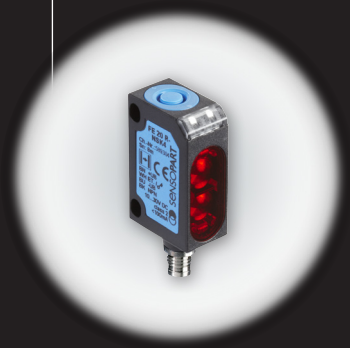
Distance sensors

Measurement from 20 mm to 250 m

Optical distance sensors

from Page 120

FT 20
- *Operating range (scanning distance) from 20 mm to 80 mm*
- *Distance sensors for short distances using the triangulation principle*
- *Simple integration thanks to small housings*
- *Analogue output 0 … 10 V*



from Page 124

FT 50
- *Operating range (scanning distance) from 30 to 300 mm*
- *High measurement frequency*
- *Laser distance sensors using the triangulation principle*
- *High absolute accuracy*
- *High precision thanks to resolution of up to 7 µm*
- *Robust with differing surfaces*
- *RS485 and analogue interfaces*

from Page 124

FT 80
- *Operating range (scanning distance) from 250 mm to 750 mm*
- *Laser distance sensors using the triangulation principle*
- *High repeatability*
- *RS485 and analogue interfaces*

from Page 136

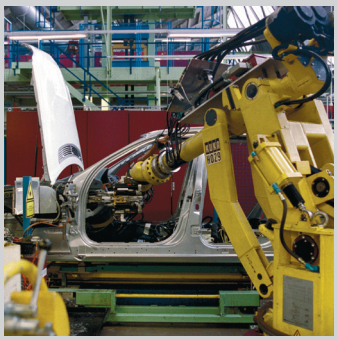
F 90 / F 91 / F 92
- *Laser distance sensors using the time-of-flight principle*
- *Scanner versions up to measurement distance of 10 m*
- *Reflector versions up to 250 m range*
- *Wide choice of interfaces (serial and analogue)*

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

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

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

Monorail system with car bodies in the automotive industry



Car production
Positioning the body using distance sensors

from Page 150

FR 85 Rail Pilot

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

Ultrasonic distance sensors

from Page 506

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

Inductive distance sensors

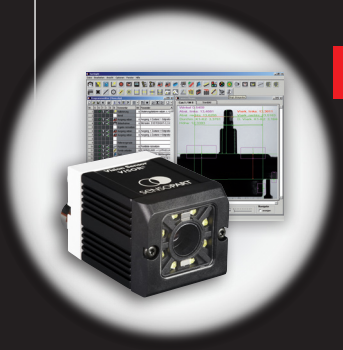
from Page 605

- *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*

Eyesight vision systems

from Page 74

- *2D camera technology for measuring e.g. moulded and turned parts*
- *Versatile measurement tool for all dimensional accuracy tasks*
- *Image and result visualisation in inspection mode*



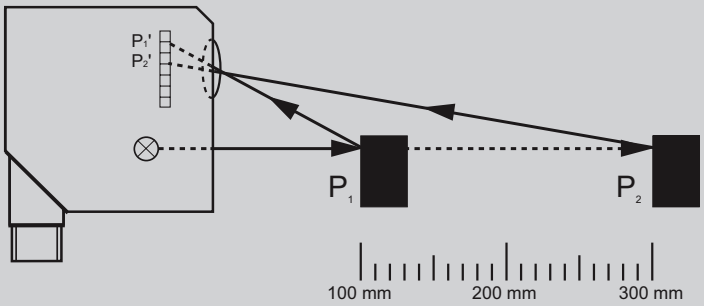
Distance sensors

System description

Distance measurement using triangulation

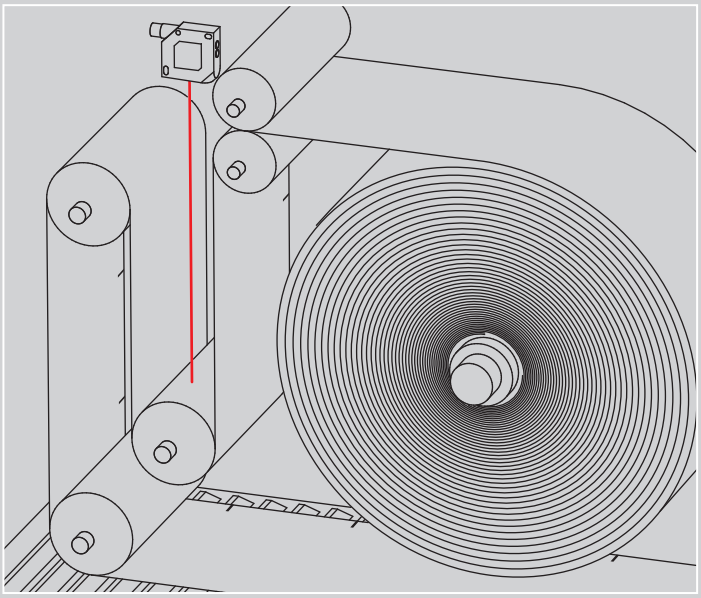
The measurement principle of optical triangulation is suitable for the precise determination of distances at close range. With the help of special receiver optics and a position-sensitive detector (e.g. a photodiode line), the sensor can determine the object distance regardless of its reflectivity (see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

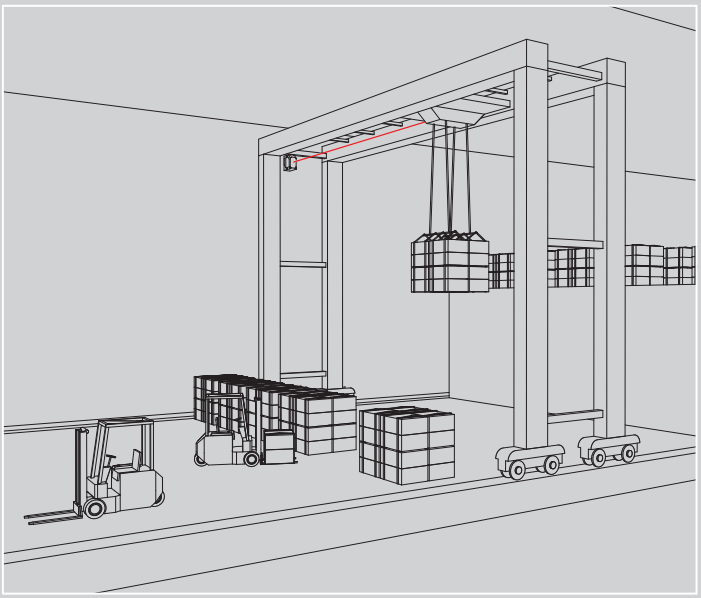
Collision prevention on monorail systems in car production is a special distance measurement task. The FR 85 series was specially developed for this application. These sensors provide excellent measurement results regardless of the reflectivity of the target object, and their comprehensive range of functions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

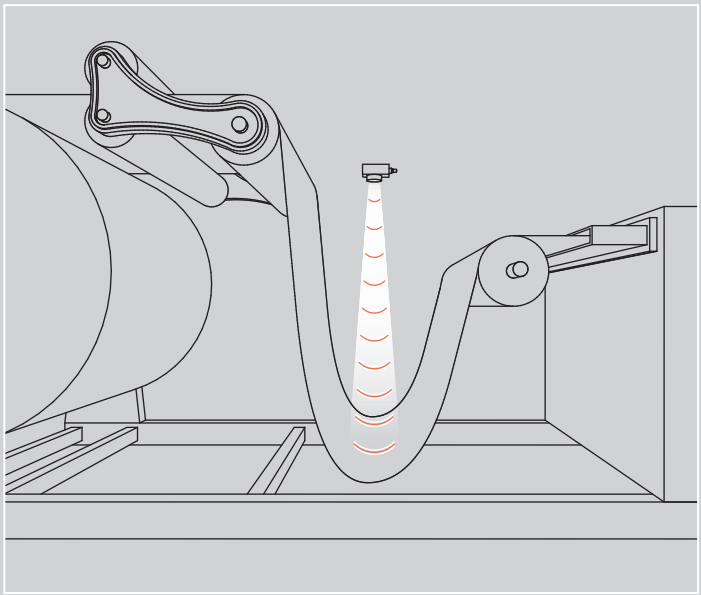
The reasonably priced solution for metallic objects. Compared to optical or ultrasonic sensors, inductive distance sensors have only limited ranges. They are still used, however, under harsh conditions, in particular, as a result of their great robustness.

- 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.

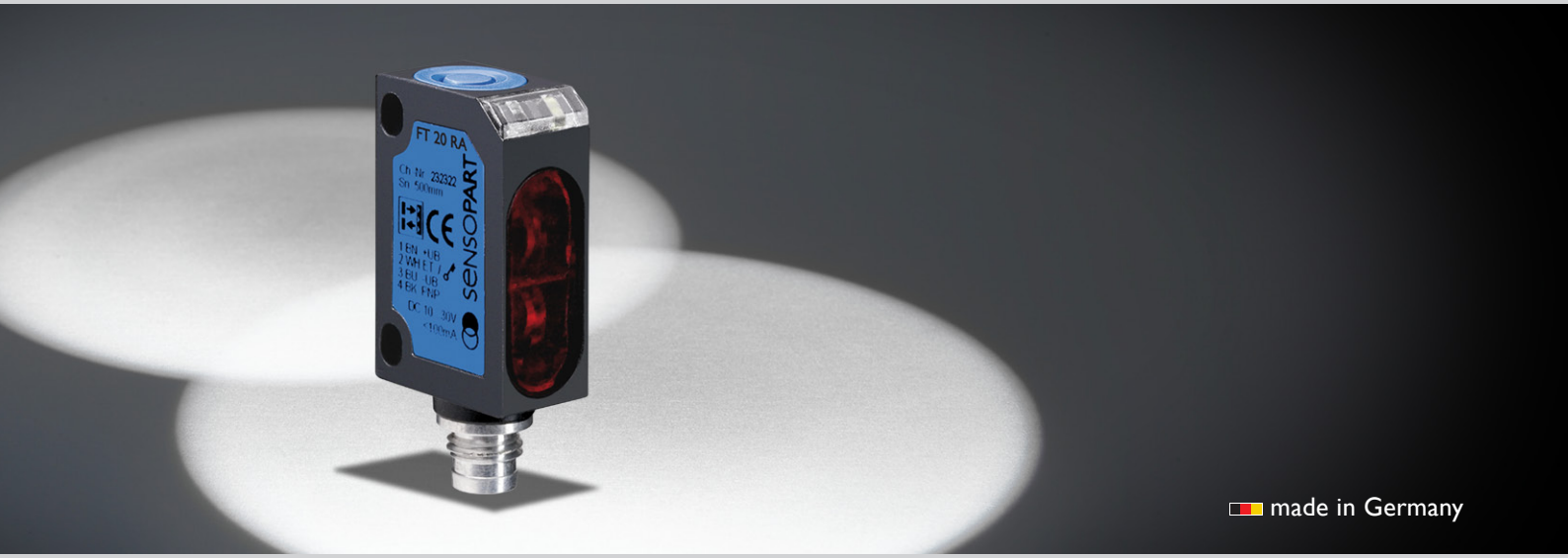
- Operating ranges from 20 … 6000 mm
- Operating range and analogue output adjustable via teach-in
- Analogue output 0 … 10 V / 4 … 20 mA



Monitoring throughput with the UT 20 ultrasonic sensor

FT 20 – optical short-range distance sensors

The compact class for measurement and regulatory tasks



In a miniature housing
The FT 20 RA is also suitable for limited installation spaces thanks to its compact dimensions of 32 x 12 x 20 mm³.

TYPICAL FT 20

- Distance sensor with 0 … 10 V analogue output
- Easily integratable ultra-compact ABS housing: 32 x 12 x 20 mm³
- Operating range (scanning distance): 20 … 80 mm
- Visible red light (660 nm) for simple alignment
- Resolution: approx. 0.5 mm
- Two adjustable switching points as window mode for 2-point control
- Teach-in operation

In addition to its analogue voltage output, the FT 20 RA also has a switching output and offers the possibility of defining a switching window by means of two switching points. It can thus serve as a threshold switch. Thanks to their simple operation, these sensors are suitable for straightforward measurement and control tasks at distances of up to 80 mm.

FT 20 RA – Product Overview			
	Operating range	Special features	Page
FT 20 RA	20 … 80 mm	Small housing	122

FT 25 RA

Miniature distance sensor

PRODUCT HIGHLIGHTS

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

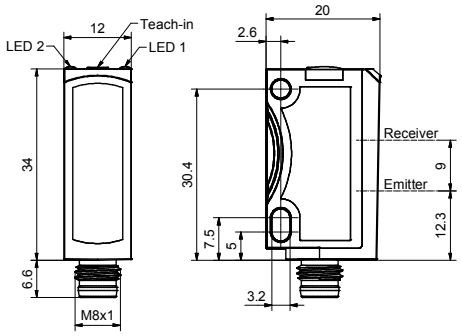
Optical data			Functions	
Measurement range	20 … 80 mm[1]	30 … 200 mm[1]	Indicator LED, green	Operating voltage indicator
Resolution	20 µm	50 µm	Indicator LED, yellow	Switching output indicator
Linearity	± 0.4 mm[2]	± 2 mm[2]	Measurement range adjustment	Via Teach-in button
Repeatability	< 0.4 mm[2, 3]	< 1 mm[2, 3]	Adjustment possibilities	Analogue measurement range Q_A Invertible analogue characteristic Switching output Q (window mode) N.O./N.C. via teach-in button
Type of light	LED, red, 632 nm	LED, red, 632 nm	Default settings	See Table

Electrical data		Mechanical data	
Operating voltage, $+U_B$	13 … 30 V DC	Dimensions	34 x 20 x 12 mm
No-load current, I_0	≤ 30 mA	Enclosure rating	IP 67 / IP 69K[4]
Output current, le Q	≤ 100 mA	Material, housing	ABS
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection (Q)	Material, front screen	PMMA
Protection Class	2	Type of connection	(See Selection Table)
Time to readiness	< 300 ms	Ambient temperature: operation	-20 … +60 °C[5]
Switching output, Q	PNP/NPN (See Selection Table)	Ambient temperature: storage	-20 … +80 °C
Output function	N.O./N.C.	Weight (plug device)	10 g
Max. capacitive load Q	10 nF	Resistance to vibrations and impacts	EN 60947-5-2
Switching frequency, f (ti/tp 1:1) Q	≤ 1000 Hz		
Response time Q	500 µs		
Analogue output Q_A	1 … 10 V / max. 3 mA		
Response time Q_A	400 µs (FT 25-RA-60) 3.4 ms (FT 25-RA-170)		
Warm-up time	10 min.		
Temperature drift	< 0.1 mm/K (FT 25-RA-60) < 0.2 mm/K (FT 25-RA-170)		

[1] Reference material: 6…90 % reflectivity, [2] Reference material grey, 18 % reflectivity, [3] at constant ambient conditions,
[4] with connected IP 67 / IP 69K plug, [5] UL: -20°C...+50 °C

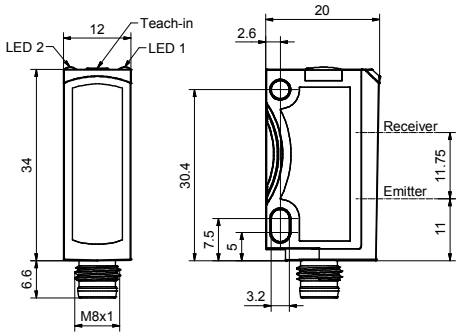
Measurement range	Analogue output	Switching output	Type of connection	Part number	Article number
20 ... 80 mm	1 ... 10 V	PNP	Metal plug, M8x1, 4-pin	FT 25 RA-60-PSU-M4M	604-41000
20 ... 80 mm	1 ... 10 V	NPN	Metal plug, M8x1, 4-pin	FT 25 RA-60-NSU-M4M	604-41001
30 ... 200 mm	1 ... 10 V	PNP	Metal plug, M8x1, 4-pin	FT 25 RA-170-PSU-M4M	604-41002
30 ... 200 mm	1 ... 10 V	NPN	Metal plug, M8x1, 4-pin	FT 25 RA-170-NSU-M4M	604-41003

Plug connection (20 ... 80 mm)



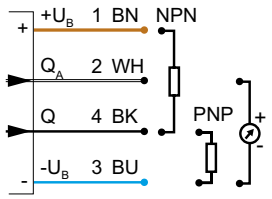
153-00839

Plug connection (30 ... 200 mm)



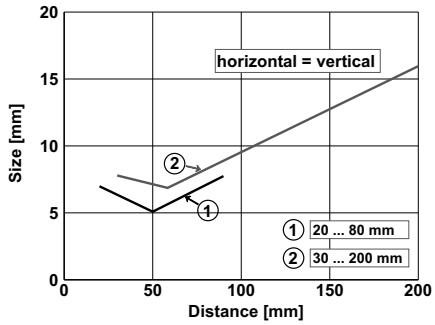
153-00837

Connection, 4-pin



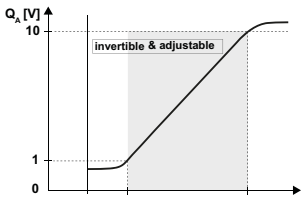
154-00329

Light spot size

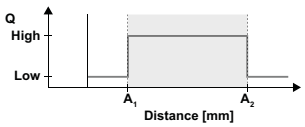


155-01663

Characteristics



155-01661



155-01681

Default settings

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

Accessories

Connection cables	From Page 670
Brackets	From Page 642

FT 20 RA

Distance sensor

PRODUCT HIGHLIGHTS

- Operating range 20 … 80 mm
- Analogue output 0 … 10 V
- Simple teach-in
- Adjustable switching window (switch on/off points) for e.g. two-point control
- Red light (660 nm)

Optical data		Functions	
Operating range	20 … 80 mm[1]	Indicator LED, green	Operating voltage indicator
Measurement range	60 mm	Indicator LED, yellow	Switching output indicator
Type of light	LED, red, 660 nm	Scanning distance adjustment	Via Teach-in button
Resolution	≈ 2 % distance (measurement value)		
Linearity	< 1 %		

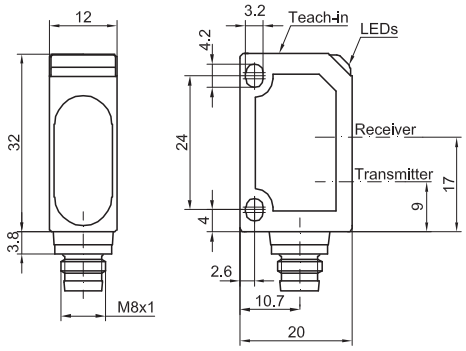
Electrical data		Mechanical data	
Operating voltage, $+U_B$	15 … 30 V DC	Dimensions	32 x 20 x 12 mm
No-load current, I_0	≤ 30 mA	Enclosure rating	IP 67[2]
Output current, Ie	≤ 100 mA	Material, housing	ABS
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection (Q)	Material, front screen	PMMA
		Type of connection	(See Selection Table)
Protection Class	2	Ambient temperature: operation	-20 … +60 °C
Switching output, Q	PNP	Ambient temperature: storage	-20 … +80 °C
Output function	N.O.	Weight (plug device)	10 g
Analogue output	0 … 10 V / max. 3 mA	Weight (cable device)	40 g
Limit frequency, analogue output	≤ 200 Hz		
Load	≥ 10 kΩ		
Switching frequency, f (ti/tp 1:1)	≤ 1000 Hz		
Response time	500 µs		

[1] Reference material: Kodak white, 90 % [2] With connected IP 67 plug

Type of connection	Part number	Article number
Plug, M8, 4-pin	FT 20 RA-60-F-M4	554-11000
Cable, 2 m, 4-wire	FT 20 RA-60-F-K4	554-11001

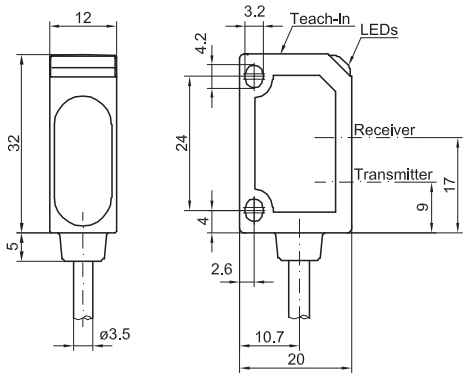
Version: 11/2012. Subject to changes; diagrams similar

Plug connection



153-00382

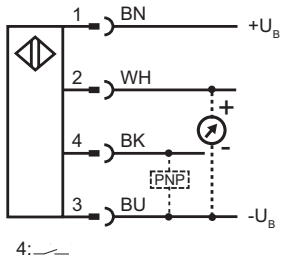
Cable connection



153-00381

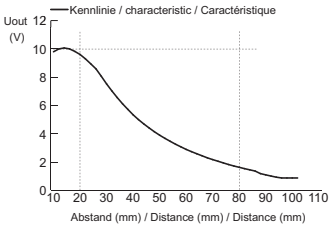
6

Connection, 4-pin



154-00179

Characteristic output curve



Typ. Ausgangskennlinie / typ. output characteristic / Caractéristique typ. de sortie

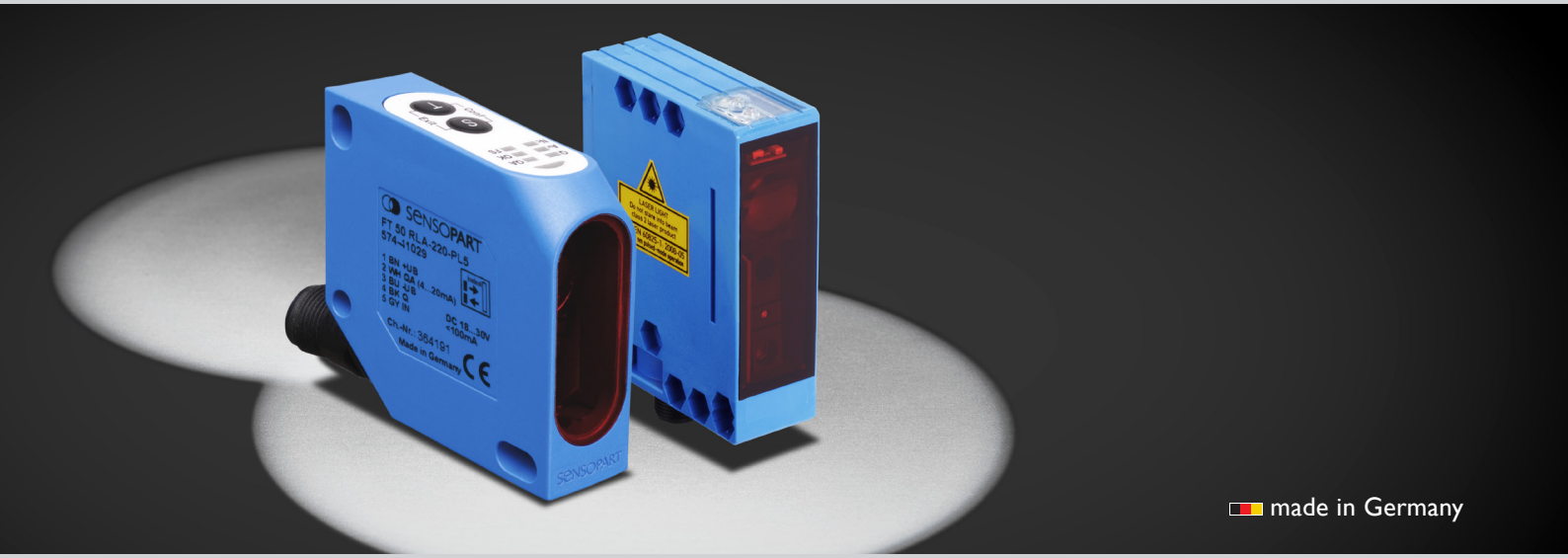
155-00434

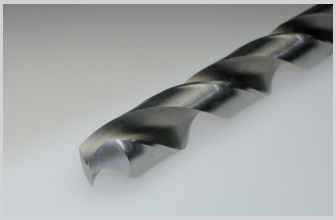
Accessories

Connection cables	From Page 670
Brackets	From Page 642

FT 50 / FT 80 – 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 / FT 80

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

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

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

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

FT 50 / FT 80 – Product Overview				
	Housing dimensions	Operating range	Special features	Page
FT 50 RLA-20	50 x 17 x 50 mm³	40 … 60 mm	Analogue output	126
FT 50 RLA-40	50 x 17 x 50 mm³	45 … 85 mm	Analogue output	128
FT 50 RLA-70 … L5 -100 … L5 -220 … L5	50 x 17 x 50 mm³	30 … 100 mm 70 … 170 mm 80 … 300 mm	Analogue output, switching output, simple teach-in of measurement ranges; M12, 5-pin	130
FT 50 RLA-70 … L8 -100 … L8 -220 … L8	50 x 17 x 50 mm³	30 … 100 mm 70 … 170 mm 80 … 300 mm	Analogue output, switching outputs, RS485 interface; M12, 8-pin	132
FT 80 RLA-500	83 x 25 x 65 mm³	250 … 750 mm	Analogue output, switching outputs, RS485 interface; M12 8-pin	134

FT 50 RLA 20

Distance sensor

PRODUCT HIGHLIGHTS

- High resolution and small light spot
- Operating range: 40 … 60 mm
- Small, easily visible light spot
- No adjustments necessary
- Resolution: 0.007 mm / 0.04 mm
- Analogue output: 0 … 10 V
- Device plug rotatable through 270°

Optical data	
Operating range	40 … 60 mm[1]
Measurement range	20 mm
Type of light	Laser, red, 670 nm
Laser Class (DIN EN 60825-1:2008-5)	2
Resolution	40 µm / 7µm (see Selection Table)
Linearity	< 1 %

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

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

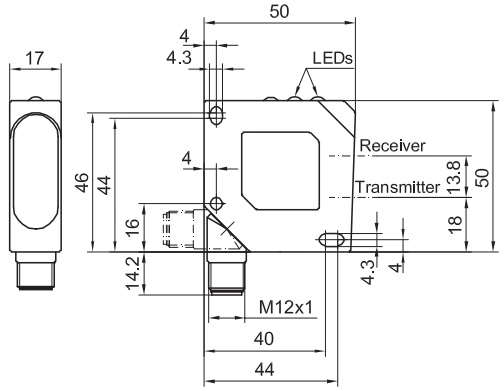
Mechanical data	
Dimensions	50 x 50 x 17 mm
Enclosure rating	IP 67[2]
Material, housing	ABS, impact-resistant
Material, front screen	PMMA
Type of connection	(See Selection Table)
Ambient temperature: operation	-10 … +45 °C
Ambient temperature: storage	-20 … +60 °C
Weight (plug device)	40 g
Weight (cable device)	260 g
Vibration and impact resistance	EN 60947-2

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

Resolution	Type of connection	Part number	Article number
40 µm	Plug, M12x1, 4-pin	FT 50 RLA-20-F-L4S	574-41005
7 µm	Plug, M12x1, 4-pin	FT 50 RLA-20-S-L4S	574-41007
40 µm	Cable, 6 m, 4-wire	FT 50 RLA-20-F-K5	574-41004
7 µm	Cable, 6 m, 4-wire	FT 50 RLA-20-S-K5	574-41006

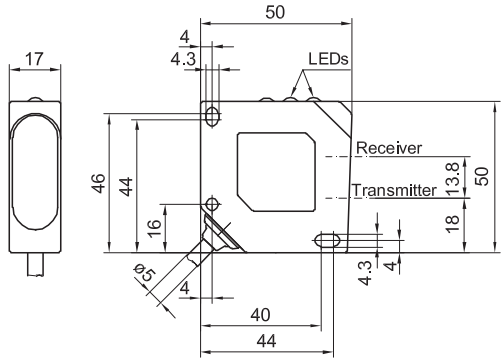
Version: 11/2012. Subject to changes; diagrams similar

Plug connection



153-00214

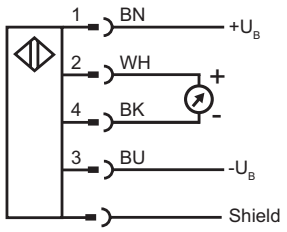
Cable connection



153-00213

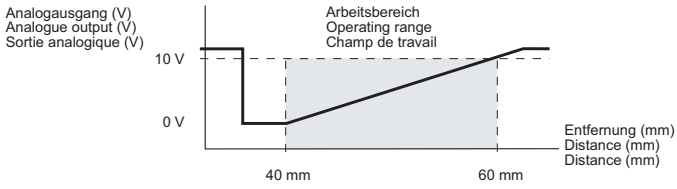
6

Connection, 4-pin



154-00195

Characteristic output curve



155-00438

Accessories

Connection cables	From Page 670
Brackets	From Page 642

FT 50 RLA 40

Distance sensor

PRODUCT HIGHLIGHTS

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

Optical data		Functions	
Operating range	45 … 85 mm[1]	Indicator LED, green	Operating voltage indicator
Measurement range	40 mm	Indicator LED, red	Contamination indicator
Type of light	Laser, red, 670 nm	Scanning distance adjustment	Fixed setting
Laser Class (DIN EN 60825-1:2008-5)	2		
Resolution	80 µm / 20 µm (see Selection Table)		
Linearity	< 1 %		
Light spot size	< 0.8 mm at 65 mm		

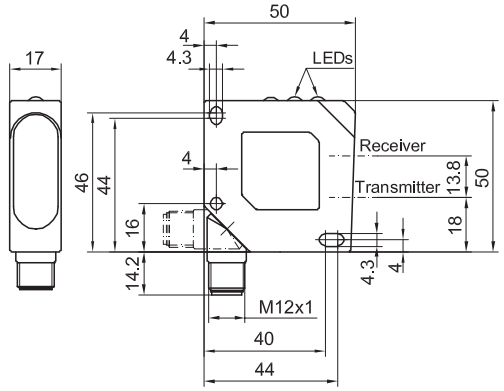
Electrical data		Mechanical data	
Operating voltage, $+U_B$	18 … 28 V DC	Dimensions	50 x 50 x 17 mm
No-load current, I_0	≤ 35 mA	Enclosure rating	IP 67[2]
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection, Q	Material, housing	ABS, impact-resistant
		Material, front screen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

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

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

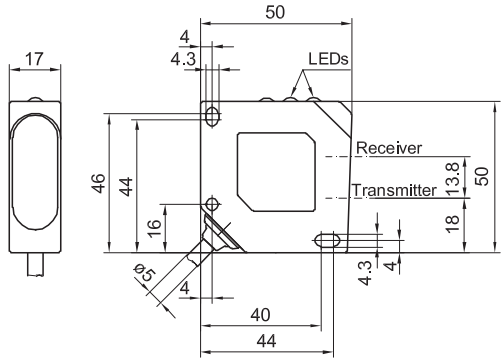
Version: 11/2012. Subject to changes; diagrams similar

Plug connection



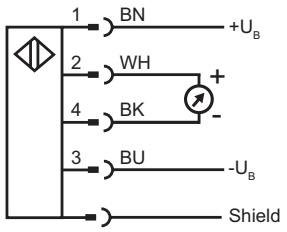
153-00214

Cable connection



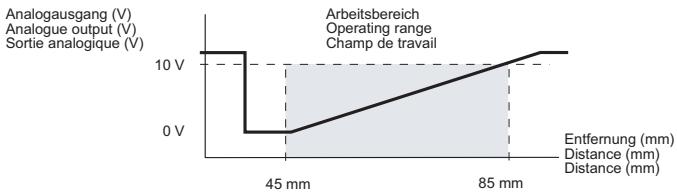
153-00213

Connection, 4-pin



154-00195

Characteristic output curve



155-00441

Accessories

Connection cables	From Page 670
Brackets	From Page 642

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
- Simple adjustment via teach-in button

Optical data	
Operating range	30 … 100 mm[1] (see Selection Table)
Measurement range	(See Selection Table)
Type of light	Laser, red, 650 nm
Laser Class (DIN EN 60825-1:2008-5)	2
Resolution	< 0.1 % of operating range end-value[2] (see Selection Table)
Linearity	< 0.25 % of operating range end-value (see Selection Table)
Repeatability	< 0.25 % of measurement value

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

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

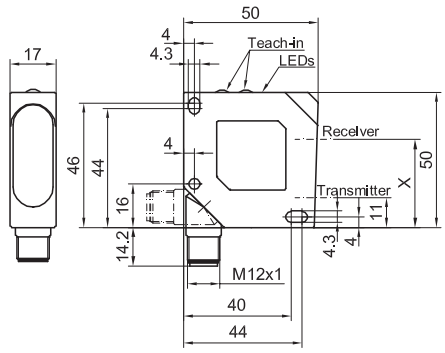
Mechanical data	
Dimensions	50 x 50 x 17 mm
Enclosure rating	IP 67[3]
Material, housing	ABS, impact-resistant
Material, front screen	PMMA
Type of connection	(See Selection Table)
Ambient temperature: operation	-10 … +60 °C
Ambient temperature: storage	-20 … +80 °C
Weight	43 g
Vibration and impact resistance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

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

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

Version: 11/2012. Subject to changes; diagrams similar

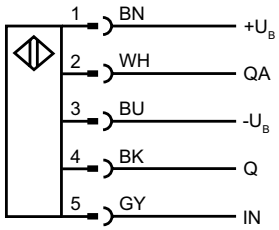
Plug connection



153-00716

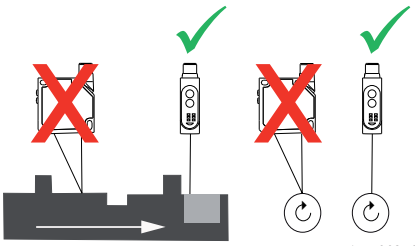
Type	X (distance, receiver)
FT 50 RLA 70	18.4 mm
FT 50 RLA 100	21.5 mm
FT 50 RLA 220	21.5 mm

Connection, 5-pin

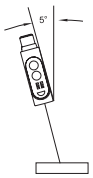


154-00176

Installation



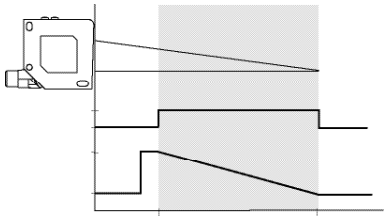
155-00270



155-00274

Characteristic analogue curve

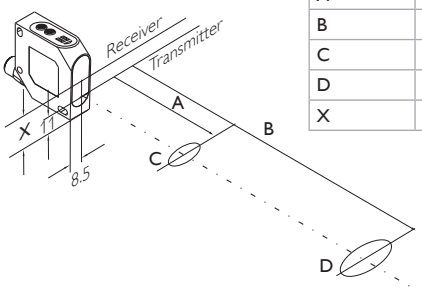
Operating range (default setting)



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

155-00271

Light spot geometry



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

155-00269

Accessories

Connection cables	From Page 670
Brackets	From Page 642

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
- High long-term stability and low temperature effects

Optical data	
Operating range	30 … 100 mm / 70 … 170 mm / 80 … 300 mm[1]
Measurement range	70 mm, 100 mm, 120 mm
Type of light	Laser, red, 650 nm
Laser Class (DIN EN 60825-1:2008-5)	2
Resolution	< 0.1 % of operating range end-value (0.1 mm / 0.17 mm/ 0.3 mm)[2]
Linearity	< 0.25 % of operating range end-value (0.25 mm / 0.42 mm / 0.75 mm)
Repeatability	< 0.25 % of measurement value

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

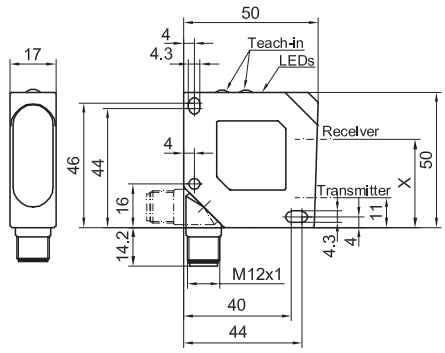
Electrical data	
Operating voltage, $+U_B$	18 … 30 V DC
No-load current, I_0	≤ 40 mA
Output current, Ie	≤ 100 mA
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection, Q (not Type S1)[3]
Protection Class	2
Standby time	≤ 300 ms
Switching output, Q1 & Q2	PNP
Output function	N.O. / N.C.
Analogue output	4 … 20 mA
Load	≤ 500 Ω
Switching frequency, f (ti/tp 1:1)	≤ 1000 Hz
Response time	≥ 0.4 ms (when mean value formation = off) / 4 ms / 40 ms to end-value
Control input, IN	RS485[2]

Mechanical data	
Dimensions	50 x 50 x 17 mm[3]
Enclosure rating	IP 67[4]
Material, housing	ABS, impact-resistant
Material, front screen	PMMA
Type of connection	(See Selection Table)
Ambient temperature: operation	-10 … +60 °C
Ambient temperature: storage	-20 … +80 °C
Weight	43 g
Vibration and impact resistance	EN 60947-2

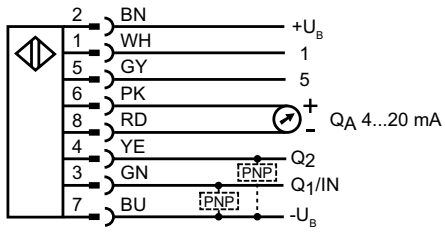
[1] Reference material: Kodak grey, 18 % [2] Smallest measurable change [3] Type S1 with RS485 [4] With connected IP 67 plug

Scanning distance	Interface	Type of connection	Part number	Article number
30 … 100 mm	–	Plug, M12x1, 8-pin	FT 50 RLA-70-L8	574-41018
30 … 100 mm	RS485	Plug, M12x1, 8-pin	FT 50 RLA-70-S1L8	574-41019
70 … 170 mm	RS485	Plug, M12x1, 8-pin	FT 50 RLA-100-S1L8	574-41033
80 … 300 mm	–	Plug, M12x1, 8-pin	FT 50 RLA-220-L8	574-41014
80 … 300 mm	RS485	Plug, M12x1, 8-pin	FT 50 RLA-220-S1L8	574-41015

Version: 11/2012. Subject to changes; diagrams similar

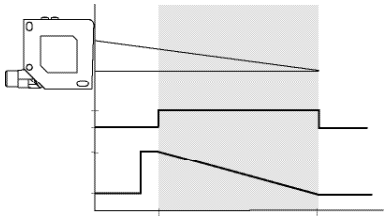
Plug connection	Type	X (distance, receiver)
 153-00716	FT 50 RLA 70 FT 50 RLA 100 FT 50 RLA 220	18.4 mm 21.5 mm 21.5 mm

6

Connection, 8-pin	Type	Pin 1	Pin 5
 154-00127	FT 50 RLA -S1L8. FT 50 RLA -L8.	RS485 Y/A –	RS485 Z/B –

Characteristic analogue curve	Light spot geometry

Operating range (default setting)

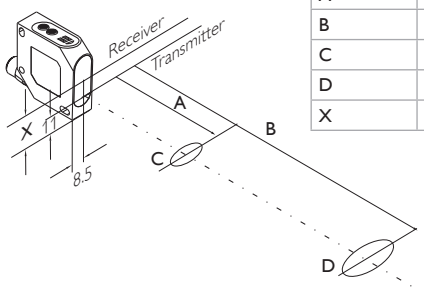


OK LED (green)
(Good Target)

Analogue output
(invertible)

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

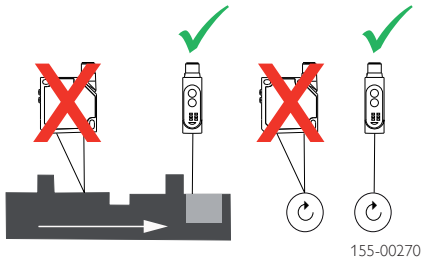
155-00271



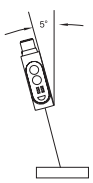
FT 50 RLA	70 …	100 …	220 …
A	30	70	80
B	100	170	300
C	1.5 x 3	1.5 x 3.5	1.5 x 3.5
D	1.5 x 3.25	1.7 x 3.9	2 x 4.5
X	29.4	32.5	32.5

155-00269

Installation	Accessories



155-00270



155-00274

Accessories	
Connection cables	From Page 670
Brackets	From Page 642

FT 80 RLA

Distance sensor

PRODUCT HIGHLIGHTS

- Long operating distance
- 2 switching outputs + analogue output: 4 … 20 mA
- High resolution (0.1% of measurement range)
- Type S1 with serial Bus interface (RS485 half-duplex)
- Adjustable via Teach-in; Type S1 also via software
- Wide range of functions

Optical data	
Operating range	250 … 750 mm[1]
Measurement range	500 mm
Type of light	Laser, red, 650 nm
Laser Class (DIN EN 60825-1:2008-5)	2
Resolution	< 0.1 % of measurement range
Linearity	< 0.25 % of measurement range

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

Electrical data	
Operating voltage, $+U_B$	18 … 30 V DC
No-load current, I_0	≤ 40 mA
Output current, Ie	≤ 100 mA
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection, Q (not Type S1[2])
Protection Class	2
Standby time	≤ 300 ms
Switching output, Q	PNP
Output function	N.O. / N.C.
Analogue output	4 … 20 mA
Load	≤ 500 Ω (recommended)
Switching frequency, f (ti/tp 1:1)	≤ 1000 Hz
Response time	≥ 0.4 ms (when mean value formation = off) / 4 ms / 40 ms to end-value
Control input, IN	RS485[2]

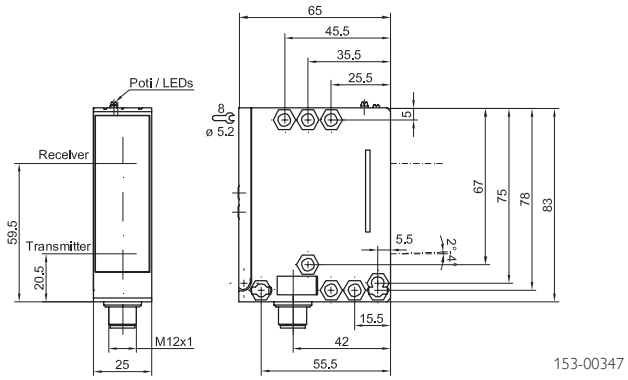
Mechanical data	
Dimensions	83 x 65 x 25 mm
Enclosure rating	IP 67[3]
Material, housing	PBT
Material, front screen	PMMA
Type of connection	(See Selection Table)
Ambient temperature: operation	-10 … +60 °C
Ambient temperature: storage	-20 … +80 °C
Weight	107 g

[1] Reference material: Kodak grey, 18 % [2] Type S1 with RS485 half-duplex [3] With connected IP 67 plug

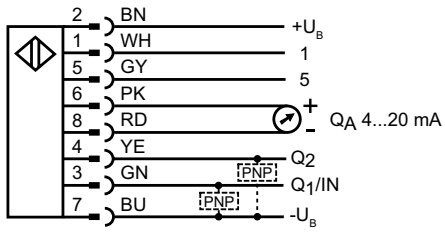
Interface	Type of connection	Part number	Article number
–	Plug, M8x1, 8-pin	FT 80 RLA-500-L8	574-41020
RS485	Plug, M8x1, 8-pin	FT 80 RLA-500-S1L8	574-41024

Version: 11/2012. Subject to changes; diagrams similar

Plug connection



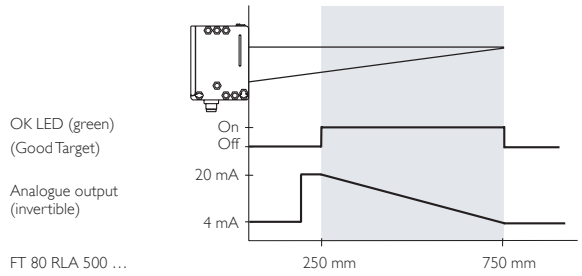
Connection, 8-pin



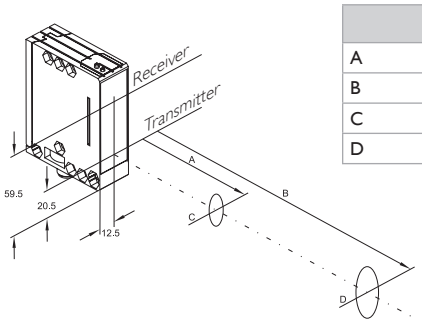
Type	Pin 1	Pin 5
FT 80 RLA 500 -S1L8.	RS485 Y/A	RS485 Z/B
FT 80 RLA 500 -L8.	N. C.	N. C.

Characteristic analogue curve

Operating range (default settings)



Light spot geometry



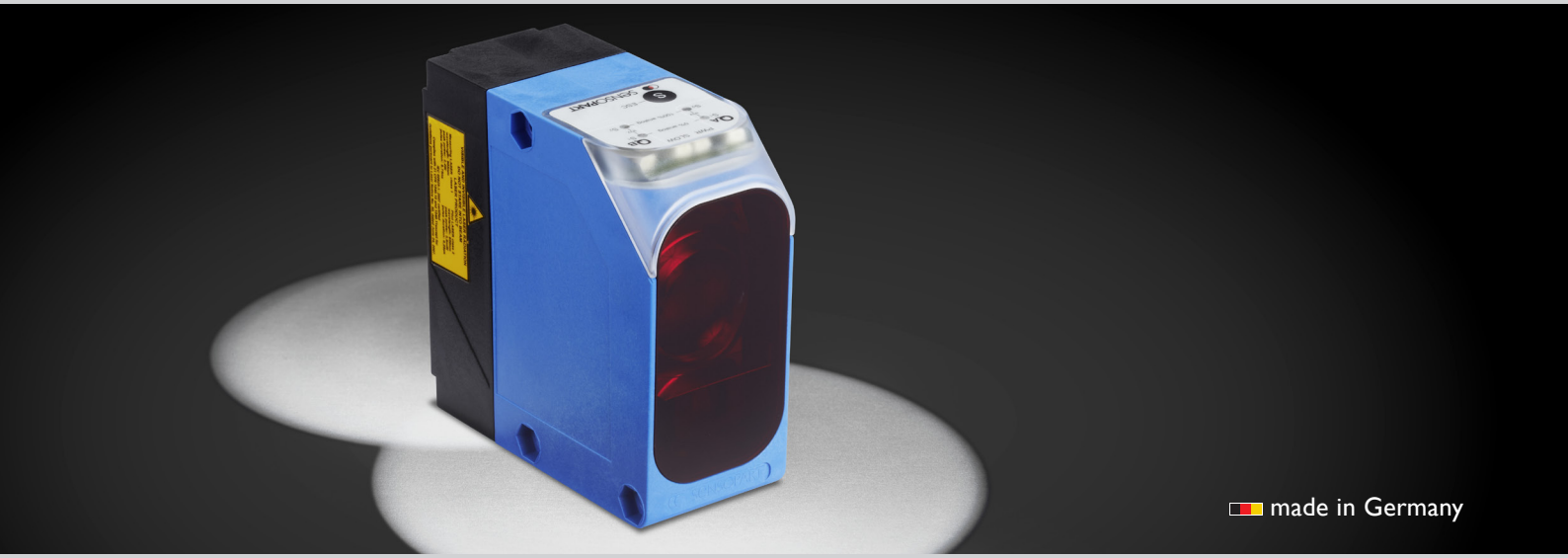
	FT 80 RLA 500 …
A	250 mm
B	750 mm
C	1.9 mm x 1.2 mm
D	2.7 mm x 1.9 mm

Accessories

Connection cables	From Page 670
Brackets	From Page 642

F 90 / F 91 / F 92 –
Laser distance sensors for long distances

Far-sighted with time-of-flight technology



Indicator
The distance is directly Indicatored 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.

TYPICAL 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
- High measurement rates
- Invisible IR measurement laser, switchable red-light pilot laser for simple alignment
- ABS housing: 93 x 42 x 93 mm^3

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 90 / F 91 / F 92 – Product Overview				
	Operating distance	Functional principle	Special features	Page
FT 90 ILA	0.5 … 10 m	Scanning on object	RS422 interface, SSI-compatible	138
FT 91 ILA	0.5 … 6 m	Scanning on object	RS422 interface, SSI-compatible	140
FT 92 ILA/RLA	0.2 … 6 m	Scanning on object	2 switching outputs, 1 analogue output	142
FR 90 ILA	0.5 … 250 m	Reflector	RS422 interface, SSI-compatible	144
FR 91 ILA	0.5 … 50 m	Reflector	RS422 interface, SSI-compatible	146
FR 92 ILA	0.2 … 30 m	Reflector	2 switching outputs, 1 analogue output	148

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

Optical data	
Operating range	0.5 … 10 m[1]
Measurement range	9.5 m
Type of light	Infrared, 905 nm (measurement laser) Laser, red, 650 nm (pilot laser)
Laser Class (DIN EN 60825-1:2008-5)	1 (measurement laser) 2 (pilot laser)
Resolution	0.1 mm or 0.125 mm
Linearity	± 8 mm
Repeatability	± 4 mm

Functions	
Indicator LED, green	Operating voltage indicator
Indicator LED, yellow	Switching output indicator
Scanning distance adjustment	Via Teach-in button and control input

Electrical data	
Operating voltage, $+U_B$	18 … 30 V DC[2]
Output current, Ie	≤ 100 mA
Plausibility output, Qp	50 mA
Service output, Qs	50 mA
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection, Q
Protection Class	2
Standby time	≤ 12 ms
Switching output, Q	PNP
Output function	N.O.
Analogue output	4 … 20 mA
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

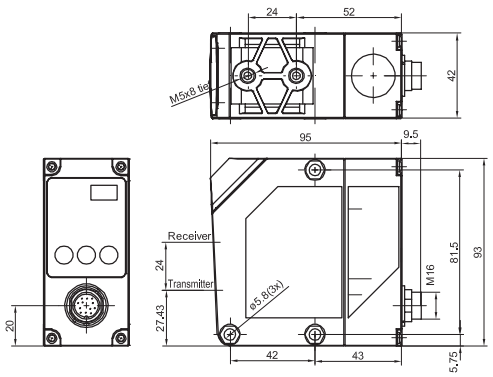
Mechanical data	
Dimensions	93 x 93 x 42 mm
Enclosure rating	IP 67[3]
Material, housing	ABS, impact-resistant
Material, front screen	PMMA
Type of connection	(See Selection Table)
Ambient temperature: operation	-10 … +50 °C (-20 … +50 °C in continuous operation)
Ambient temperature: storage	-30 … +75 °C
Weight	230 g
Vibration and impact resistance	EN 60947-5-2

[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

Version: 11/2012. Subject to changes; diagrams similar

Plug connection

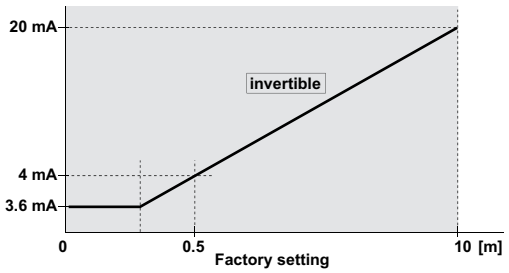


153-00457

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 … 30 V
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	0 V (GND)

Characteristic analogue curve



155-01406

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 670
Brackets	From Page 642

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

Optical data	
Operating range	0.5 … 6 m[1]
Type of light	Infrared, 905 nm (measurement laser) Laser, red, 650 nm (pilot laser)
Laser Class (DIN EN 60825-1:2008-5)	1 (measurement laser) 2 (pilot laser)
Resolution	0.1 mm or 0.125 mm
Linearity	± 10 mm
Repeatability	± 5 mm

Functions	
Indicator LED, green	Operating voltage indicator
Indicator LED, yellow	Switching output indicator
Scanning distance adjustment	Via Teach-in button and control input

Electrical data	
Operating voltage, +U_B	18 … 30 V DC[2]
Output current, Ie	≤ 100 mA
Plausibility output, Qp	50 mA
Service output, Qs	50 mA
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection, Q
Protection Class	2
Standby time	≤ 12 ms
Switching output, Q	PNP
Output function	N.O.
Analogue output	4 … 20 mA
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

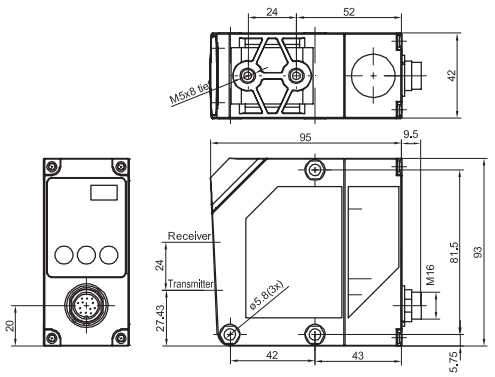
Mechanical data	
Dimensions	93 x 93 x 42 mm
Enclosure rating	IP 67[3]
Material, housing	ABS, impact-resistant
Material, front screen	PMMA
Type of connection	(See Selection Table)
Ambient temperature: operation	-10 … +50 °C (-20 … +50 °C in continuous operation)
Ambient temperature: storage	-30 … +75 °C
Weight	230 g
Vibration and impact resistance	EN 60947-5-2

[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

Version: 11/2012. Subject to changes; diagrams similar

Plug connection

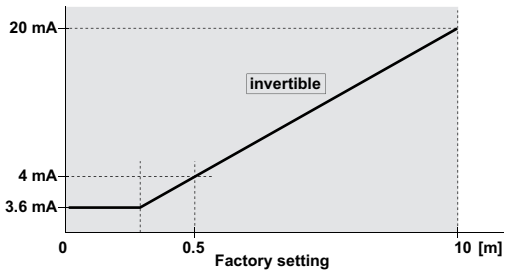


153-00457

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 … 30 V
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	0 V (GND)

Characteristic analogue curve



155-01406

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 670
Brackets	From Page 642

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	
Scanning distance	0.2 … 6 m[1]
Type of light	Infrared, 905 nm (measurement laser) Laser, red, 650 nm (pilot laser)
Laser Class (DIN EN 60825-1:2008-5)	1 (measurement laser) 2 (pilot laser)
Repeatability Fast/Slow	< ± 15 / 10 mm[2]
Linearity	± 40 mm[2]

Functions	
Indicator LED, green	Operating voltage indicator
Indicator LED, yellow	2 x switching output indicator
Indicator LED, orange	Operating mode
Indicator LED, red	Menu Indicator
Scanning distance adjustment	Via Teach-in button
Default settings	Max. scanning distance and N.O.

Electrical data	
Operating voltage, $+U_B$	18 … 30 V DC[3]
No-load current, I_0	≤ 125 mA
Output current, Ie	≤ 100 mA
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection (Q)
Protection Class	2
Standby time	< 300 ms
Switching output, Q	PNP / NPN
Analogue output	4 … 20 mA
Load	≤ 500 Ω

Mechanical data	
Dimensions	95 x 93 x 42 mm
Enclosure rating	IP 67[4]
Material, housing	ABS, impact-resistant
Material, front screen	PMMA
Type of connection	(See Selection Table)
Ambient temperature: operation	-20 … +50 °C
Ambient temperature: storage	-40 … +80 °C
Weight	200 g
Vibration and impact resistance	EN 60947-5-2

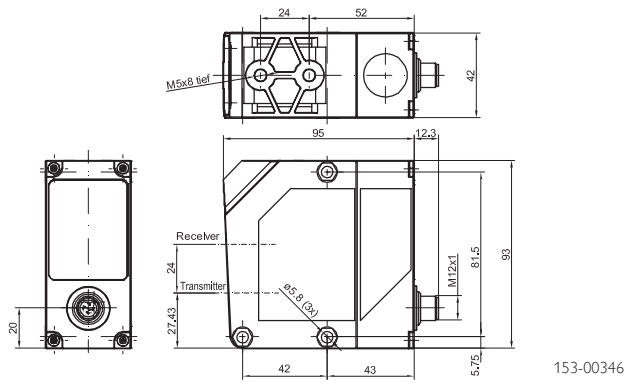
[1] With RL250 reflector [2] Data apply after a minimum switch-on time of 30 min [3] 10 % ripple, within U_B [4] With connected IP 67 plug

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

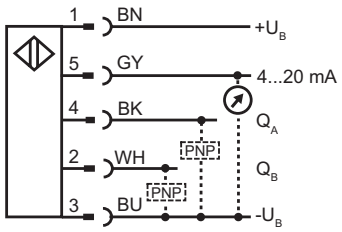
Version: 11/2012. Subject to changes; diagrams similar

Plug connection



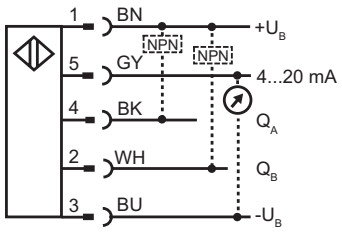
153-00346

Connection, 5-pin (PNP)



154-00125

Connection, 5-pin (NPN)



154-00472

Scanning distance

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

Accessories

Reflectors	From Page 654
Connection cables	From Page 670
Brackets	From Page 642

FR 90 ILA

Reflector distance sensor

PRODUCT HIGHLIGHTS

- Long range of up to 250 m on specified reflector
- High repeatability
- High measurement rates
- Ideal for precise positioning tasks
- Open interfaces ensure maximum compatibility (SSI-compatible, RS422)
- Profibus and DeviceNet via gateway
- Switchable red-light pilot laser

Optical data	
Scanning distance	0.5 … 250 m
Type of light	Infrared, 905 nm (measurement laser) Laser, red, 650 nm (pilot laser)
Laser Class (DIN EN 60825-1:2008-5)	1 (measurement laser) 2 (pilot laser)
Resolution	0.1 mm or 0.125 mm
Linearity	± 3 mm (from 2 m)
Repeatability	< ± 2 mm
Light spot	20 x 20 mm[1]

Functions	
Indicator LED, green	Operating voltage indicator
Indicator LED, yellow	Switching output indicator
Scanning distance adjustment	Via Teach-in button and control input

Electrical data	
Operating voltage, $+U_B$	18 … 30 V DC[2]
Output current, Ie	≤ 100 mA
Plausibility output, Qp	50 mA
Service output, Qs	50 mA
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection, Q
Protection Class	2
Standby time	≤ 12 ms
Switching output, Q	PNP
Output function	N.O.
Serial interface	RS422 or SSI-compatible (GREY / BINARY) adjustable
Bus interface	Profibus or DeviceNet each via gateway (accessories)
Cable length / m	< 25 / < 50 / < 100 / < 200 / < 400
Cycle rate	< 500 kHz / < 400 kHz / < 300 kHz / < 200 kHz / < 100 kHz

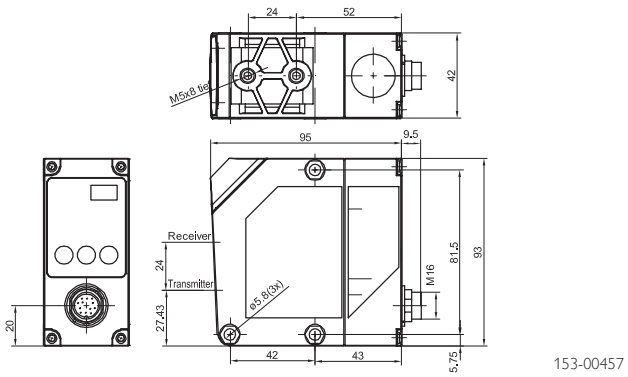
Mechanical data	
Dimensions	93 x 93 x 42 mm
Enclosure rating	IP 67[3]
Material, housing	ABS, impact-resistant
Material, front screen	PMMA
Type of connection	(See Selection Table)
Ambient temperature: operation	-10 … +50 °C (-20 … +50 °C in continuous operation)
Ambient temperature: storage	-30 … +75 °C
Weight	230 g
Vibration and impact resistance	EN 60947-5-2

[1] At scanning distance of 10 m [2] 10 % ripple, within U_B [3] With connected IP 67 plug

Type of connection	Part number	Article number
Plug, M16x1, 12-pin	FR 90 ILA-S2-Q12	591-91001

Version: 11/2012. Subject to changes; diagrams similar

Plug connection



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 … 30 V
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	0 V (GND)

Accessories

Reflectors	From Page 654
Connection cables	From Page 670
Brackets	From Page 642

FR 91 ILA

Reflector distance sensor

PRODUCT HIGHLIGHTS

- Long range of up to 250 m on specified reflector
- High repeatability
- High measurement rates
- Very good price/performance ratio
- Open interfaces ensure maximum compatibility (SSI-compatible, RS422)
- Profibus and DeviceNet via gateway
- Switchable red-light pilot laser

Optical data	
Scanning distance	0.5 … 50 m
Type of light	Infrared, 905 nm (measurement laser) Laser, red, 650 nm (pilot laser)
Laser Class (DIN EN 60825-1:2008-5)	1 (measurement laser) 2 (pilot laser)
Resolution	0.1 mm or 0.125 mm
Linearity	± 5 mm (from 2 m)
Repeatability	< ± 4 mm
Light spot	20 x 20 mm[1]

Functions	
Indicator LED, green	Operating voltage indicator
Indicator LED, yellow	Switching output indicator
Scanning distance adjustment	Via Teach-in button and control input

Electrical data	
Operating voltage, $+U_B$	18 … 30 V DC[2]
Output current, Ie	≤ 100 mA
Plausibility output, Qp	50 mA
Service output, Qs	50 mA
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection, Q
Protection Class	2
Standby time	≤ 12 ms
Switching output, Q	PNP
Output function	N.O.
Serial interface	RS422 or SSI-compatible (GREY / BINARY) adjustable
Bus interface	Profibus or DeviceNet, each via gateway (accessories)
Cable length / m	< 25 / < 50 / < 100 / < 200 / < 400
Cycle rate	< 500 kHz / < 400 kHz / < 300 kHz / < 200 kHz / < 100 kHz

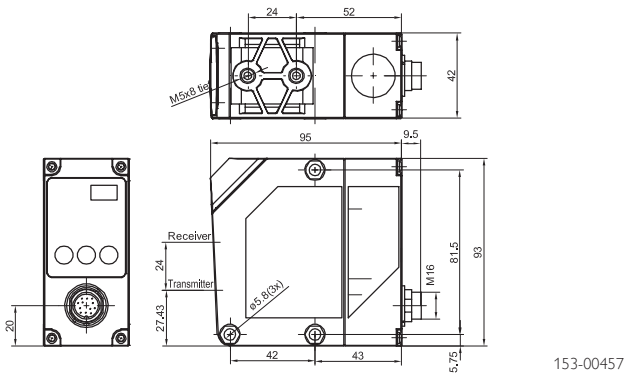
Mechanical data	
Dimensions	95 x 93 x 42 mm
Enclosure rating	IP 67[3]
Material, housing	ABS, impact-resistant
Material, front screen	PMMA
Type of connection	(See Selection Table)
Ambient temperature: operation	-10 … +50 °C
Ambient temperature: storage	-30 … +75 °C
Weight	230 g
Vibration and impact resistance	EN 60947-5-2

[1] At scanning distance of 10 m [2] 10 % ripple, within U_B [3] With connected IP 67 plug

Type of connection	Part number	Article number
Plug, M16, 12-pin	FR 91 ILA-S2-Q12	591-91002

Version: 11/2012. Subject to changes; diagrams similar

Plug connection



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 … 30 V
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	0 V (GND)

Accessories

Reflectors	From Page 654
Connection cables	From Page 670
Brackets	From Page 642

FR 92 ILA

Reflector distance sensor

PRODUCT HIGHLIGHTS

- Long scanning distance and range (scanning up to 6 m on white objects, with reflector up to 30 m)
- High repeatability
- High measurement rates
- Switchable red-light pilot laser
- Simple teach-in

Optical data	
Scanning distance	0.2 … 30 m[1]
Type of light	Infrared, 905 nm (measurement laser) Laser, red, 650 nm (pilot laser)
Laser Class (DIN EN 60825-1:2008-5)	1 (measurement laser) 2 (pilot laser)
Repeatability Fast/Slow	< ± 15 / 10 mm[2]
Linearity	± 60 mm[2]

Functions	
Indicator LED, green	Operating voltage indicator
Indicator LED, yellow	Switching output indicator
Indivator LED, orange	Operating mode
Indicator LED, red	Menu Indicator
Scanning distance adjustment	Via Teach-in button
Default settings	Max. scanning distance and N.O.

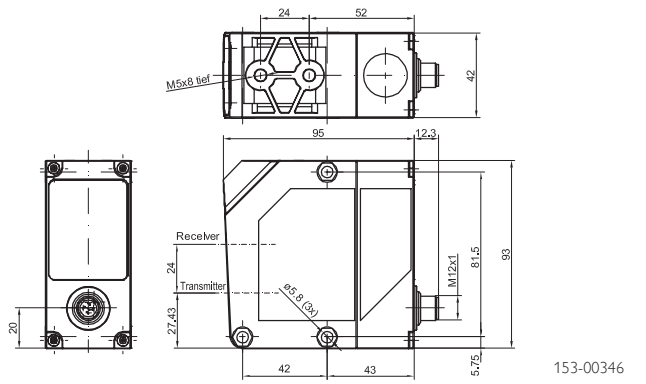
Electrical data	
Operating voltage, $+U_B$	18 … 30 V DC[3]
No-load current, I_0	≤ 125 mA
Output current, Ie	100 mA
Max. voltage drop at switching output	≤ 2.4 V
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection (Q)
Protection Class	2
Standby time	< 300 ms
Response time fast / slow	30 ms / 65 ms
Switching output, Q	PNP
Output function	N.O.
Analogue output	4 … 20 mA

Mechanical data	
Dimensions	95 x 93 x 42 mm
Enclosure rating	IP 67[4]
Material, housing	ABS
Material, front screen	PMMA
Type of connection	(See Selection Table)
Ambient temperature: operation	-20 … +50 °C
Ambient temperature: storage	-40 … +80 °C
Weight	200 g
Vibration and impact resistance	EN 60947-5-2

[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

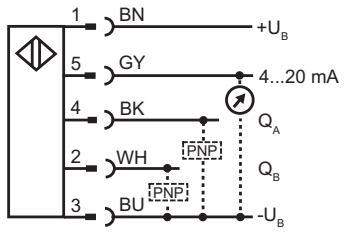
Type of connection	Part number	Article number
Plug, M12, 5-pin	FT 92 ILA-PSL5	591-91006

Plug connection



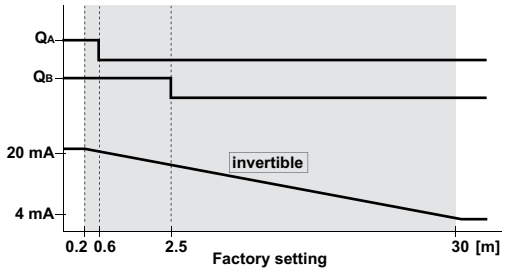
153-00346

Connection, 5-pin



154-00125

Operating range



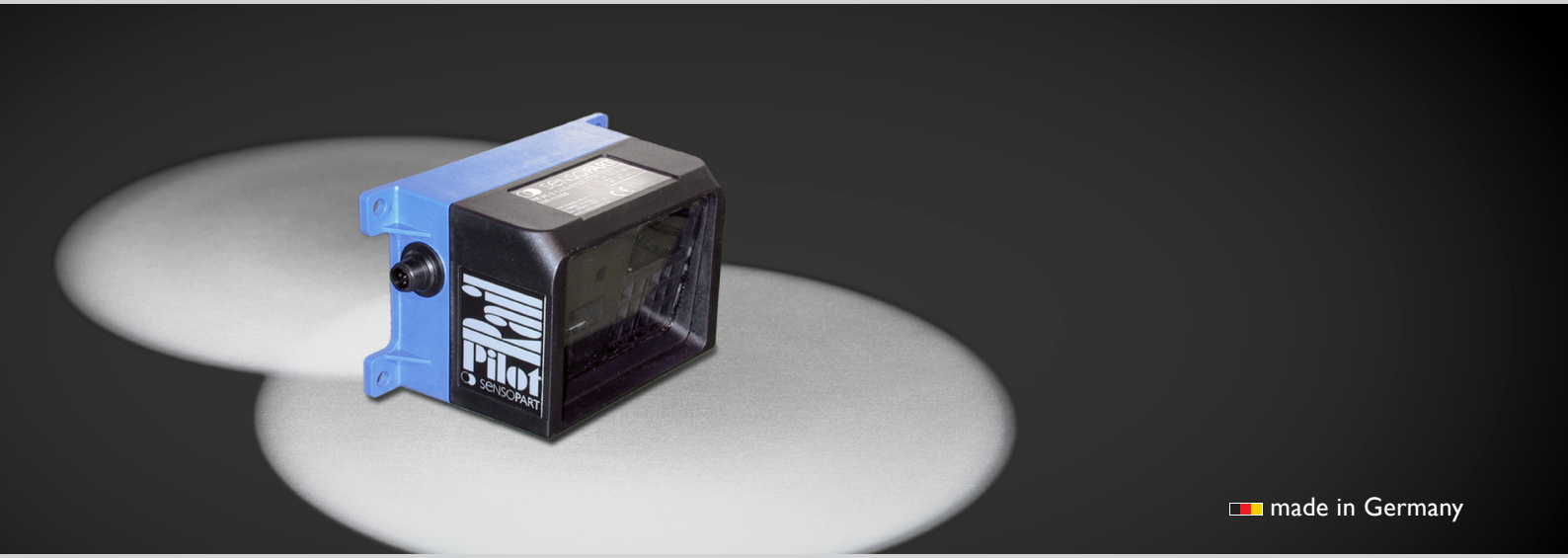
155-01359

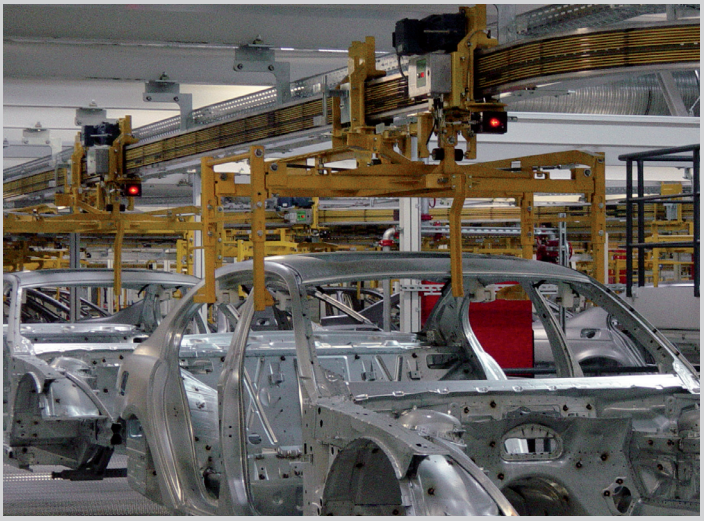
Accessories

Reflectors	From Page 654
Connection cables	From Page 670
Brackets	From Page 642

FR 85 Rail Pilot – optical collision protection sensors

Safe movement on monorail systems





Monorail system with car bodies in the automotive industry

TYPICAL FR 85 RAIL PILOT

- Laser photoelectric reflex switches for preventing collisions on monorail systems
- Operating range: 0 … 6 m
- Typical measurement accuracy: ± 10 cm
- Large optics aperture angle and thus long detection range
- Cornering also possible
- 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^3

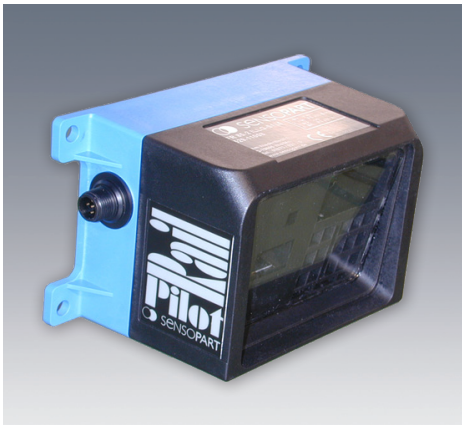
The sensor's task is to prevent collisions between vehicles on monorail systems. The Rail Pilot achieves this reliably. The distances to be maintained, and the braking distances of the monorail vehicles, depend on the load transported and on the speed – this is taken into account by means of flexibly 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 Rail Pilot – Product Overview			
	Operating range	Special features	Page
FR 85 Rail Pilot	0 … 6 m	RS485 interface	152

FR 85 Rail Pilot

Distance sensor for collision prevention



PRODUCT HIGHLIGHTS

- Measurement range: 0 … 6 m
- Wide detection cone
- Switching point accuracy ± 10 cm
- 2x2 detection zones
- 1 input
- 2 PNP outputs
- RS485 interface
- Detection zone adjustable externally
- Reliable suppression of foreign objects (girders, pillars)

Optical data	
Scanning distance	0 … 6 m[1]
Type of light	Infrared, 905 nm
Laser Class (DIN EN 60825-1:2008-5)	1
Repeatability	± 100 mm

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

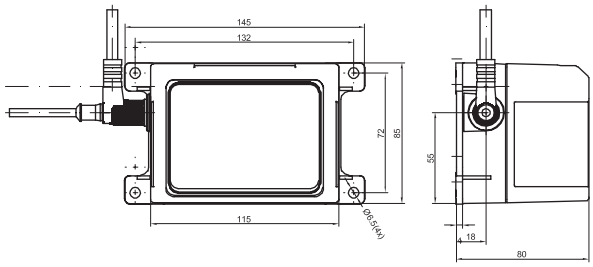
Electrical data	
Operating voltage, $+U_B$	18 … 30 V DC[2]
No-load current, I_0	≤ 200 mA
Output current, Ie	≤ 200 mA
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection (Q)
Protection Class	2
Standby time	< 300 ms
Switching output, Q	(See Selection Table)
Output function	(See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

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

[1] Reference material: R10/2 reflector [2] 10 % ripple, within U_B [3] Type FR85 … S1L5 [4] With connected IP 54 plug

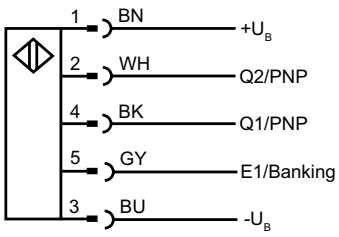
Interface	Type of connection	Part number	Article number
RS485	Plug, M12x1, 5-pin	FR 85-2 ILLG-S1L5	529-11008
2 switching points Q (PNP) N.C.	Plug, M12x1, 5-pin	FR 85-2 ILLG-POL5	529-11010

Plug connection



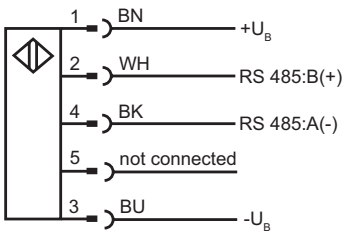
153-00349

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



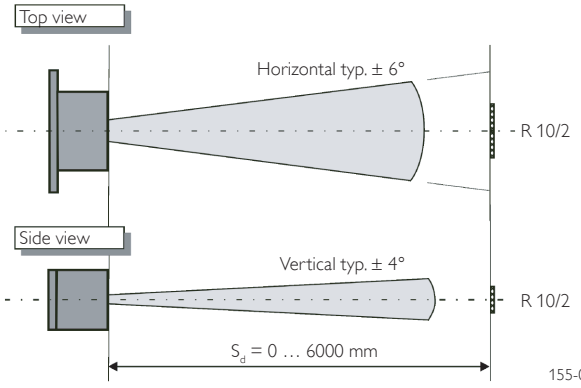
154-00325

Connection, 5-pin: FR 85-2 ILLG-S1L5



154-00478

Detection cone



155-00202

Accessories

Reflectors	From Page 654
Connection cables	From Page 670
Brackets	From Page 642