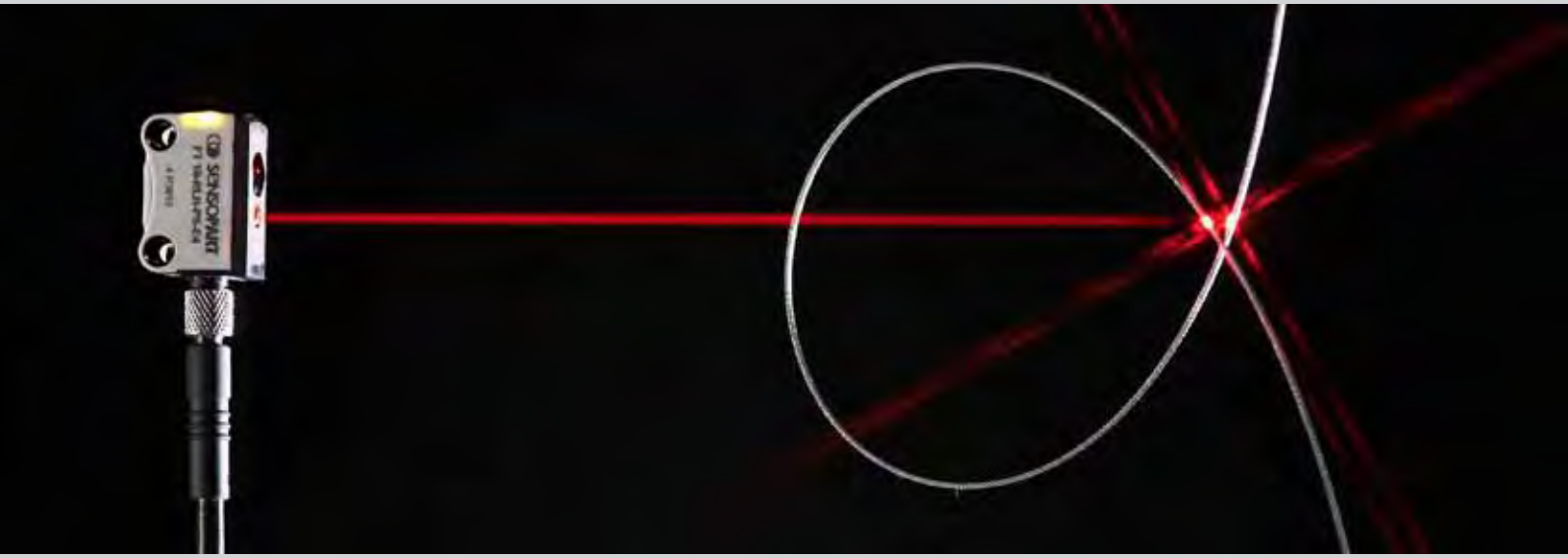
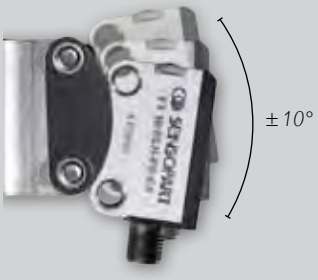
F 10 – family of sub-miniature sensors

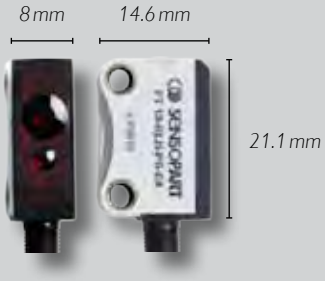
Small housings, great performance



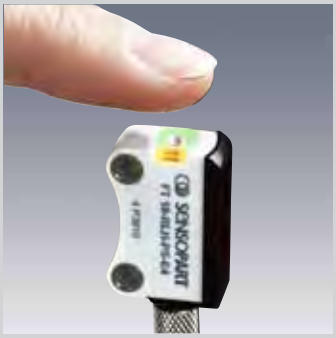
made in Germany



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 unmistakeable 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	272
FT 10-RLHR	Laser	Teach-in	60 mm	Broad-beam light spot	274
FT 10-B-RLF	Laser	Fixed focus	15 mm / 30 mm		276
FT 10-RH	LED	Teach-in	70 mm		278
FT 10-RF	LED	Fixed focus	15 mm / 30 mm / 50 mm		280
FT 10-BF Bluelight	LED, blue	Fixed focus	30 mm / 50 mm	Blue transmission LED for strongly light-absorbing objects	282
Retroreflective photoelectric sensors					
FR 10-RL	Laser	Teach-in	2 m	Long range, precise small-part detection	284
FR 10-R	LED	Teach-in	1.6 m	Long range	286
Through-beam photoelectric sensors					
FS/FE 10-RL	Laser	Teach-in	3 m	Sensor pair, very accurate object positioning	288
FS 10-RL/FE 10-RL	Laser	Teach-in	3 m	Transmitter/receiver, very accurate object positioning	290

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 … 30 V DC[2]	Dimensions	21.1 x 14.6 x 8 mm
No-load current, I_0	≤ 12 mA	Enclosure rating	IP 67[3]
Output current, Ie	≤ 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

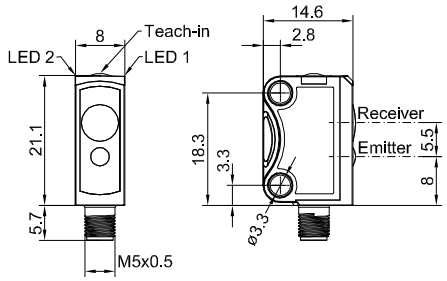
[1] Reference material white, 90 % reflectivity [2] Max. 10 % ripple, within U_B, ~ 50 Hz / 100 Hz [3] With connected IP 67 plug

Scanning distance	Switching output	Type of connection	Part number	Article number
6 … 60 mm	PNP	Plug, M5x0.5, 4-pin	FT 10-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

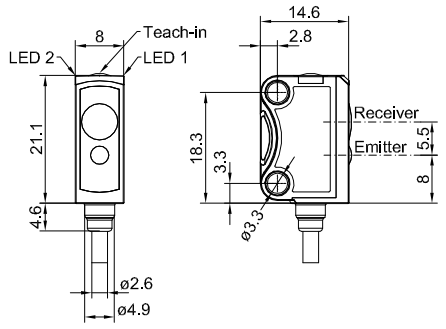
Plug connection

153-00894



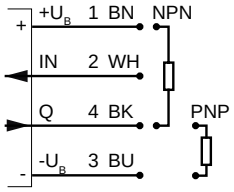
Cable connection

153-00895



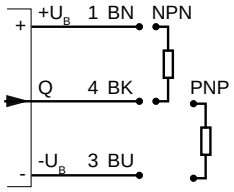
Connection, 4-pin

154-00508



Connection, 3-pin

154-00509



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

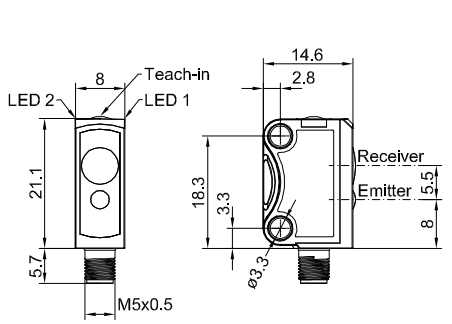
Optical data		Functions	
Scanning distance	6 … 60 mm[1]	Indicator LED, green	Operating voltage indicator
Adjustment range	10 … 60 mm[1]	Indicator LED, yellow	Switching output indicator
Type of light	Laser, red, 655 nm	Scanning distance adjustment	Via Teach-in button and control input
Light spot size	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 … 30 V DC[2]	Dimensions	21.1 x 14.6 x 8 mm
No-load current, I_0	≤ 12 mA	Enclosure rating	IP 67[3]
Output current, Ie	≤ 50 mA	Material, housing	PUR
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 … +50 °C
Switching output, Q	PNP/NPN (see Selection Table)	Ambient temperature: storage	-20 … +80 °C
Output function	N.O.	Weight (plug device)	Ca. 3 g
Switching frequency, f (ti/tp 1:1)	≤ 1000 Hz	Weight (cable device)	Ca. 22 g
Response time	500 µs	Weight (pigtail)	Ca. 10 g
Control input, IN (only 4-pin design)	$+U_B$ = teach-in $-U_B$ = button locked Open = normal operation		

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

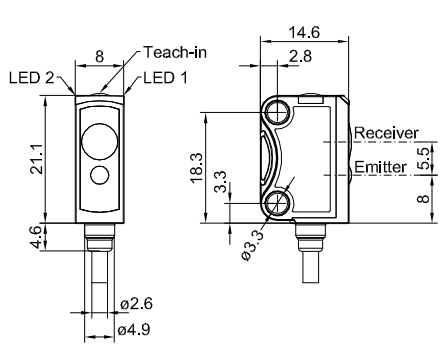
Scanning distance	Switching output	Type of connection	Part number	Article number
6 … 60 mm	PNP	Plug, M5x0.5, 4-pin	FT 10-RLHR-PS-E4	600-11136
6 … 60 mm	NPN	Plug, M5x0.5, 4-pin	FT 10-RLHR-NS-E4	600-11137
6 … 60 mm	PNP	Cable, 2 m, 4-wire	FT 10-RLHR-PS-K4	600-11138
6 … 60 mm	NPN	Cable, 2 m, 4-wire	FT 10-RLHR-NS-K4	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

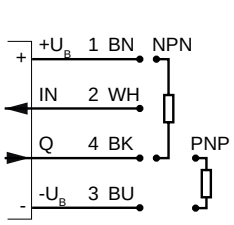
Plug connection



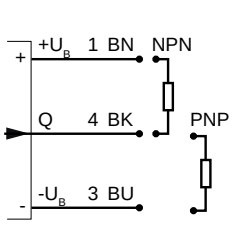
Cable connection



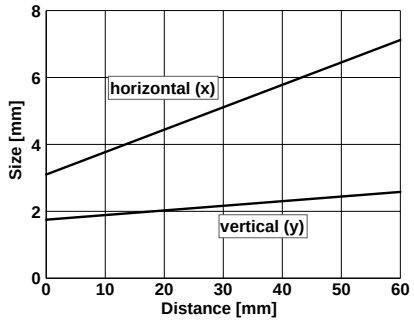
Connection, 4-pin



Connection, 3-pin



Light spot size



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 … 30 V DC[2]	Dimensions	21.1 x 14.6 x 8 mm
No-load current, I_0	≤ 12 mA	Enclosure rating	IP 67[3]
Output current, Ie	≤ 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)	$+U_B$ = 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

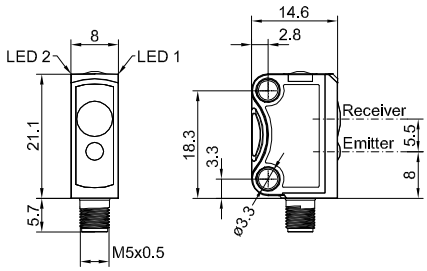
Version: 07/2015. Subject to changes; diagrams similar

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

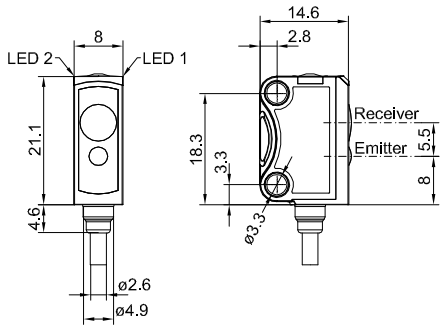
Plug connection

153-00909



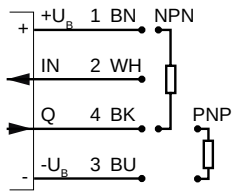
Cable connection

153-00910



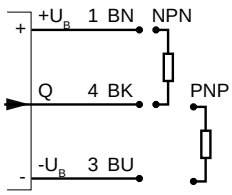
Connection, 4-pin

154-00508



Connection, 3-pin

154-00509



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 proxmity 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	
Scanning distance	5 … 70 mm[1]
Adjustment range	10 … 70 mm[1]
Used light	LED, red, 650 nm
Light spot size	See diagram
Repeatability	0,45 mm[2, 3]
Hysteresis	≤ 2 mm[2]
Grey/white shift (18%/90%)	≤ 3 mm[2]
Black/white shift (6%/90%)	≤ 4 mm[2]

Functions	
Indicator LED, green	Operating voltage indicator
Indicator LED, yellow	Switching output indicator
Scanning distance adjustment	Via Teach-in button and control input[5]
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[5] Button lock via control input[5]
Default settings	Max. range and N.O.

Electrical data	
Operating voltage, $+U_B$	10 … 30 V DC[4]
No-load current, I_0	≤ 20 mA
Output current, Ie	≤ 50 mA
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection (Q)
Protection class	2
Power On Delay	< 300 ms
Switching output, Q	PNP/NPN
Output function	N.O. /N.C.
Switching frequency, f (ti/tp 1:1)	≤ 1000 Hz
Response time	500 µs
Control input, IN[3]	$+U_B$ = teach-in $-U_B$ = button locked Open = normal operation

Mechanical data	
Dimensions	21,1 x 14,6 x 8 mm
Enclosure rating	IP 67[6]
Material, housing	PUR
Material, front screen	PMMA
Type of connection	See Selection Table
Ambient temperature: operation	-20 … +60 °C
Ambient temperature: storage	-20 … +80 °C
Weight (plug device)	approx. 3 g
Weight (cable device)	approx. 22 g
Weight (pigtail)	approx. 10 g

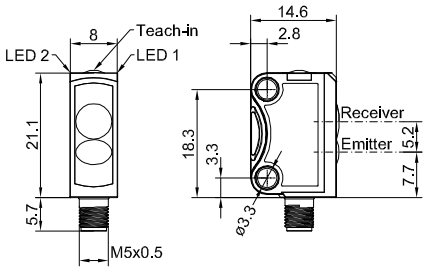
[1] Reference material white, 90 % reflectivity [2] At maximum scanning distance [3] In constant environmental conditions [4] Max. 10 % ripple within U_B, ~ 50 Hz / 100 Hz
[5] Only 4-pin design [6] With connected IP 67 plug

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

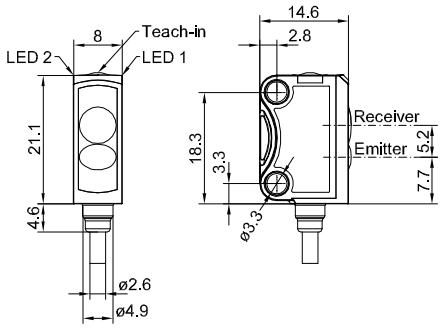
Including dovetail clamp mounting MBD F 10 for all types

Version: 07/2015. Subject to changes; diagrams similar

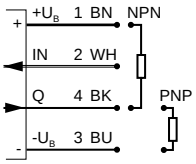
Plug connection



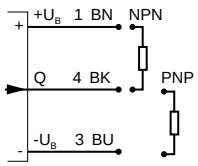
Cable connection



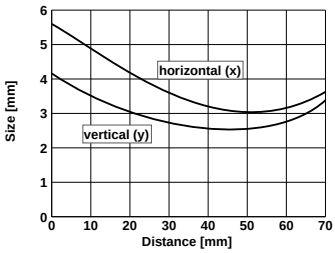
Connection, 4-pin



Connection, 3-pin



Light spot size



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

8

FT 10-RF

Photoelectric proxmity 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 … 30 V DC[2]	Dimensions	21,1 x 14,6 x 8 mm
No-load current, I_0	≤ 20 mA	Enclosure rating	IP 67[4]
Output current, Ie	≤ 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, IN[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

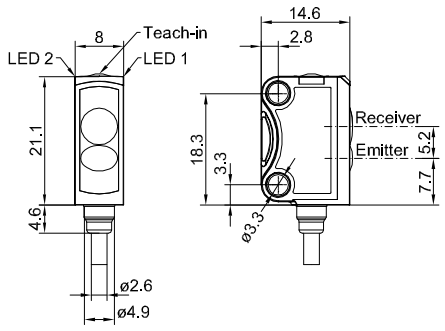
Version: 07/2015. Subject to changes; diagrams similar

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

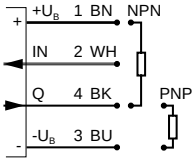
Cable connection

153-01110



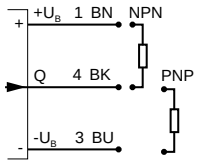
Connection, 4-pin

154-00312



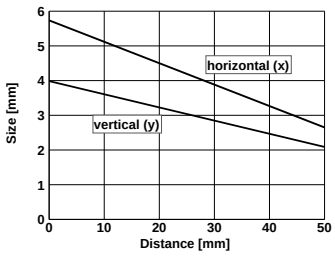
Connection, 3-pin

154-00311



Light spot size

155-01769



Reference material

	FT 10-RF1	FT 10-RF2	FT 10-RF3
white (90 %)	2 … 15 mm	2 … 30 mm	2 … 50 mm
grey (18 %)	3 … 15 mm	4 … 30 mm	5 … 50 mm
black (6 %)	4 … 15 mm	5 … 30 mm	7 … 50 mm

Accessories

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

FT 10-BF

Bluelight photoelectric proxmity 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		

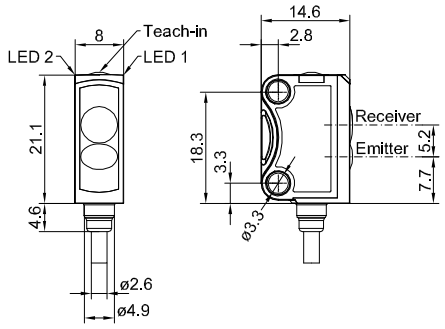
Electrical data		Mechanical data	
Operating voltage $+U_B$	10 … 30 V DC[2]	Dimensions	21,1 x 14,6 x 8 mm
No-load supply current I_0	≤ 20 mA	Enclosure rating	IP 67[4]
Output current Ie	≤ 50 mA	Material, housing	PUR
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection (Q)	Material, front screen	PMMA
		Type of connection	See Selection Table
Protection class	2	Ambient temperature: operation	-20 … +50 °C
Power On Delay	< 300 ms	Ambient temperature: storage	-20 … +80 °C
Switching output, Q	PNP/NPN (see Selection Table)	Weight (cable device)	approx. 22 g
Output function	N.O. /N.C.	Weight (pigtail)	approx. 10 g
Switching frequency, f (ti/tp 1:1)	800 Hz		
Response time	625 µs		
Control input, IN[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

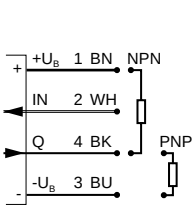
Scanning distance	Switching output	Type of connection	Part number	Article number
2 … 30 mm[1]	PNP	Cable, 2 m, 4-wire	FT 10-BF2-PS-K4	600-11026
2 … 30 mm[1]	NPN	Cable, 2 m, 4-wire	FT 10-BF2-NS-K4	600-11029
2 … 30 mm[1]	PNP	Pigtail, 200 mm with M8 plug, 4-pin	FT 10-BF2-PS-KM4	600-11027
2 … 30 mm[1]	NPN	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

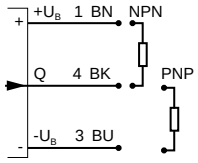
Cable connection



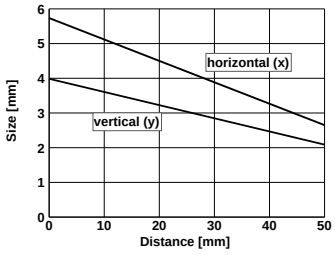
Connection, 4-pin



Connection, 3-pin



Light spot size



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

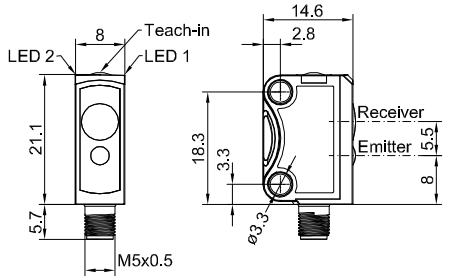
Optical data		Functions	
Limit range	0.1 … 2.5 m[1]	Indicator LED, green	Operating voltage indicator
Operating range	0.1 … 2 m[1]	Indicator LED, yellow	Switching output indicator
Type of light	Laser, red, 655 nm	Sensitivity adjustment	Via Teach-in button and control input
Light spot size	See diagram	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 … 30 V DC[2]	Dimensions	21.1 x 14.6 x 8 mm
No-load current, I_0	≤ 12 mA	Enclosure rating	IP 67[3]
Output current, Ie	≤ 50 mA	Material, housing	PUR
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 … +50 °C
Switching output, Q	PNP/NPN (see Selection Table)	Ambient temperature: storage	-20 … +80 °C
Output function	N.O. /N.C.	Weight (plug device)	Ca. 3 g
Switching frequency, f (ti/tp 1:1)	≤ 1000 Hz	Weight (cable device)	Ca. 22 g
Response time	500 µs	Weight (pigtail)	Ca. 10 g
Control input, IN (only 4-pin design)	$+U_B$ = teach-in $-U_B$ = button locked Open = normal operation		

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

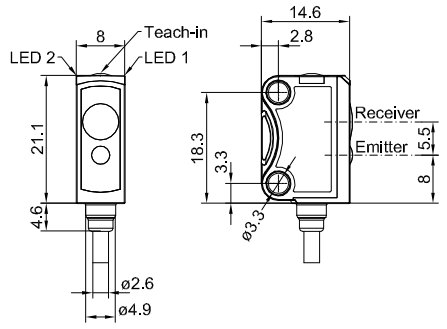
Operating range	Switching output	Type of connection	Part number	Article number
0.1 … 2 m	PNP	Plug, M5x0.5, 4-pin	FR 10-RL-PS-E4	603-31000
0.1 … 2 m	NPN	Plug, M5x0.5, 4-pin	FR 10-RL-NS-E4	603-31001
0.1 … 2 m	PNP	Cable, 2 m, 4-wire	FR 10-RL-PS-K4	603-31002
0.1 … 2 m	NPN	Cable, 2 m, 4-wire	FR 10-RL-NS-K4	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

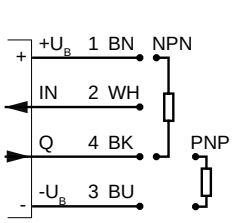
Plug connection



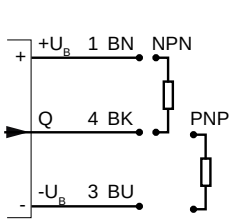
Cable connection



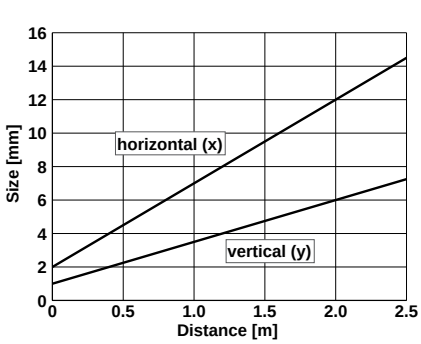
Connection, 4-pin



Connection, 3-pin



Light spot size



Reflector / Reflective foil*	Operating range
R5/L	0.1 … 2 m
R2-2LB	0.1 … 2 m
R3-2LK	0.1 … 2 m
RF-50 KL*	0.06 … 0.75 m
RF-100 KL*	0.1 … 2 m

Accessories	
Reflectors	From Page A-18
Connection cables	From Page A-34
Brackets	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 µs
- Static and dynamic teach-in via electronic teach-in button or control line
- Simple mounting and adjustment through innovative dovetail clamp mounting

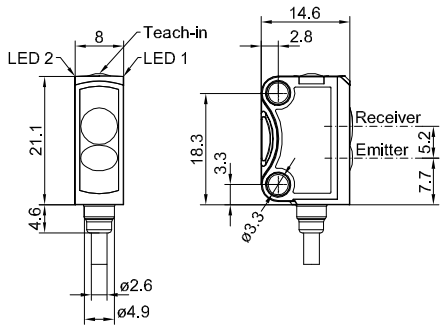
Optical data		Functions	
Operating range	0.1 … 1.6 m[1]	Indicator LED green	Operating voltage indicator
Used light	LED, red, 650 nm	Indicator LED yellow	Switching output indicator
Light spot size	See diagram	Sensitivity adjustment	Via Teach-in button and control input[3]
Polarising filter	Yes	Teach-in 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 … 30 V DC[2]	Dimensions	21,1 x 14,6 x 8 mm
No-load current, I_0	≤ 20 mA	Enclosure rating	IP 67[4]
Output current, Ie	≤ 50 mA	Material, housing	PUR
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
Power On Delay	< 300 ms	Ambient temperature: storage	-20 … +80 °C
Switching output, Q	PNP/NPN (see Selection Table)	Weight (cable device)	approx. 22 g
Output function	N.O. /N.C.	Weight (pigtail)	approx. 10 g
Switching frequency, f (ti/tp 1:1)	≤ 1000 Hz		
Response time	500 µs		
Control input, IN[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

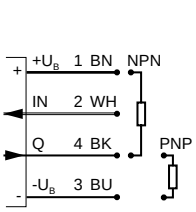
Operating range	Switching output	Type of connection	Part number	Article number-Nr.
0.1 … 1.6 m[1]	PNP	Cable, 2 m, 4-wire	FR 10-R-PS-K4	603-11001
0.1 … 1.6 m[1]	NPN	Cable, 2 m, 4-wire	FR 10-R-NS-K4	603-11004
0.1 … 1.6 m[1]	PNP	Pigtail, 200 mm with M8 plug, 4-pin	FR 10-R-PS-KM4	603-11002
0.1 … 1.6 m[1]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

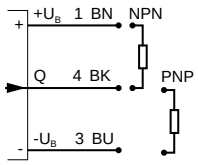
Cable connection



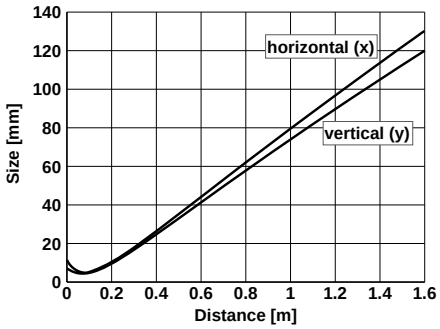
Connection, 4-pin



Connection, 3-pin



Light spot size



Reflector / Reflective foil*	Operating range (min./max. reflector distance)
R5	0.1 … 1.6 m
R1	0.1 … 1 m
R2-2LB1	0,15 … 0,5 m
R3-2LK1	0,15 … 0,5 m
RF-100 KL*	0,15 … 1 m

Accessories	
Reflectors	From Page A-34
Brackets	From Page A-4

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	
Limit range	0 … 5 m
Operating range	0 … 3 m
Type of light	Laser, red, 655 nm
Light spot size	See diagram
Laser Class (DIN EN 60825-1:2008-5)	1

Functions	
Indicator LED, green	Operating voltage indicator
Indicator LED, yellow	Switching output indicator
Sensitivity adjustment	Via Teach-in button and control input
Teach-in modes	Mode 1: during running process Mode 2: during standing process
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	
Operating voltage, $+U_B$	10 … 30 V DC[1]
No-load current, I_0	≤ 12 mA
Output current, Ie	≤ 50 mA
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection (Q)
Protection Class	2
Switching output, Q	PNP/NPN (see Selection Table)
Output function	N.O. /N.C.
Switching frequency, f (ti/tp 1:1)	≤ 4000Hz
Response time	125 µs
Control input, IN (receiver) (only 4-pin design)	$+U_B$ = teach-in $-U_B$ = button locked Open = normal operation
Control input, Test (transmitter)	$+U_B$ = Test (transmitter off) $-U_B$ / Open = normal operation

Mechanical data	
Dimensions	21.1 x 14.6 x 8 mm
Enclosure rating	IP 67[2]
Material, housing	PUR
Material, front screen	PMMA
Type of connection	See Selection Table
Ambient temperature: operation	-20 ... +50 °C
Ambient temperature: storage	-20 ... +80 °C
Weight (plug device)	Ca. 6 g
Weight (cable device)	Ca. 44 g
Weight (pigtail)	Ca. 20 g

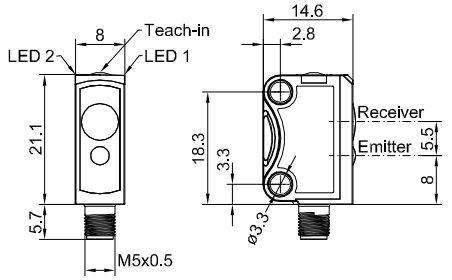
[1] Max. 10 % ripple, within U_B, ~ 50 Hz / 100 Hz [2] With connected IP 67 plug

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

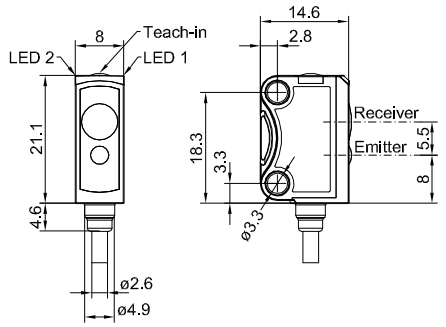
Including dovetail clamp mounting MBD F 10 for all types

Version: 07/2015. Subject to changes; diagrams similar

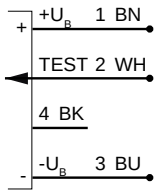
Plug connection



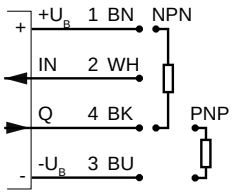
Cable connection



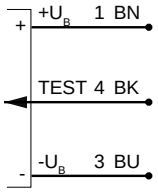
Connection, transmitter, 4-pin



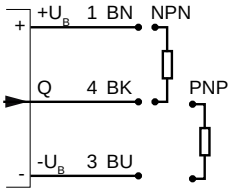
Connection, receiver, 4-pin



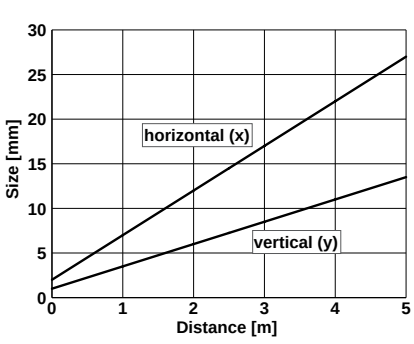
Connection, transmitter, 3-pin



Connection, receiver, 3-pin



Light spot size



Accessories

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

8

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	
Limit range	0 … 5 m
Operating range	0 … 3 m
Type of light	Laser, red, 655 nm
Light spot size	See diagram
Laser Class (DIN EN 60825-1:2008-5)	1

Functions	
Indicator LED, green	Operating voltage indicator
Indicator LED, yellow	Switching output indicator
Sensitivity adjustment	Via Teach-in button and control input
Teach-in modes	Mode 1: during running process Mode 2: during standing process
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	
Operating voltage, $+U_B$	10 … 30 V DC[1]
No-load current, I_0	≤ 12 mA
Output current, Ie	≤ 50 mA
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection (Q)
Protection Class	2
Switching output, Q	PNP/NPN (see Selection Table)
Output function	N.O. /N.C.
Switching frequency, f (ti/tp 1:1)	≤ 4000Hz
Response time	125 µs
Control input, IN (receiver) (only 4-pin design)	$+U_B$ = Teach-in; $-U_B$ = button locked; Open = normal operation
Control input, Test (transmitter)	$+U_B$ = Test (transmitter off) $-U_B$ / Open = normal operation

Mechanical data	
Dimensions	21.1 x 14.6 x 8 mm
Enclosure rating	IP 67[2]
Material, housing	PUR
Material, front screen	PMMA
Type of connection	See Selection Table
Ambient temperature: operation	-20 … +50 °C
Ambient temperature: storage	-20 … +80 °C
Weight (plug device)	Ca. 6 g
Weight (cable device)	Ca. 44 g
Weight (pigtail)	Ca. 20 g

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

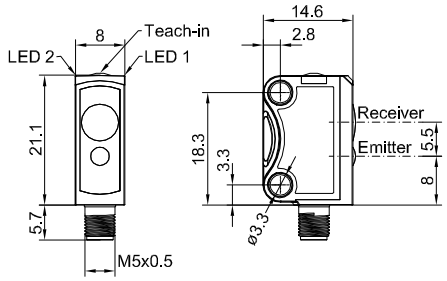
Operating range	Switching output	Type of connection	Part number	Design	Article number
1 ... 3 m	PNP	Plug, M5x0.5, 4-pin	FE 10-RL-PS-E4	Receiver	602-71000
1 ... 3 m	–	Plug, M5x0.5, 4-pin	FS 10-RL-E4	Transmitter	601-61000
1 ... 3 m	NPN	Plug, M5x0.5, 4-pin	FE 10-RL-NS-E4	Receiver	602-71001
1 ... 3 m	PNP	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

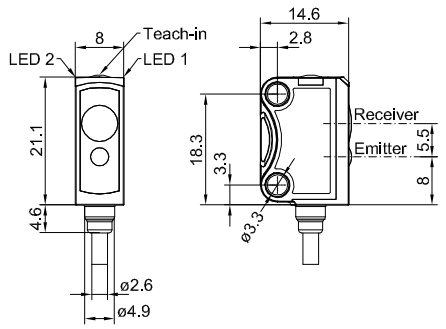
Plug connection

153-00894



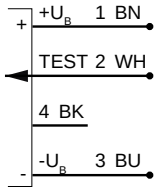
Cable connection

153-00895



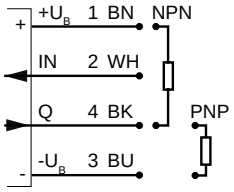
Connection, transmitter, 4-pin

154-00511



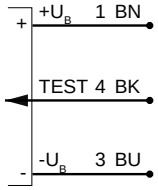
Connection, receiver, 4-pin

154-00508



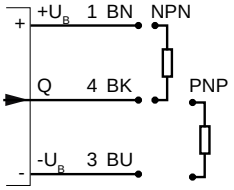
Connection, transmitter, 3-pin

154-00514



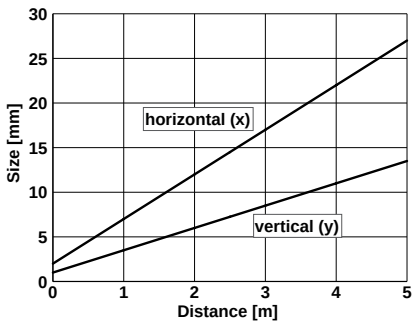
Connection, receiver, 3-pin

154-00509



Light spot size

155-01321



Accessories

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