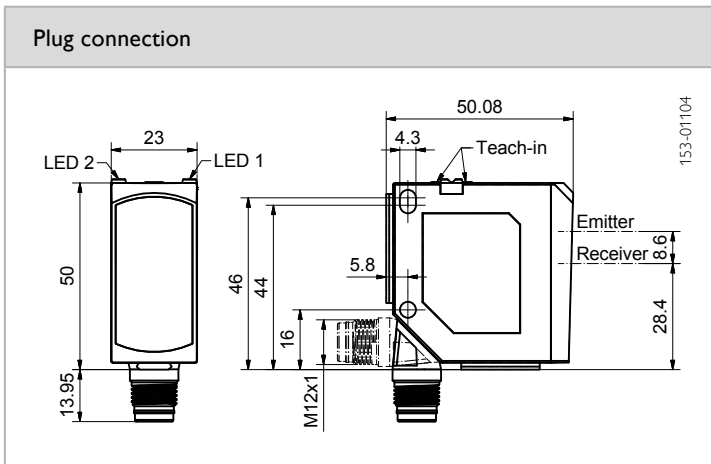
- Sensor with large range for anticollision and positioning applications
- 4 distance positions with 2 switching outputs, adjustable via window function
- Q₂ can be switched to Q₁ as antivalent output, e.g. for wire breakage monitoring
- Compact design for an easy integration
- Easy installation and 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
Repeatability Q	1.5 mm ²	Indicator LED 1, yellow	Switching output indicator
Hysteresis	60 mm	Indicator LED 2 yellow	Switching output indicator
Type of light	Laser, red 655 nm	Measurement range adjustment	Via Teach-in button or control input
Laser class (IEC 60825-1)	1	Adjustment possibilities	Switching output Q (window mode) N.O. / N.C. / antivalent Q ₁ /Q ₁ and Auto-Detect / NPN / PNP via teach-in and control line
		Default settings	Button lock via control input See Selection Table
Electrical data			
Operating voltage +U _B	18 ... 30V DC	Response time Q	10 ms
No-load current I ₀	≤ 60 mA	Temperature drift	< 1 mm / K
Output current I _e Q	≤ 100 mA	Warm-up time	20 min.
Protection circuits	Reverse polarity protection U _B / short-circuit protection (Q)	Control input IN	+U _B = Teach-in -U _B = Button locked Open = normal operation
Protection class	2		
Power On Delay	< 5 s		
Switching output Q	Auto-Detect (NPN / PNP) ³		
Output function	N.O. / N.C. / antivalent Q ₁ /Q ₁		
Switching frequency f (ti/tp 1:1) Q	≤ 50 Hz		
Mechanical data			
Dimensions	50 x 50.1 x 23 mm	Ambient temperature: operation	-30 ... +60 °C ⁵
Enclosure rating	IP 67 & IP 69K ⁴	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 RF250 reflector ² For 1 σ, the set measuring range is < 20 m, for further values see diagram ³ Auto-Detect: Automatic selection of PNP or NPN by the sensor; PNP or NPN can be fixed

⁴ With connected IP 67 / IP 69K plug ⁵ UL: max. +45 °C

Measurement range ¹	Switching output	Type of connection	Part Number	Article number
0.3... 70 m	2 x Auto-Detect	Plug, M12x1, 5-pin	FR 55-RLP-70-2PNS-L5	621-11027



¹ At constant ambient conditions

Default setting	Measurement range	Accessories	
Switching output Q ₁ (A ₁ ...A ₂), N.O., Auto-Detect	2 ... 6 m	Mounting angle MA F 55 (579-50007)	From Page A-4
Switching output Q ₂ (A ₁ ...A ₂), N.O., Auto-Detect	2 ... 6 m	Further brackets	From Page A-4
		Connection cables	From Page A-38
		Reflective foil RF 250 (599-91009)	From Page A-18
		Further reflectors	From Page A-18