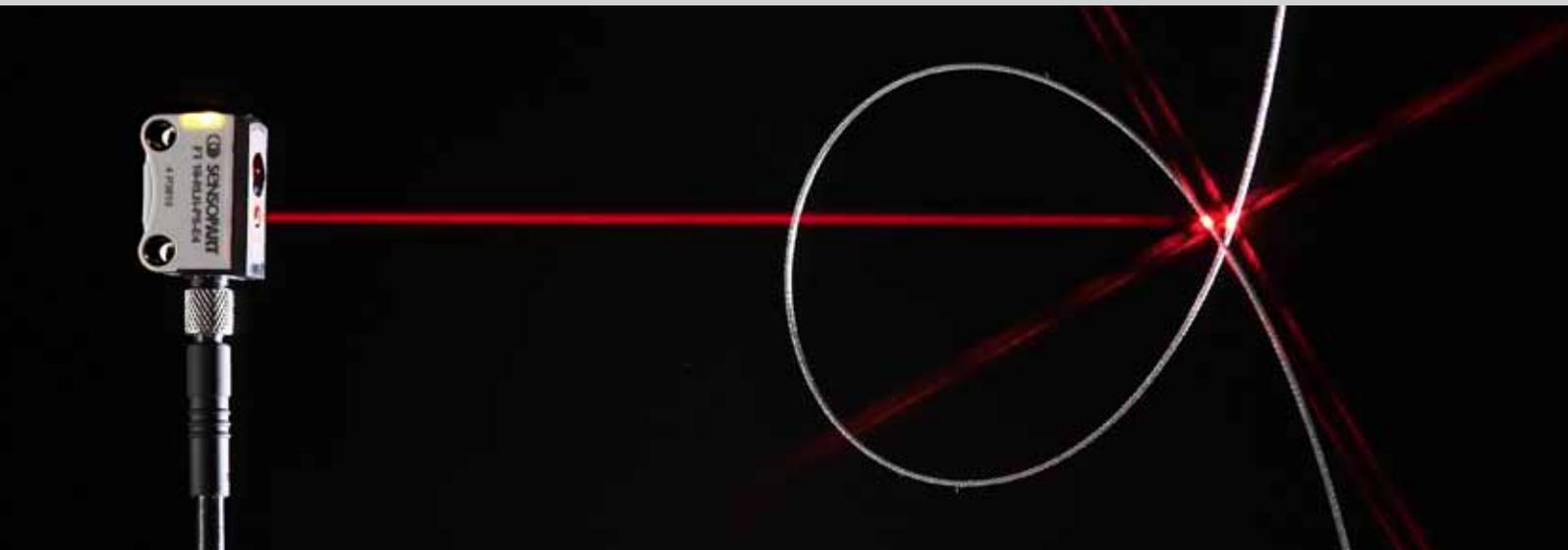
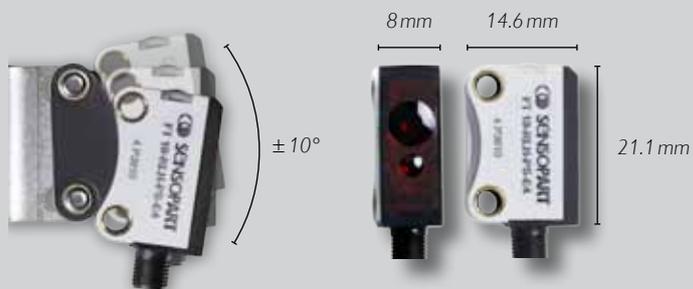


F 10 – family of sub-miniature sensors

Small housings, great performance



 made in Germany



Simple mounting:

Mounting using a dovetail that permits fine retro-adjustment of the sensor is particularly recommended when space is limited.

Special characteristics:

The glass-fibre-reinforced plastic housing with its integrated mounting sleeve, dovetail guide on the back, and laser-marked indelible type code are characteristic of the F 10.



Mini-sensor with maximum ease-of-use:

Simple commissioning with an electronic teach-in button and easily visible status LEDs is by no means typical for housings of this size.

TYPICAL F 10

- Sub-miniature sensor for installation in the smallest of spaces and in moving machine parts
- The world's smallest laser sensor with background suppression, adjustable via teach-in
- Sensors as LED or laser versions
- F 10 BlueLight: specially designed for scanning solar wafers and strongly light-absorbing objects
- User-friendly commissioning via electronic teach-in button or control wire
- Well thought-out mounting accessories for rapid and simple integration

The sensors of the F 10 series, available as LED and laser versions, form one of the most comprehensive series on the market in sub-miniature housings. Their precise background suppression, adjustable via teach-in, makes the sensors unique. The light spot of the F 10 laser sensors also remains so focused that small parts in the millimetre range can still be reliably detected even at long distances – for example, a wire with a diameter of 0.5 mm at a distance of 60 mm. One highlight of the new F 10 LED sensors is the F 10 Bluelight with its blue transmission LED, specially developed for detecting solar wafers and strongly light-absorbing objects using the scanning principle.

The F 10 sensors not only impress through their excellent performance data, but also through their unmistakable design with special features – unique in this size of housing. The dovetail mounting system considerably simplifies fine adjustment, particularly in difficult installation locations, and the various connection variants allow rapid commissioning and replacement. The mounting holes of the sub-miniature sensors are reinforced with metal eyelets. A small sensor that will give users great pleasure!

F 10 Product Overview					
	Type of light	Adjustment	Scanning distance/range	Special features	Page
Photoelectric proximity sensors with background suppression					
FT 10-RLH	Laser 	Teach-in 	60 mm	The only scanner with scanning distance adjustment	238
FT 10-RLHR	Laser 	Teach-in 	60 mm	Broad-beam light spot	240
FT 10-B-RLF	Laser 	Fixed focus	15 mm / 30 mm		242
FT 10-RH	LED	Teach-in 	70 mm		244
FT 10-RF	LED	Fixed focus	15 mm / 30 mm / 50 mm		246
FT 10-BF Bluelight	LED, blue	Fixed focus	30 mm / 50 mm	Blue transmission LED for strongly light-absorbing objects	248
Retroreflective photoelectric sensors					
FR 10-RL	Laser 	Teach-in 	2 m	Long range, precise small-part detection	250
FR 10-R	LED	Teach-in 	1.6 m	Long range	252
Through-beam photoelectric sensors					
FS/FE 10-RL	Laser 	Teach-in 	3 m	Sensor pair; very accurate object positioning	254
FS 10-RL/FE 10-RL	Laser 	Teach-in 	3 m	Transmitter/receiver; very accurate object positioning	256

FT 10-RLH

Laser photoelectric proximity sensor with background suppression



PRODUCT HIGHLIGHTS

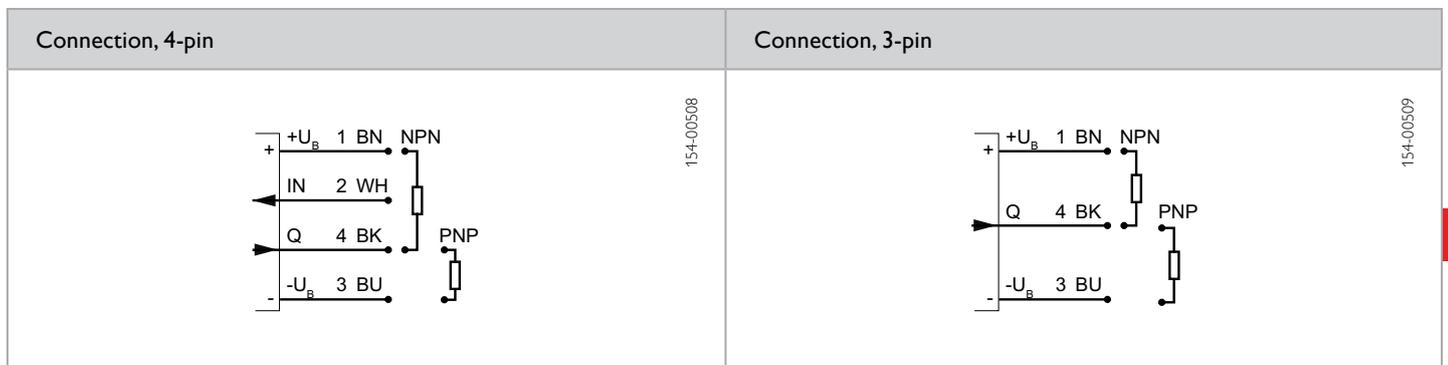
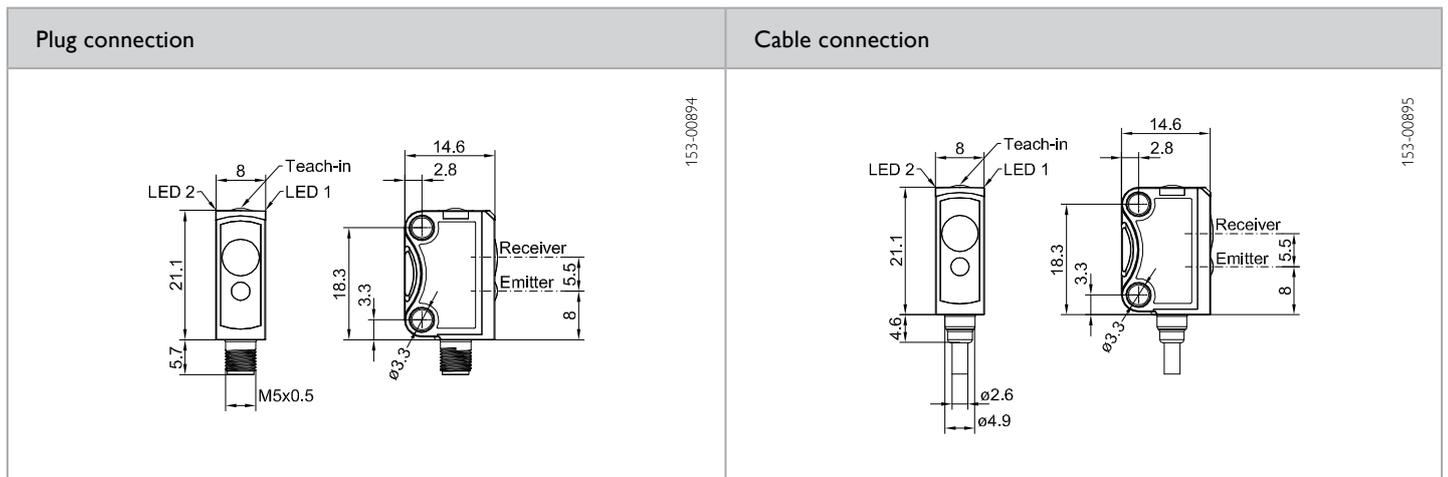
- Sub-miniature sensor with laser light and adjustable background suppression
- Precise and reliable switching behaviour, even with varying object surfaces and colours
- Reliable operation even with highly reflective machine parts in the background, thanks to SensoPart ASIC technology
- Particularly suitable for detecting the smallest of parts and for installation in extremely confined spaces

Optical data		Functions	
Scanning distance	6 ... 60 mm ¹	Indicator LED, green	Operating voltage indicator
Adjustment range	10 ... 60 mm ¹	Indicator LED, yellow	Switching output indicator
Type of light	Laser, red, 655 nm	Scanning distance adjustment	Via Teach-in button and control input
Light spot size (total detection area)	1 x 3 mm ²	Adjustment possibilities	Button lock via control input
Laser Class (DIN EN 60825-1:2008-5)	1	Default settings	Max. scanning distance and N.O.
Electrical data		Mechanical data	
Operating voltage, +U _B	10 ... 30V DC ²	Dimensions	21.1 x 14.6 x 8 mm ³
No-load current, I ₀	≤ 12 mA	Enclosure rating	IP 67 ³
Output current, I _e	≤ 50 mA	Material, housing	PUR
Protective circuits	Reverse-polarity protection, U _B / short-circuit protection (Q)	Material, front screen	PMMA
Protection Class	2	Type of connection	See Selection Table
Switching output, Q	PNP/NPN (see Selection Table)	Ambient temperature: operation	-20 ... +50 °C
Output function	N.O.	Ambient temperature: storage	-20 ... +80 °C
Switching frequency, f (ti/tp 1:1)	≤ 1000 Hz	Weight (plug device)	Ca. 3 g
Response time	500 μs	Weight (cable device)	Ca. 22 g
Control input, I _N (only 4-pin design)	+U _B = teach-in -U _B = button locked Open = normal operation	Weight (pigtail)	Ca. 10 g

¹ Reference material white, 90 % reflectivity ² Max. 10 % ripple, within U_B, ~ 50 Hz / 100 Hz ³ With connected IP 67 plug

Scanning distance	Switching output	Type of connection	Part number	Article number
6 ... 60 mm	PNP	Plug, M5x0.5, 4-pin	FT 10-RLH-PS-E4	600-11130
6 ... 60 mm	NPN	Plug, M5x0.5, 4-pin	FT 10-RLH-NS-E4	600-11131
6 ... 60 mm	PNP	Cable, 2 m, 4-wire	FT 10-RLH-PS-K4	600-11132
6 ... 60 mm	NPN	Cable, 2 m, 4-wire	FT 10-RLH-NS-K4	600-11133
6 ... 60 mm	PNP	Pigtail, 200 mm with M8 plug, 4-pin	FT 10-RLH-PS-KM4	600-11134
6 ... 60 mm	NPN	Pigtail, 200 mm with M8 plug, 4-pin	FT 10-RLH-NS-KM4	600-11135
6 ... 60 mm	PNP	Pigtail, 200 mm with M8 plug, 3-pin	FT 10-RLH-PS-KM3	600-11146
6 ... 60 mm	NPN	Pigtail, 200 mm with M8 plug, 3-pin	FT 10-RLH-NS-KM3	600-11147
6 ... 60 mm	PNP	Pigtail, 500 mm with M8 plug, 3-pin	FT 10-RLH-PS-KM3-X07	600-11158

Including dovetail clamp mounting MBD F 10 for all types



Reference material	Detection range
White (90 %)	6 ... 60 mm
Grey (18 %)	7 ... 60 mm
Black (6 %)	7 ... 60 mm

Accessories	
Connection cables	From Page A-34
Brackets	From Page A-4

FT 10-RLHR

Laser photoelectric proximity sensor with background suppression



PRODUCT HIGHLIGHTS

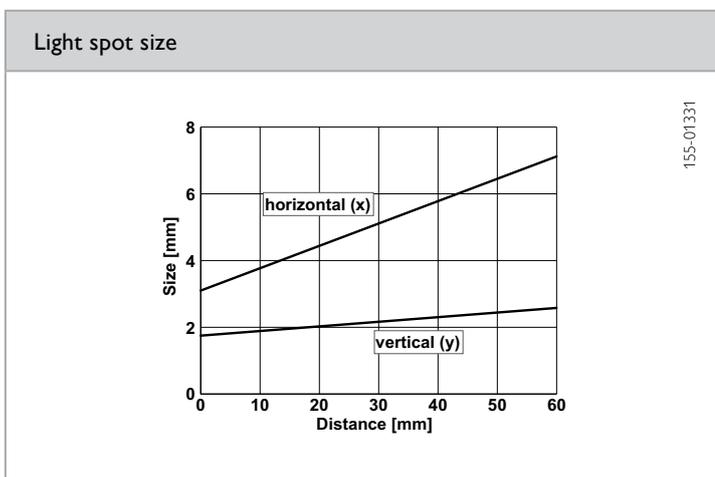
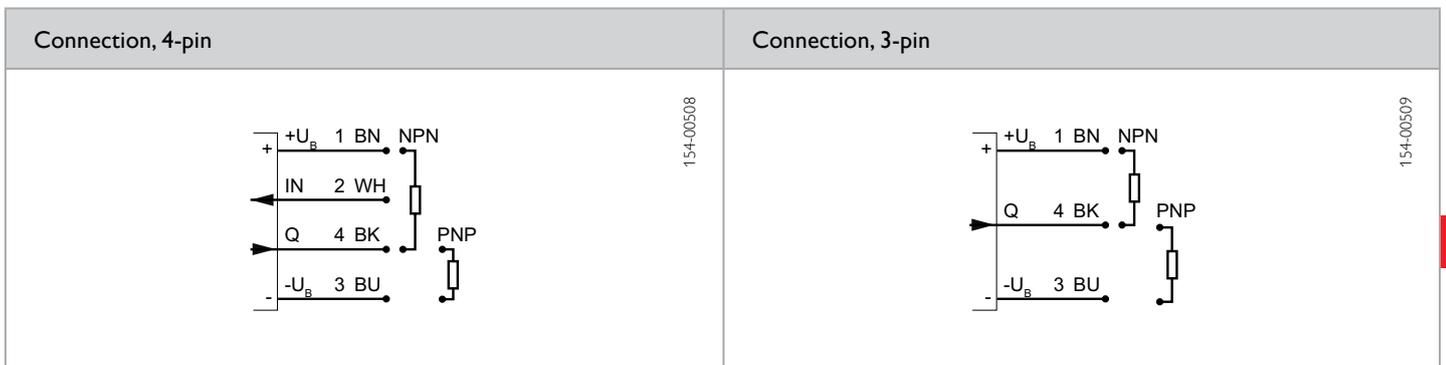
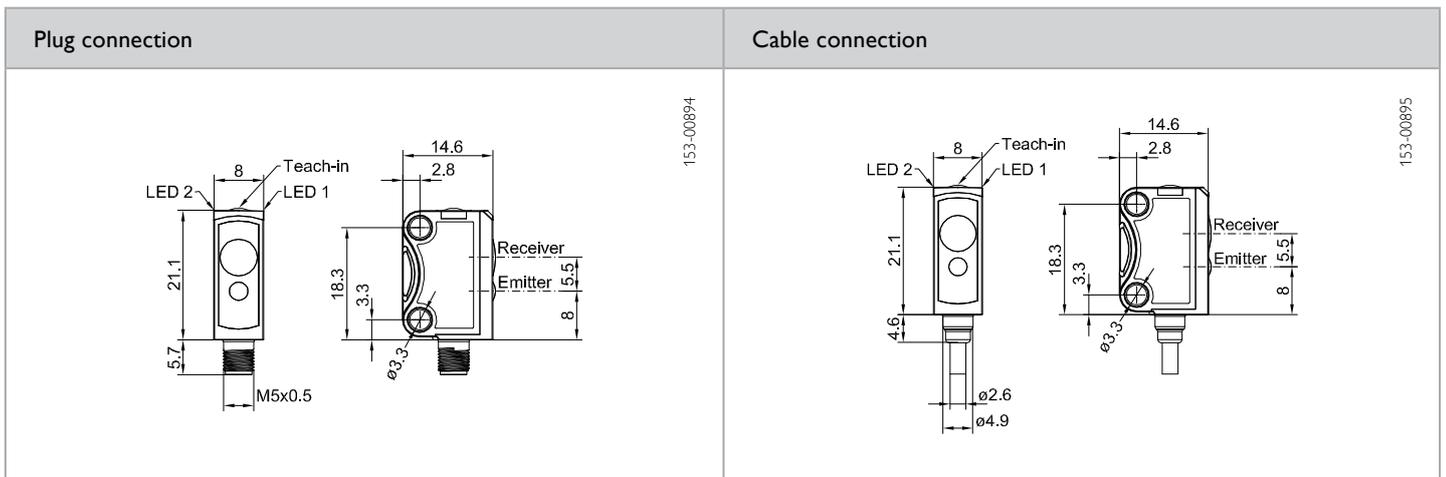
- Sub-miniature sensor with wide laser light spot and adjustable background suppression
- Precise and reliable switching behaviour, even with varying object surfaces and colours
- Reliable operation even with highly reflective machine parts in the background, thanks to SensoPart ASIC technology
- Particularly suitable for installation in the smallest of spaces
- Simple operation via electronic Teach-in button or control line

Optical data		Functions	
Scanning distance	6 ... 60 mm ¹	Indicator LED, green	Operating voltage indicator
Adjustment range	10 ... 60 mm ¹	Indicator LED, yellow	Switching output indicator
Type of light	Laser, red, 655 nm	Scanning distance adjustment	Via Teach-in button and control input
Light spot size	See diagram	Adjustment possibilities	Button lock via control input
Laser Class (DIN EN 60825-1:2008-5)	1	Default settings	Max. scanning distance and N.O.
Electrical data		Mechanical data	
Operating voltage, +U _B	10 ... 30V DC ²	Dimensions	21.1 x 14.6 x 8 mm ³
No-load current, I ₀	≤ 12 mA	Enclosure rating	IP 67 ³
Output current, I _e	≤ 50 mA	Material, housing	PUR
Protective circuits	Reverse-polarity protection, U _B / short-circuit protection (Q)	Material, front screen	PMMA
Protection Class	2	Type of connection	See Selection Table
Switching output, Q	PNP/NPN (see Selection Table)	Ambient temperature: operation	-20 ... +50 °C
Output function	N.O.	Ambient temperature: storage	-20 ... +80 °C
Switching frequency, f (ti/tp 1:1)	≤ 1000 Hz	Weight (plug device)	Ca. 3 g
Response time	500 μs	Weight (cable device)	Ca. 22 g
Control input, IN (only 4-pin design)	+U _B = teach-in -U _B = button locked Open = normal operation	Weight (pigtail)	Ca. 10 g

¹ Reference material white, 90 % reflectivity ² Max. 10 % ripple, within U_B, ~ 50 Hz / 100 Hz ³ With connected IP 67 plug

Scanning distance	Switching output	Type of connection	Part number	Article number
6 ... 60 mm	PNP	Plug, M5x0.5, 4-pin	FT 10-RLHR-PS-E4	600-11136
6 ... 60 mm	NPN	Plug, M5x0.5, 4-pin	FT 10-RLHR-NS-E4	600-11137
6 ... 60 mm	PNP	Cable, 2 m, 4-wire	FT 10-RLHR-PS-K4	600-11138
6 ... 60 mm	NPN	Cable, 2 m, 4-wire	FT 10-RLHR-NS-K4	600-11139
6 ... 60 mm	PNP	Pigtail, 200 mm with M8 plug, 4-pin	FT 10-RLHR-PS-KM4	600-11140
6 ... 60 mm	NPN	Pigtail, 200 mm with M8 plug, 4-pin	FT 10-RLHR-NS-KM4	600-11141
6 ... 60 mm	PNP	Pigtail, 200 mm with M8 plug, 3-pin	FT 10-RLHR-PS-KM3	600-11148
6 ... 60 mm	NPN	Pigtail, 200 mm with M8 plug, 3-pin	FT 10-RLHR-NS-KM3	600-11149

Including dovetail clamp mounting MBD F 10 for all types



Reference material	Detection range
White (90 %)	6 ... 60 mm
Grey (18 %)	7 ... 60 mm
Black (6 %)	7 ... 60 mm

Accessories	
Connection cables	From Page A-34
Brackets	From Page A-4

FT 10-B-RLF

Laser photoelectric proximity sensor with background suppression, fixed focus



PRODUCT HIGHLIGHTS

- Sub-miniature sensor with laser light and precise fixed background suppression
- Reliable switching behaviour even with varying object surfaces and colours
- Particularly suitable for detecting the smallest of parts and for installation in extremely confined spaces
- Tamper-proof sensor design – no misalignment possible
- Robust, glass-fibre-reinforced plastic housings

Optical data		Functions	
Scanning distance	6 ... 15 mm ¹ 6 ... 30 mm ¹	Indicator LED, green	Operating voltage indicator
Type of light	Laser, red, 655 nm	Indicator LED, yellow	Switching output indicator
Light spot size (total detection area)	1 x 3 mm ²	Adjustment possibilities	N.O. / N.C. via control input
Laser Class (DIN EN 60825-1:2008-5)	1		
Electrical data		Mechanical data	
Operating voltage, +U _B	10 ... 30V DC ²	Dimensions	21.1 x 14.6 x 8 mm ³
No-load current, I ₀	≤ 12 mA	Enclosure rating	IP 67 ³
Output current, I _e	≤ 50 mA	Material, housing	PUR
Protective circuits	Reverse-polarity protection, U _B / short-circuit protection (Q)	Material, front screen	PMMA
Protection Class	2	Type of connection	See Selection Table
Switching output, Q	PNP/NPN (see Selection Table)	Ambient temperature: operation	-20 ... +50 °C
Output function	N.O. / N.C.	Ambient temperature: storage	-20 ... +80 °C
Switching frequency, f (ti/tp 1:1)	≤ 1000 Hz	Weight (plug device)	Ca. 3 g
Response time	500 μs	Weight (cable device)	Ca. 22 g
Control input, I _N (only 4-pin design)	+U _B = N.C. -U _B / Open = N.O.	Weight (pigtail)	Ca. 10 g

¹ Reference material white, 90 % reflectivity ² Max. 10 % ripple, within U_B ~ 50 Hz / 100 Hz ³ With connected IP 67 plug

Operating range	Switching output	Type of connection	Part number	Article number
6 ... 15 mm	PNP	Plug, M5x0.5, 4-pin	FT 10-B-RLF1-PS-E4	600-11100
6 ... 15 mm	NPN	Plug, M5x0.5, 4-pin	FT 10-B-RLF1-NS-E4	600-11101
6 ... 30 mm	PNP	Plug, M5x0.5, 4-pin	FT 10-B-RLF2-PS-E4	600-11106
6 ... 30 mm	NPN	Plug, M5x0.5, 4-pin	FT 10-B-RLF2-NS-E4	600-11107
6 ... 15 mm	PNP	Cable, 2 m, 4-wire	FT 10-B-RLF1-PS-K4	600-11102
6 ... 15 mm	NPN	Cable, 2 m, 4-wire	FT 10-B-RLF1-NS-K4	600-11103
6 ... 30 mm	PNP	Cable, 2 m, 4-wire	FT 10-B-RLF2-PS-K4	600-11108
6 ... 30 mm	NPN	Cable, 2 m, 4-wire	FT 10-B-RLF2-NS-K4	600-11109
6 ... 15 mm	PNP	Pigtail, 200 mm with M8 plug, 4-pin	FT 10-B-RLF1-PS-KM4	600-11104
6 ... 15 mm	NPN	Pigtail, 200 mm with M8 plug, 4-pin	FT 10-B-RLF1-NS-KM4	600-11105
6 ... 30 mm	PNP	Pigtail, 200 mm with M8 plug, 4-pin	FT 10-B-RLF2-PS-KM4	600-11110
6 ... 30 mm	NPN	Pigtail, 200 mm with M8 plug, 4-pin	FT 10-B-RLF2-NS-KM4	600-11111

Operating range	Switching output	Type of connection	Part number	Article number
6 ... 15 mm	PNP	Pigtail, 200 mm with M8 plug, 3-pin	FT 10-B-RLF1-PS-KM3	600-11142
6 ... 15 mm	NPN	Pigtail, 200 mm with M8 plug, 3-pin	FT 10-B-RLF1-NS-KM3	600-11143
6 ... 30 mm	PNP	Pigtail, 200 mm with M8 plug, 3-pin	FT 10-B-RLF2-PS-KM3	600-11144
6 ... 30 mm	NPN	Pigtail, 200 mm with M8 plug, 3-pin	FT 10-B-RLF2-NS-KM3	600-11145

Including dovetail clamp mounting MBD F 10 for all types

Plug connection	Cable connection
<p>153-00909</p>	<p>153-00910</p>

Connection, 4-pin	Connection, 3-pin
<p>154-00508</p>	<p>154-00509</p>

Reference material	Detection range
White (90 %)	6 ... 15 mm / 30 mm
Grey (18 %)	7 ... 15 mm / 30 mm
Black (6 %)	7 ... 15 mm / 30 mm

Accessories	
Connection cables	From Page A-34
Brackets	From Page A-4

FT 10-RH

Photoelectric proximity sensor with background suppression



PRODUCT HIGHLIGHTS

- Sub-miniature sensor with precise adjustable background suppression
- Precise and reliable switching behaviour even with varying object surfaces and colours
- Reliable operation even with highly reflective machine parts in the background, thanks to SensoPart ASIC technology
- Static and dynamic teach-in via electronic teach-in button or control line

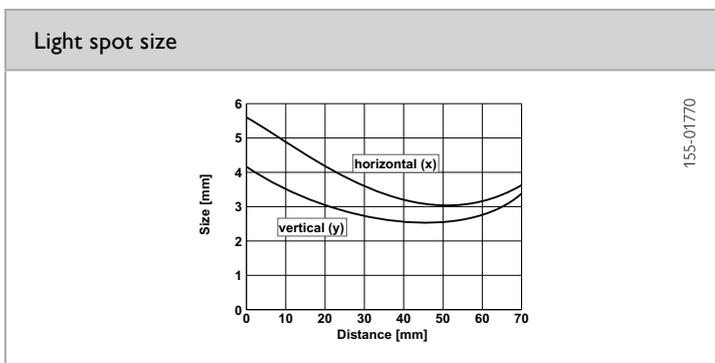
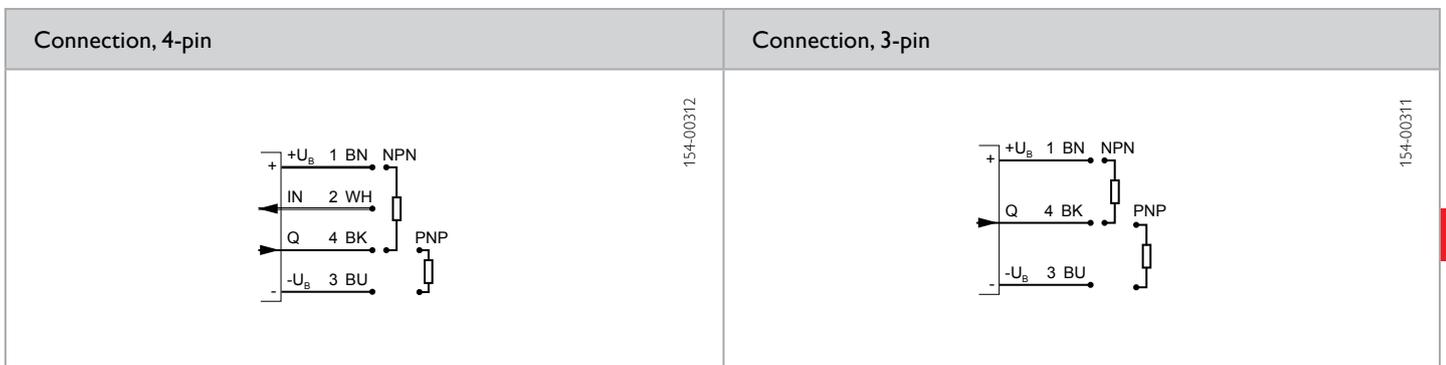
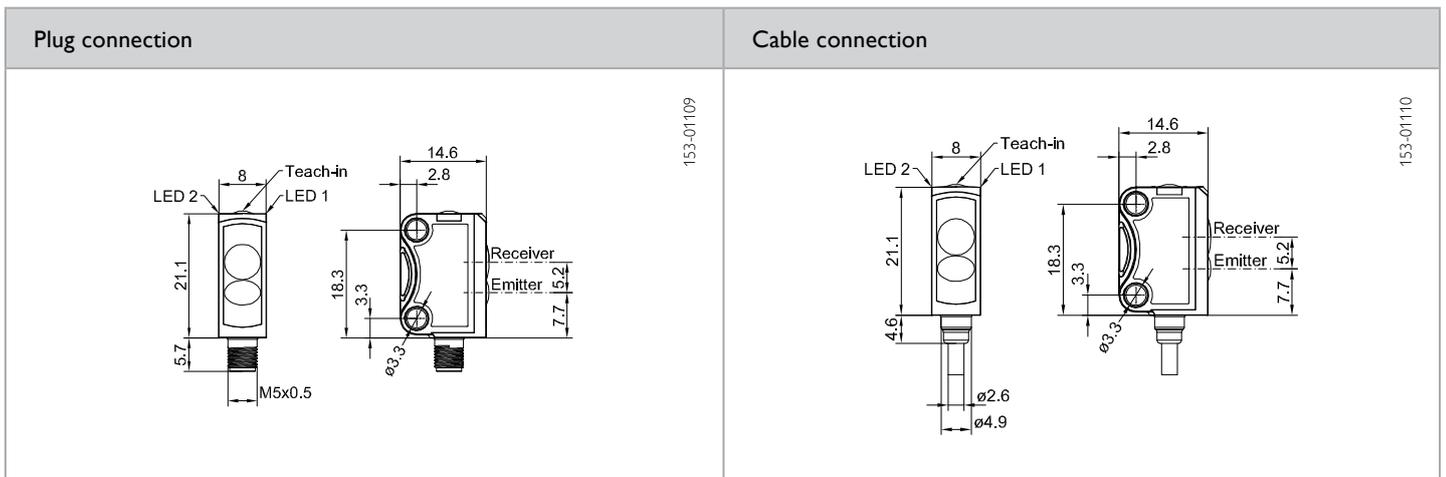
Optical data		Functions	
Scanning distance	5 ... 70 mm ¹	Indicator LED, green	Operating voltage indicator
Adjustment range	10 ... 70 mm ¹	Indicator LED, yellow	Switching output indicator
Used light	LED, red, 650 nm	Scanning distance adjustment	Via Teach-in button and control input ⁵
Light spot size	See diagram	Teach-in modes	Mode 1: during running process Mode 2: during standing process
Repeatability	0,45 mm ^{2,3}	Adjustment possibilities	N.O./N.C. via Teach-in button and control input ⁵ Button lock via control input ⁵
Hysteresis	≤ 2 mm ²	Default settings	Max. range and N.O.
Grey/white shift (18%/90%)	≤ 3 mm ²		
Black/white shift (6%/90%)	≤ 4 mm ²		
Electrical data		Mechanical data	
Operating voltage, +U _B	10 ... 30V DC ⁴	Dimensions	21,1 x 14,6 x 8 mm ³
No-load current, I ₀	≤ 20 mA	Enclosure rating	IP 67 ⁶
Output current, I _e	≤ 50 mA	Material, housing	PUR
Protective circuits	Reverse-polarity protection, U _B / short-circuit protection (Q)	Material, front screen	PMMA
Protection class	2	Type of connection	See Selection Table
Power On Delay	< 300 ms	Ambient temperature: operation	-20 ... +60 °C
Switching output, Q	PNP/NPN	Ambient temperature: storage	-20 ... +80 °C
Output function	N.O./N.C.	Weight (plug device)	approx. 3 g
Switching frequency, f (ti/tp 1:1)	≤ 1000 Hz	Weight (cable device)	approx. 22 g
Response time	500 μs	Weight (pigtail)	approx. 10 g
Control input, IN ³	+U _B = teach-in -U _B = button locked Open = normal operation		

¹ Reference material white, 90 % reflectivity ² at maximum scanning distance ³ in constant environmental conditions ⁴ max. 10 % ripple within U_B, ~ 50 Hz / 100 Hz

⁵ only 4-pin design ⁶ with connected IP 67 plug

Scanning distance	Switching output	Type of connection	Part number	Article number
5 ... 70 mm ¹	PNP	Plug, M5x0.5, 4-pin	FT 10-RH-PS-E4	600-11000
5 ... 70 mm ¹	NPN	Plug, M5x0.5, 4-pin	FT 10-RH-NS-E4	600-11004
5 ... 70 mm ¹	PNP	Cable, 2 m, 4-wire	FT 10-RH-PS-K4	600-11001
5 ... 70 mm ¹	NPN	Cable, 2 m, 4-wire	FT 10-RH-NS-K4	600-11005
5 ... 70 mm ¹	PNP	Pigtail, 200 mm with M8 plug, 4-pin	FT 10-RH-PS-KM4	600-11002
5 ... 70 mm ¹	NPN	Pigtail, 200 mm with M8 plug, 4-pin	FT 10-RH-NS-KM4	600-11006
5 ... 70 mm ¹	PNP	Pigtail, 200 mm with M8 plug, 3-pin	FT 10-RH-PS-KM3	600-11003
5 ... 70 mm ¹	NPN	Pigtail, 200 mm with M8 plug, 3-pin	FT 10-RH-NS-KM3	600-11007

Including dovetail clamp mounting MBD F 10 for all types



Reference material	Detection range
White (90 %)	5 ... 70 mm
Grey (18 %)	8 ... 70 mm
Black (6 %)	8 ... 70 mm

Accessories	
Connection cables	From Page A-34
Brackets	From Page A-4

FT 10-RF

Photoelectric proximity sensor with background suppression, fixed focus



PRODUCT HIGHLIGHTS

- Sub-miniature sensor with precise fixed background suppression
- Economical multi-purpose sensor
- Reliable switching behaviour even with varying object surfaces and colours
- Tamper-proof sensor design – no misalignment possible
- Simple mounting and adjustment through innovative dovetail clamp mounting

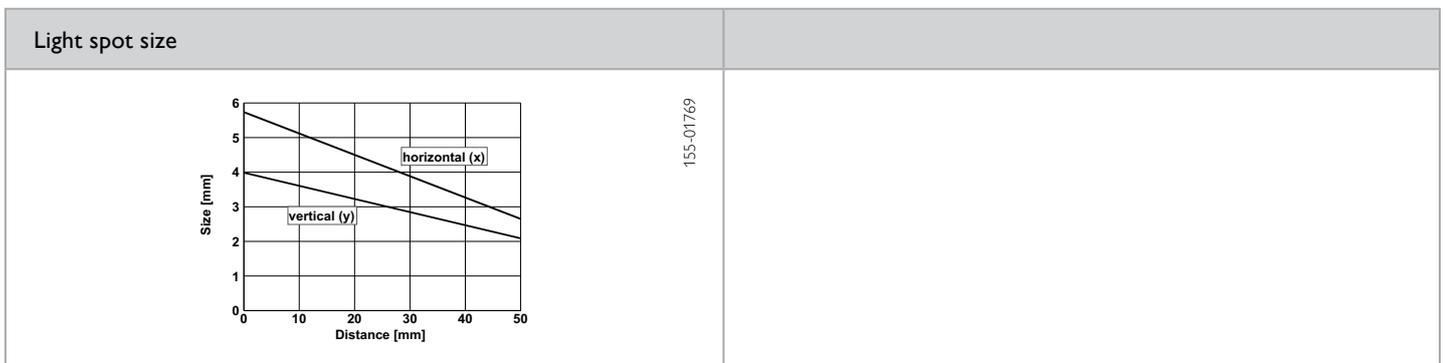
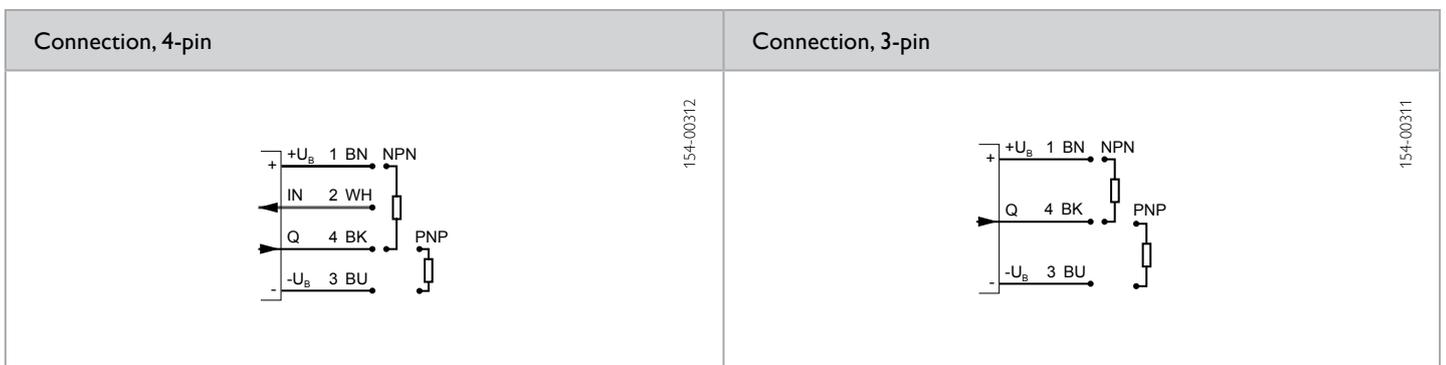
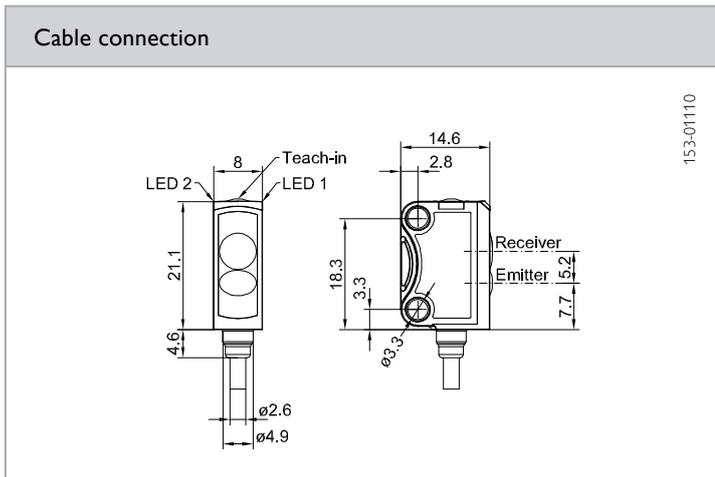
Optical data		Functions	
Scanning distance	2 ... 15 mm ¹ 2 ... 30 mm ¹ 2 ... 50 mm ¹	Indicator LED, green	Operating voltage indicator
Used light	LED, red, 650 nm	Indicator LED, yellow	Switching output indicator
Light spot size	See diagram	Adjustment possibilities	N.O. / N.C. via control input ³
Electrical data		Mechanical data	
Operating voltage, +U _B	10 ... 30V DC ²	Dimensions	21,1 x 14,6 x 8 mm ³
No-load current, I ₀	≤ 20 mA	Enclosure rating	IP 67 ⁴
Output current, I _e	≤ 50 mA	Material, housing	PUR
Protective circuits	Reverse-polarity protection, U _B / short-circuit protection (Q)	Material, front screen	PMMA
Protection class	2	Type of connection	See Selection Table
Power On Delay	< 300 ms	Ambient temperature: operation	-20 ... +60 °C
Switching output, Q	PNP/NPN (see Selection Table)	Ambient temperature: storage	-20 ... +80 °C
Output function	N.O./N.C.	Weight (cable device)	approx. 22 g
Switching frequency, f (ti/tp 1:1)	≤ 1000 Hz	Weight (pigtail)	approx. 10 g
Response time	500 μs		
Control input, I _N ³	+U _B = N.C. -U _B / Open = N.O.		

¹ Reference material white, 90 % reflectivity ² max. 10 % ripple within U_B, ~ 50 Hz / 100 Hz ³ only 4-pin design ⁴ with connected IP 67 plug

Scanning distance	Switching output	Type of connection	Part number	Article number
2 ... 15 mm ¹	PNP	Cable, 2 m, 4-wire	FT 10-RF1-PS-K4	600-11008
2 ... 15 mm ¹	NPN	Cable, 2 m, 4-wire	FT 10-RF1-NS-K4	600-11011
2 ... 30 mm ¹	PNP	Cable, 2 m, 4-wire	FT 10-RF2-PS-K4	600-11014
2 ... 30 mm ¹	NPN	Cable, 2 m, 4-wire	FT 10-RF2-NS-K4	600-11017
2 ... 50 mm ¹	PNP	Cable, 2 m, 4-wire	FT 10-RF3-PS-K4	600-11020
2 ... 50 mm ¹	NPN	Cable, 2 m, 4-wire	FT 10-RF3-NS-K4	600-11023
2 ... 15 mm ¹	PNP	Pigtail, 200 mm with M8 plug, 4-pin	FT 10-RF1-PS-KM4	600-11009
2 ... 15 mm ¹	NPN	Pigtail, 200 mm with M8 plug, 4-pin	FT 10-RF1-NS-KM4	600-11012
2 ... 30 mm ¹	PNP	Pigtail, 200 mm with M8 plug, 4-pin	FT 10-RF2-PS-KM4	600-11015
2 ... 30 mm ¹	NPN	Pigtail, 200 mm with M8 plug, 4-pin	FT 10-RF2-NS-KM4	600-11018
2 ... 50 mm ¹	PNP	Pigtail, 200 mm with M8 plug, 4-pin	FT 10-RF3-PS-KM4	600-11021
2 ... 50 mm ¹	NPN	Pigtail, 200 mm with M8 plug, 4-pin	FT 10-RF3-NS-KM4	600-11024
2 ... 15 mm ¹	PNP	Pigtail, 200 mm with M8 plug, 3-pin	FT 10-RF1-PS-KM3	600-11010
2 ... 15 mm ¹	NPN	Pigtail, 200 mm with M8 plug, 3-pin	FT 10-RF1-NS-KM3	600-11013

Scanning distance	Switching output	Type of connection	Part number	Article number
2 ... 30 mm ¹	PNP	Pigtail, 200 mm with M8 plug, 3-pin	FT 10-RF2-PS-KM3	600-11016
2 ... 30 mm ¹	NPN	Pigtail, 200 mm with M8 plug, 3-pin	FT 10-RF2-NS-KM3	600-11019
2 ... 50 mm ¹	PNP	Pigtail, 200 mm with M8 plug, 3-pin	FT 10-RF3-PS-KM3	600-11022
2 ... 50 mm ¹	NPN	Pigtail, 200 mm with M8 plug, 3-pin	FT 10-RF3-NS-KM3	600-11025

Including dovetail clamp mounting MBD F 10 for all types



Reference material	Detection range			Accessories	
white (90 %)	FT 10-RF1 2 ... 15 mm	FT 10-RF2 2 ... 30 mm	FT 10-RF3 2 ... 50 mm	Connection cables	From Page A-34
grey (18 %)	3 ... 15 mm	4 ... 30 mm	5 ... 50 mm	Brackets	From Page A-4
black (6 %)	4 ... 15 mm	5 ... 30 mm	7 ... 50 mm		

FT 10-BF

Bluelight photoelectric proximity sensor with background suppression, fixed focus



PRODUCT HIGHLIGHTS

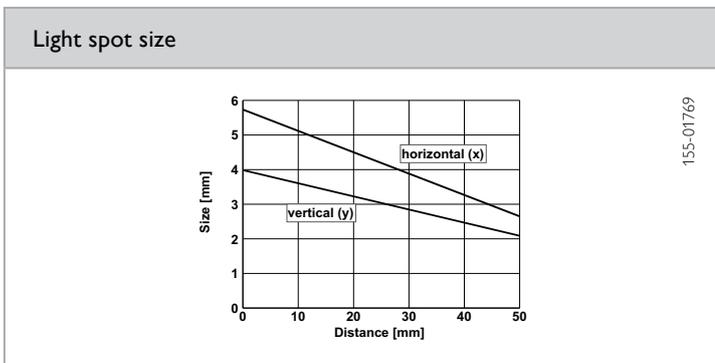
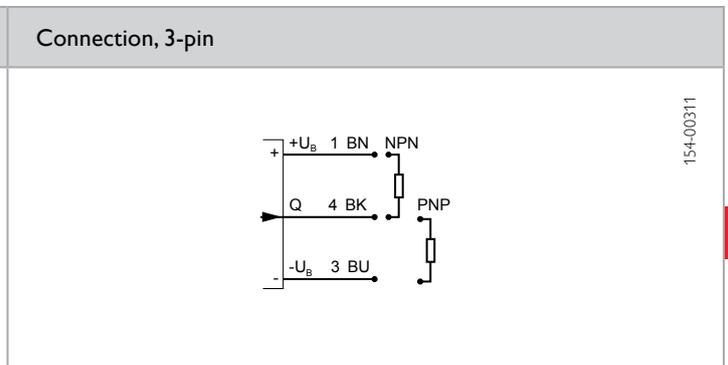
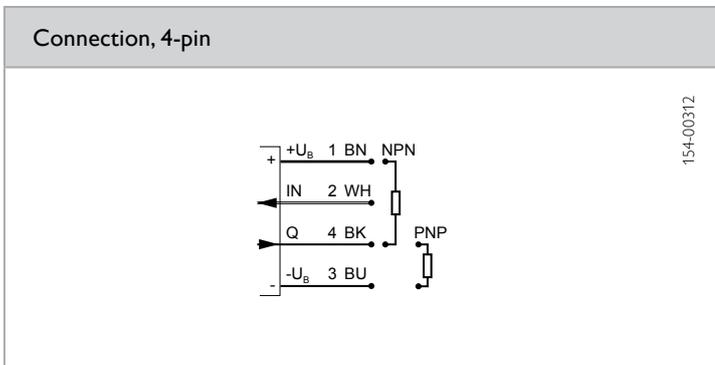
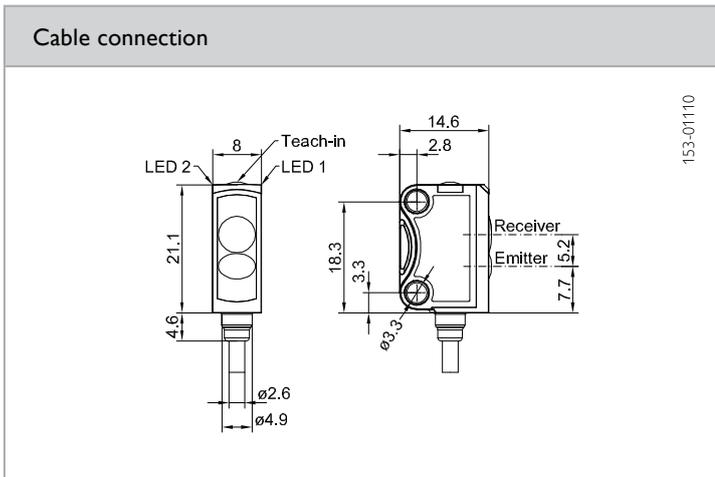
- Sub-miniature sensor with blue transmission LED and precise fixed background suppression
- Reliable switching behaviour with strongly light-absorbing objects, e.g. solar wafers
- Reliable operation without reflector - even with critical surfaces
- Tamper-proof sensor design - no misalignment possible
- Simple mounting and adjustment through innovative dovetail clamp mounting

Optical data		Functions	
Scanning distance	2 ... 30 mm ¹ / 2 ... 50 mm ¹	Indicator LED, green	Operating voltage indicator
Optimum scanning distance	15 ... 20 mm	Indicator LED, yellow	Switching output indicator
Used light	LED, blue, 450 nm	Adjustment possibilities	N.O. / N.C. via control input ³
LED risk group (DIN 62471)	2		
Light spot size	See diagram		
Electrical data		Mechanical data	
Operating voltage +U _B	10 ... 30V DC ²	Dimensions	21,1 x 14,6 x 8 mm ³
No-load supply current I ₀	≤ 20 mA	Enclosure rating	IP 67 ⁴
Output current I _e	≤ 50 mA	Material, housing	PUR
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 output, Q	PNP/NPN (see Selection Table)	Ambient temperature: storage	-20 ... +80 °C
Output function	N.O./N.C.	Weight (cable device)	approx. 22 g
Switching frequency, f (ti/tp 1:1)	800 Hz	Weight (pigtail)	approx. 10 g
Response time	625 μs		
Control input, I _N ³	+U _B = N.C. -U _B / Open = N.O.		

¹ Reference material white, 90 % reflectivity ² max. residual ripple 10 %, within U_B, approx. 50 Hz/100 Hz ³ only 4-pin design ⁴ with connected IP 67 plug

Scanning distance	Switching output	Type of connection	Part number	Article number
2 ... 30 mm ¹	PNP	Cable, 2 m, 4-wire	FT 10-BF2-PS-K4	600-11026
2 ... 30 mm ¹	NPN	Cable, 2 m, 4-wire	FT 10-BF2-NS-K4	600-11029
2 ... 30 mm ¹	PNP	Pigtail, 200 mm with M8 plug, 4-pin	FT 10-BF2-PS-KM4	600-11027
2 ... 30 mm ¹	NPN	Pigtail, 200 mm with M8 plug, 4-pin	FT 10-BF2-NS-KM4	600-11030
2 ... 30 mm ¹	PNP	Pigtail, 200 mm with M8 plug, 3-pin	FT 10-BF2-PS-KM3	600-11028
2 ... 30 mm ¹	NPN	Pigtail, 200 mm with M8 plug, 3-pin	FT 10-BF2-NS-KM3	600-11031
2 ... 50 mm ¹	PNP	Cable, 2 m, 4-wire	FT 10-BF3-PS-K4	600-11036
2 ... 50 mm ¹	NPN	Cable, 2 m, 4-wire	FT 10-BF3-NS-K4	600-11039
2 ... 50 mm ¹	PNP	Pigtail, 200 mm with M8 plug, 4-pin	FT 10-BF3-PS-KM4	600-11037
2 ... 50 mm ¹	NPN	Pigtail, 200 mm with M8 plug, 4-pin	FT 10-BF3-NS-KM4	600-11040
2 ... 50 mm ¹	PNP	Pigtail, 200 mm with M8 plug, 3-pin	FT 10-BF3-PS-KM3	600-11038
2 ... 50 mm ¹	NPN	Pigtail, 200 mm with M8 plug, 3-pin	FT 10-BF3-NS-KM3	600-11041

Including dovetail clamp mounting MBD F 10 for all types



Accessories

Connection cables	From Page A-34
Brackets	From Page A-4

FR 10-RL

Laser retroreflective photoelectric sensor



PRODUCT HIGHLIGHTS

- Sub-miniature sensor for installation in the smallest of spaces
- Bright, precise laser light spot for optimum small-part detection and simple alignment
- Suitable for numerous different reflectors
- User-friendly operation via electronic Teach-in button or control line
- Robust, glass-fibre-reinforced plastic housings

Optical data		Functions	
Limit range	0.1 ... 2.5 m ¹	Indicator LED, green	Operating voltage indicator
Operating range	0.1 ... 2 m ¹	Indicator LED, yellow	Switching output indicator
Type of light	Laser, red, 655 nm	Sensitivity adjustment	Via Teach-in button and control input
Light spot size	See diagram	Teach-in modes	Mode 1: during running process Mode 2: during standing process
Laser Class (DIN EN 60825-1:2008-5)	1	Adjustment possibilities	N.O. / N.C. via Teach-in button and control input Button lock via control input
		Default settings	Max. range and N.O.
Electrical data		Mechanical data	
Operating voltage, +U _B	10 ... 30V DC ²	Dimensions	21.1 × 14.6 × 8 mm ³
No-load current, I ₀	≤ 12 mA	Enclosure rating	IP 67 ³
Output current, I _e	≤ 50 mA	Material, housing	PUR
Protective circuits	Reverse-polarity protection, U _B / short-circuit protection (Q)	Material, front screen	PMMA
Protection Class	2	Type of connection	See Selection Table
Switching output, Q	PNP/NPN (see Selection Table)	Ambient temperature: operation	-20 ... +50 °C
Output function	N.O./N.C.	Ambient temperature: storage	-20 ... +80 °C
Switching frequency, f (ti/tp 1:1)	≤ 1000 Hz	Weight (plug device)	Ca. 3 g
Response time	500 μs	Weight (cable device)	Ca. 22 g
Control input, IN (only 4-pin design)	+U _B = teach-in -U _B = button locked Open = normal operation	Weight (pigtail)	Ca. 10 g

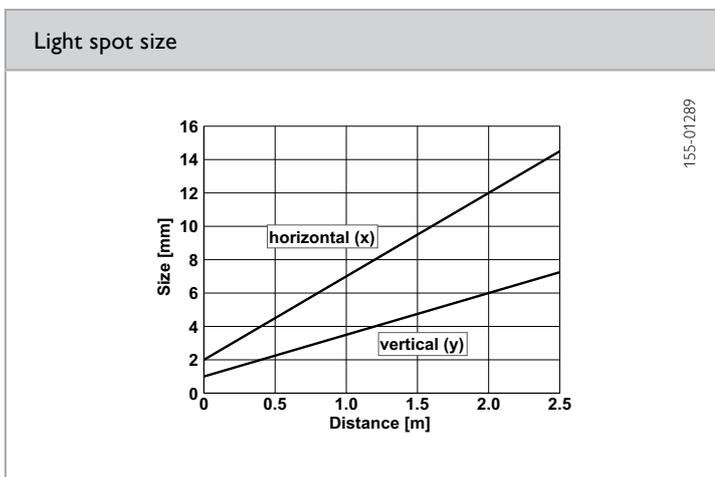
¹ Reference material: R5/L reflector ² Max. 10 % ripple, within U_B, ~ 50 Hz / 100 Hz ³ With connected IP 67 plug

Operating range	Switching output	Type of connection	Part number	Article number
0.1 ... 2 m	PNP	Plug, M5x0.5, 4-pin	FR 10-RL-PS-E4	603-31000
0.1 ... 2 m	NPN	Plug, M5x0.5, 4-pin	FR 10-RL-NS-E4	603-31001
0.1 ... 2 m	PNP	Cable, 2 m, 4-wire	FR 10-RL-PS-K4	603-31002
0.1 ... 2 m	NPN	Cable, 2 m, 4-wire	FR 10-RL-NS-K4	603-31003
0.1 ... 2 m	PNP	Pigtail, 200 mm with M8 plug, 4-pin	FR 10-RL-PS-KM4	603-31004
0.1 ... 2 m	NPN	Pigtail, 200 mm with M8 plug, 4-pin	FR 10-RL-NS-KM4	603-31005
0.1 ... 2 m	PNP	Pigtail, 200 mm with M8 plug, 3-pin	FR 10-RL-PS-KM3	603-31006
0.1 ... 2 m	NPN	Pigtail, 200 mm with M8 plug, 3-pin	FR 10-RL-NS-KM3	603-31007

Including dovetail clamp mounting MBD F 10 for all types

Plug connection	Cable connection
153-00894	153-00895

Connection, 4-pin	Connection, 3-pin
154-00508	154-00509



Reflector / Reflective foil*	Operating range	Accessories
R5/L	0.1 ... 2 m	Reflectors
R2-2LB	0.1 ... 2 m	Connection cables
R3-2LK	0.1 ... 2 m	Brackets
RF-50 KL*	0.06 ... 0.75 m	
RF-100 KL*	0.1 ... 2 m	
		From Page A-18
		From Page A-34
		From Page A-4

FR 10-R

Retroreflective photoelectric sensor



PRODUCT HIGHLIGHTS

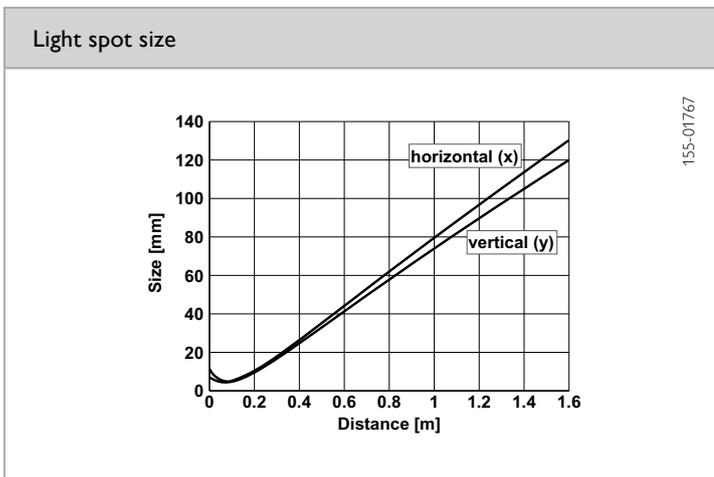
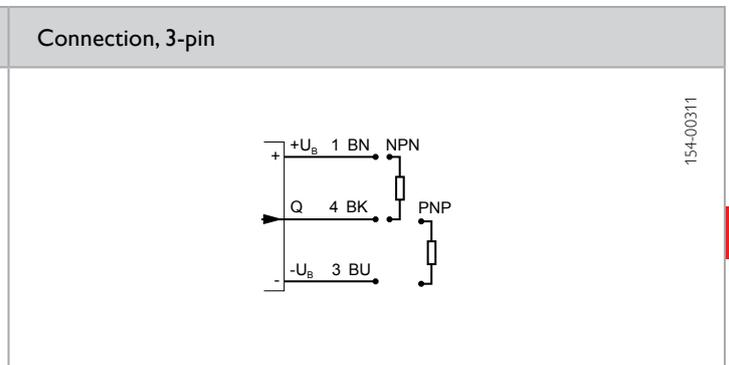
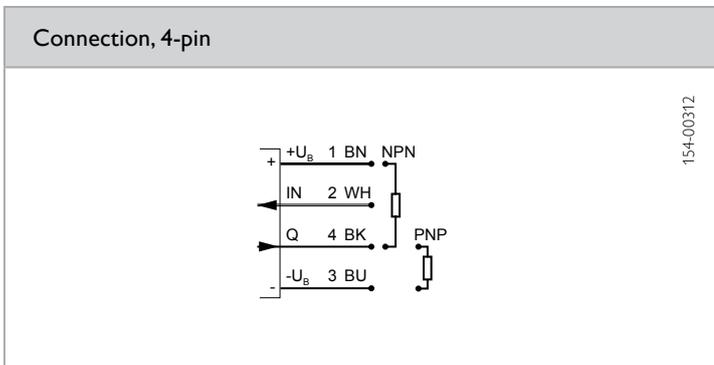
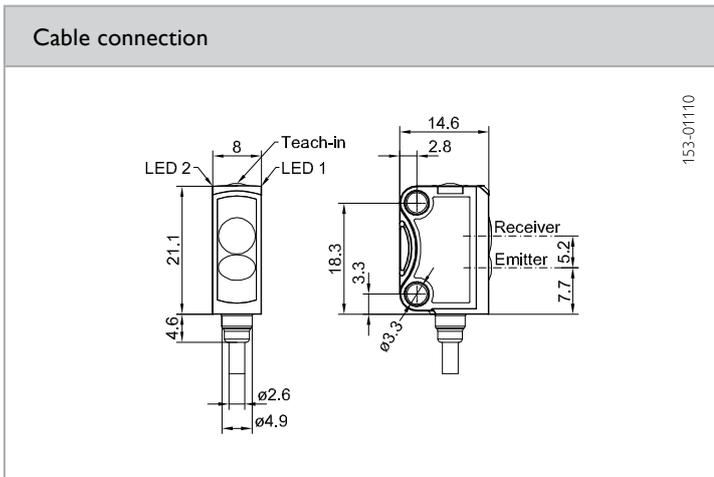
- Sub-miniature sensor for installation in the smallest of spaces
- Despite very small sensor housing very long operating range of 1.6 m
- Fast response time: only 500 μ s
- Static and dynamic teach-in via electronic teach-in button or control line
- Simple mounting and adjustment through innovative dovetail clamp mounting

Optical data		Functions	
Operating range	0.1 ... 1.6 m ¹	Indicator LED green	Operating voltage indicator
Used light	LED, red, 650 nm	Indicator LED yellow	Switching output indicator
Light spot size	See diagram	Sensitivity adjustment	Via Teach-in button and control input ³
Polarising filter	Yes	Teach-in modes	Mode 1: during running process Mode 2: during standing process
		Adjustment possibilities	N.O./N.C. via Teach-in button and control input ³ Button lock via control input ³
		Default settings	Max. range and N.O.
Electrical data		Mechanical data	
Operating voltage, +U _B	10 ... 30V DC ²	Dimensions	21,1 × 14,6 × 8 mm ³
No-load current, I ₀	≤ 20 mA	Enclosure rating	IP 67 ⁴
Output current, I _e	≤ 50 mA	Material, housing	PUR
Protective circuits	Reverse-polarity protection, U _B / short-circuit protection (Q)	Material, front screen	PMMA
Protection class	2	Type of connection	See Selection Table
Power On Delay	< 300 ms	Ambient temperature: operation	-20 ... +60 °C
Switching output, Q	PNP/NPN (see Selection Table)	Ambient temperature: storage	-20 ... +80 °C
Output function	N.O./N.C.	Weight (cable device)	approx. 22 g
Switching frequency, f (ti/tp 1:1)	≤ 1000 Hz	Weight (pigtail)	approx. 10 g
Response time	500 μ s		
Control input, I _N ³	+U _B = teach-in -U _B = button locked Open = normal operation		

¹ Reference material reflector R5 ² max. 10 % ripple within U_B, ~ 50 Hz / 100 Hz ³ only 4-pin design ⁴ with connected IP 67 plug

Operating range	Switching output	Type of connection	Part number	Article number-Nr.
0.1 ... 1.6 m ¹	PNP	Cable, 2 m, 4-wire	FR 10-R-PS-K4	603-11001
0.1 ... 1.6 m ¹	NPN	Cable, 2 m, 4-wire	FR 10-R-NS-K4	603-11004
0.1 ... 1.6 m ¹	PNP	Pigtail, 200 mm with M8 plug, 4-pin	FR 10-R-PS-KM4	603-11002
0.1 ... 1.6 m ¹	NPN	Pigtail, 200 mm with M8 plug, 4-pin	FR 10-R-NS-KM4	603-11005
0.1 ... 1.6 m ¹	PNP	Pigtail, 200 mm with M8 plug, 3-pin	FR 10-R-PS-KM3	603-11003
0.1 ... 1.6 m ¹	NPN	Pigtail, 200 mm with M8 plug, 3-pin	FR 10-R-NS-KM3	603-11006

Including dovetail clamp mounting MBD F 10 for all types



Reflector / Reflective foil*	Operating range (min./max. reflector distance)	Accessories	
R5	0.1 ... 1.6 m	Reflectors	From Page A-34
R1	0.1 ... 1 m		
R2-2LB1	0,15 ... 0,5 m	Brackets	From Page A-4
R3-2LK1	0,15 ... 0,5 m		
RF-100 KL*	0,15 ... 1 m		

FS/FE 10-RL

Laser through-beam photoelectric sensor



PRODUCT HIGHLIGHTS

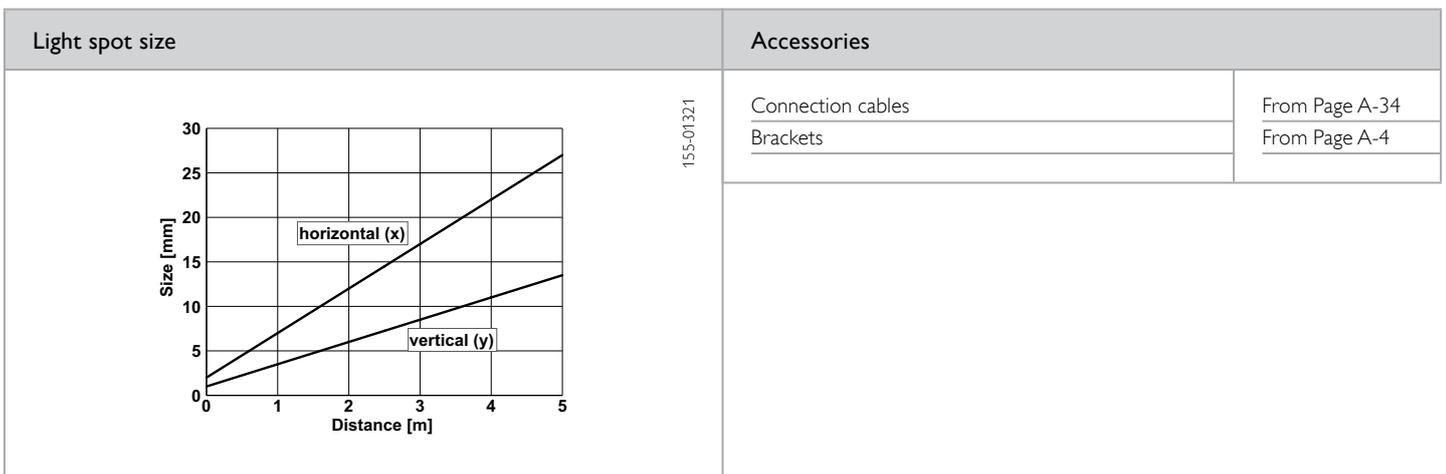
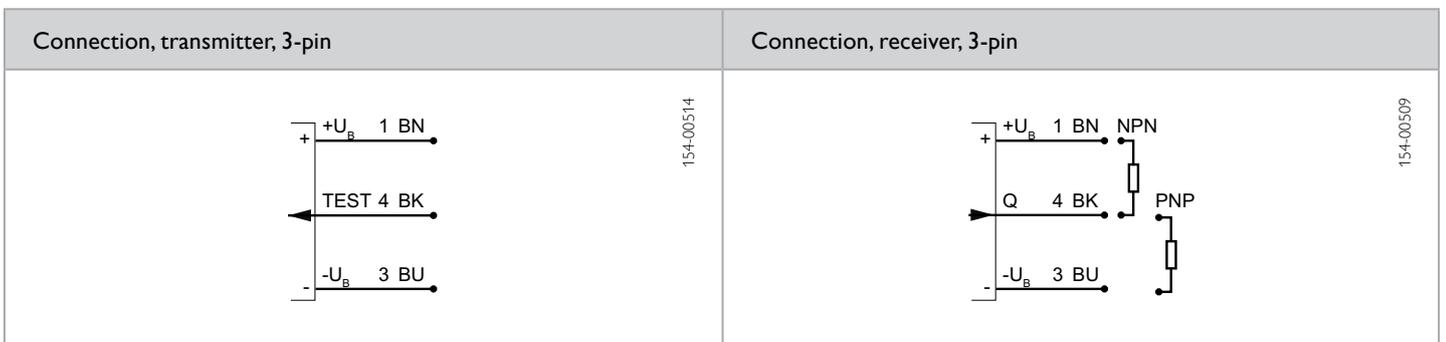
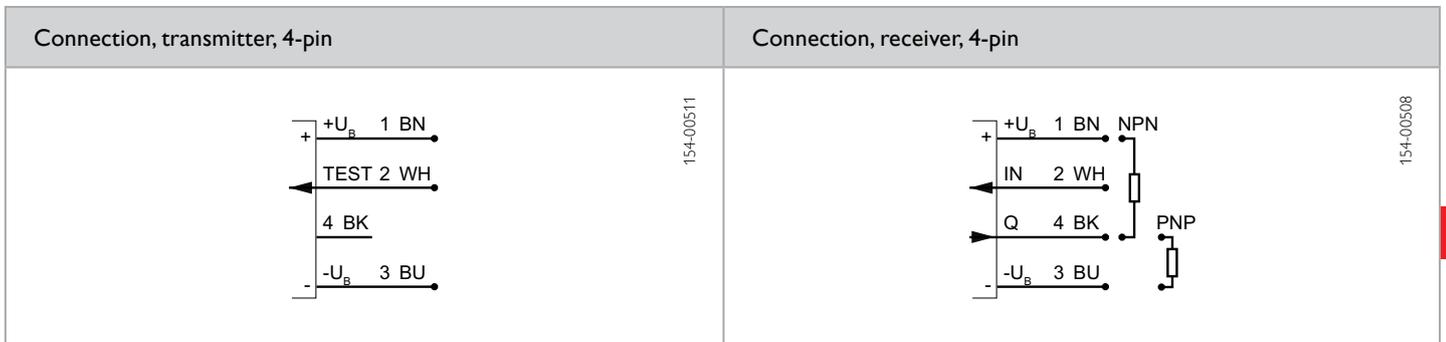
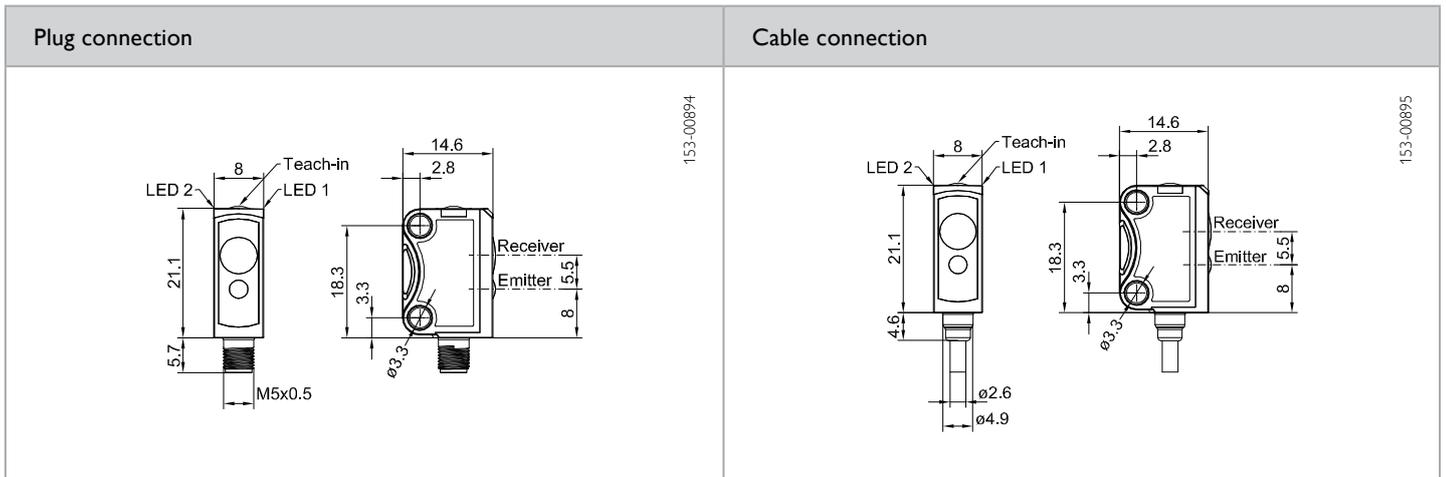
- Sub-miniature sensor for installation in the smallest of spaces
- Bright, precise laser light spot for optimum small-part detection and simple alignment
- High switching frequency for detection in even the fastest processes
- User-friendly operation via electronic Teach-in button or control line
- Robust, glass-fibre-reinforced plastic housings

Optical data		Functions	
Limit range	0 ... 5 m	Indicator LED, green	Operating voltage indicator
Operating range	0 ... 3 m	Indicator LED, yellow	Switching output indicator
Type of light	Laser, red, 655 nm	Sensitivity adjustment	Via Teach-in button and control input
Light spot size	See diagram	Teach-in modes	Mode 1: during running process Mode 2: during standing process
Laser Class (DIN EN 60825-1:2008-5)	1	Adjustment possibilities (receiver)	N.O. / N.C. via Teach-in button and control input Button lock via control input
		Default settings	Max. range and N.O.
Electrical data		Mechanical data	
Operating voltage, +U _B	10 ... 30V DC ¹	Dimensions	21.1 × 14.6 × 8 mm ³
No-load current, I ₀	≤ 12 mA	Enclosure rating	IP 67 ²
Output current, I _e	≤ 50 mA	Material, housing	PUR
Protective circuits	Reverse-polarity protection, U _B / short-circuit protection (Q)	Material, front screen	PMMA
Protection Class	2	Type of connection	See Selection Table
Switching output, Q	PNP/NPN (see Selection Table)	Ambient temperature: operation	-20 ... +50 °C
Output function	N.O./N.C.	Ambient temperature: storage	-20 ... +80 °C
Switching frequency, f (ti/tp 1:1)	≤ 4000Hz	Weight (plug device)	Ca. 6 g
Response time	125 µs	Weight (cable device)	Ca. 44 g
Control input, IN (receiver) (only 4-pin design)	+U _B = teach-in -U _B = button locked Open = normal operation	Weight (pigtail)	Ca. 20 g
Control input, Test (transmitter)	+U _B = Test (transmitter off) -U _B / Open = normal operation		

¹ Max. 10 % ripple, within U_B, ~ 50 Hz / 100 Hz ² With connected IP 67 plug

Operating range	Switching output	Type of connection	Part number	Design	Article number
1 ... 3 m	PNP	Plug, M5x0.5, 4-pin	FS/FE 10-RL-PS-E4	Sensor pair (transmitter & receiver)	611-51000
1 ... 3 m	NPN	Plug, M5x0.5, 4-pin	FS/FE 10-RL-NS-E4	Sensor pair (transmitter & receiver)	611-51001
1 ... 3 m	PNP	Cable, 2 m, 4-wire	FS/FE 10-RL-PS-K4	Sensor pair (transmitter & receiver)	611-51002
1 ... 3 m	NPN	Cable, 2 m, 4-wire	FS/FE 10-RL-NS-K4	Sensor pair (transmitter & receiver)	611-51003
1 ... 3 m	PNP	Pigtail, 200 mm with M8 plug, 4-pin	FS/FE 10-RL-PS-KM4	Sensor pair (transmitter & receiver)	611-51004
1 ... 3 m	NPN	Pigtail, 200 mm with M8 plug, 4-pin	FS/FE 10-RL-NS-KM4	Sensor pair (transmitter & receiver)	611-51005
1 ... 3 m	PNP	Pigtail, 200 mm with M8 plug, 3-pin	FS/FE 10-RL-PS-KM3	Sensor pair (transmitter & receiver)	611-51006
1 ... 3 m	NPN	Pigtail, 200 mm with M8 plug, 3-pin	FS/FE 10-RL-NS-KM3	Sensor pair (transmitter & receiver)	611-51007

Including dovetail clamp mounting MBD F 10 for all types



FS 10-RL / FE 10-RL

Laser through-beam photoelectric sensor



PRODUCT HIGHLIGHTS

- Sub-miniature sensor for installation in the smallest of spaces
- Bright, precise laser light spot for optimum small-part detection and simple alignment
- High switching frequency for detection in even the fastest processes
- User-friendly operation via electronic Teach-in button or control line
- Robust, glass-fibre-reinforced plastic housings

Optical data		Functions	
Limit range	0 ... 5 m	Indicator LED, green	Operating voltage indicator
Operating range	0 ... 3 m	Indicator LED, yellow	Switching output indicator
Type of light	Laser, red, 655 nm	Sensitivity adjustment	Via Teach-in button and control input
Light spot size	See diagram	Teach-in modes	Mode 1: during running process Mode 2: during standing process
Laser Class (DIN EN 60825-1:2008-5)	1	Adjustment possibilities (receiver)	N.O. / N.C. via Teach-in button and control input; Button lock via control input
		Default settings	Max. range and N.O.
Electrical data		Mechanical data	
Operating voltage, +U _B	10 ... 30V DC ¹	Dimensions	21.1 × 14.6 × 8 mm ³
No-load current, I ₀	≤ 12 mA	Enclosure rating	IP 67 ²
Output current, I _e	≤ 50 mA	Material, housing	PUR
Protective circuits	Reverse-polarity protection, U _B / short-circuit protection (Q)	Material, front screen	PMMA
Protection Class	2	Type of connection	See Selection Table
Switching output, Q	PNP/NPN (see Selection Table)	Ambient temperature: operation	-20 ... +50 °C
Output function	N.O. / N.C.	Ambient temperature: storage	-20 ... +80 °C
Switching frequency, f (ti/tp 1:1)	≤ 4000Hz	Weight (plug device)	Ca. 6 g
Response time	125 µs	Weight (cable device)	Ca. 44 g
Control input, IN (receiver) (only 4-pin design)	+U _B = Teach-in; -U _B = button locked; Open = normal operation	Weight (pigtail)	Ca. 20 g
Control input, Test (transmitter)	+U _B = Test (transmitter off) -U _B / Open = normal operation		

¹ Max. 10 % ripple, within U_B, ~ 50 Hz / 100 Hz ² With connected IP 67 plug

Operating range	Switching output	Type of connection	Part number	Design	Article number
1 ... 3 m	PNP	Plug, M5x0.5, 4-pin	FE 10-RL-PS-E4	Receiver	602-71000
1 ... 3 m	-	Plug, M5x0.5, 4-pin	FS 10-RL-E4	Transmitter	601-61000
1 ... 3 m	NPN	Plug, M5x0.5, 4-pin	FE 10-RL-NS-E4	Receiver	602-71001
1 ... 3 m	PNP	Cable, 2 m, 4-wire	FE 10-RL-PS-K4	Receiver	602-71002
1 ... 3 m	-	Cable, 2 m, 4-wire	FS 10-RL-K4	Transmitter	601-61002
1 ... 3 m	NPN	Cable, 2 m, 4-wire	FE 10-RL-NS-K4	Receiver	602-71003
1 ... 3 m	PNP	Pigtail, 200 mm with M8 plug, 4-pin	FE 10-RL-PS-KM4	Receiver	602-71004
1 ... 3 m	-	Pigtail, 200 mm with M8 plug, 4-pin	FS 10-RL-KM4	Transmitter	601-61004
1 ... 3 m	NPN	Pigtail, 200 mm with M8 plug, 4-pin	FE 10-RL-NS-KM4	Receiver	602-71005
1 ... 3 m	PNP	Pigtail, 200 mm with M8 plug, 3-pin	FE 10-RL-PS-KM3	Receiver	602-71006
1 ... 3 m	-	Pigtail, 200 mm with M8 plug, 3-pin	FS 10-RL-KM3	Transmitter	601-61005

Operating range	Switching output	Type of connection	Part number	Design	Article number.
1 ... 3 m	NPN	Pigtail, 200 mm with M8 plug, 3-pin	FE 10-RL-NS-KM3	Receiver	602-71008

Including dovetail clamp mounting MBD F 10 for all types

Plug connection	Cable connection

Connection, transmitter, 4-pin	Connection, receiver, 4-pin

Connection, transmitter, 3-pin	Connection, receiver, 3-pin

Light spot size	Accessories				
	<table border="1"> <tr> <td>Connection cables</td> <td>From Page A-34</td> </tr> <tr> <td>Brackets</td> <td>From Page A-4</td> </tr> </table>	Connection cables	From Page A-34	Brackets	From Page A-4
Connection cables	From Page A-34				
Brackets	From Page A-4				