F 10 – family of sub-miniature sensors

Small housings, great performance

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

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.

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!

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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	228
FT 10-RLHR	Laser	Teach-in	60 mm	Broad-beam light spot	230
FT 10-B-RLF	Laser	Fixed focus	15 mm / 30 mm		232
FT 10-RH	LED	Teach-in	70 mm		234
FT 10-RF	LED	Fixed focus	15 mm / 30 mm / 50 mm		236
FT 10-BF Bluelight	LED, blue	Fixed focus	30 mm	Blue transmission LED for strongly light-absorbing objects	238
Retroreflective photoelectric sensors					
FR 10-RL	Laser	Teach-in	2 m	Long range, precise small-part detection	240
FR 10-R	LED	Teach-in	1.6 m	Long range	242
Through-beam photoelectric sensors					
FS/FE 10-RL	Laser	Teach-in	3 m	Sensor pair, very accurate object positioning	244
FS 10-RL/FE 10-RL	Laser	Teach-in	3 m	Transmitter/receiver, very accurate object positioning	246

FT 10-RLH

Laser photoelectric proximity sensor with background suppression

CE
IP 67
ECOLAB

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	
Scanning distance	6 … 60 mm[1]
Adjustment range	10 … 60 mm[1]
Type of light	Laser, red, 655 nm
Light spot size (total detection area)	1×3 mm[2]
Laser Class (DIN EN 60825-1:2008-5)	1

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	Button lock via control input
Default settings	Max. scanning distance and N.O.

Electrical data	
Operating voltage, $+U_B$	10 … 30 V DC[2]
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.
Switching frequency, f (ti/tp 1:1)	≤ 1000 Hz
Response time	500 µs
Control input, IN (only 4-pin design)	$+U_B$ = teach-in $-U_B$ = button locked Open = normal operation

Mechanical data	
Dimensions	$21.1 \times 14.6 \times 8$ mm[3]
Enclosure rating	IP 67[3]
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. 3 g
Weight (cable device)	Ca. 22 g
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

Version: 10/2013. Subject to changes; diagrams similar

Plug connection	Cable connection

153-00894

153-00895

Connection, 4-pin	Connection, 3-pin

154-00508

154-00509

8

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-32
Brackets	From Page A-4

FT 10-RLHR

Laser photoelectric proximity sensor with background suppression
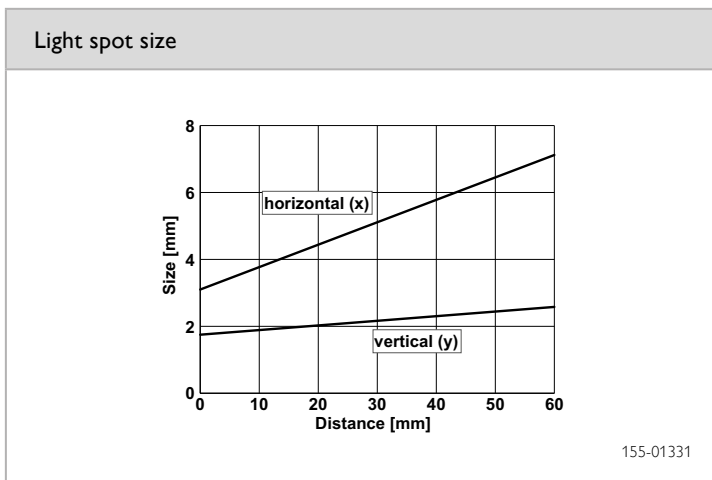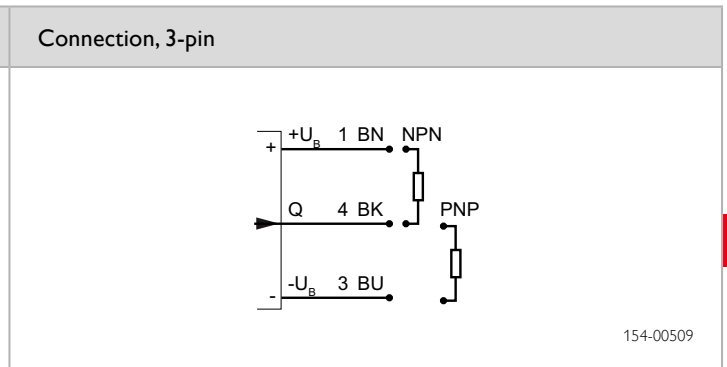
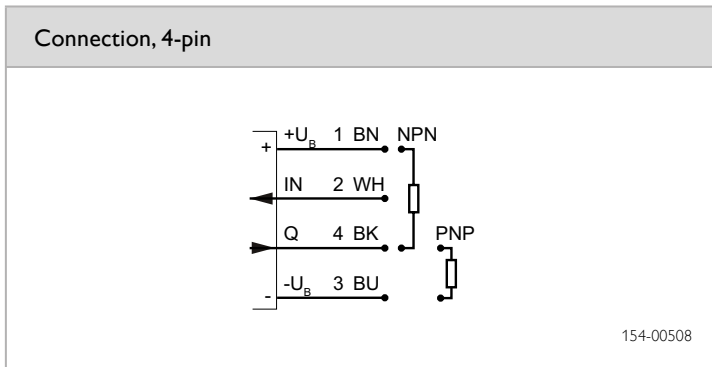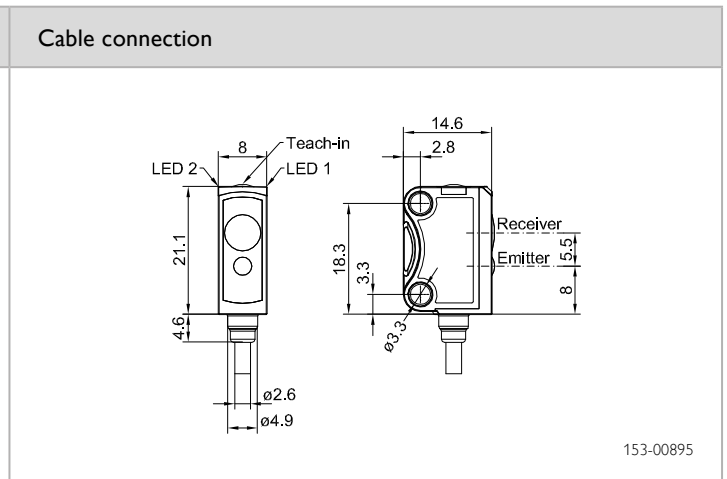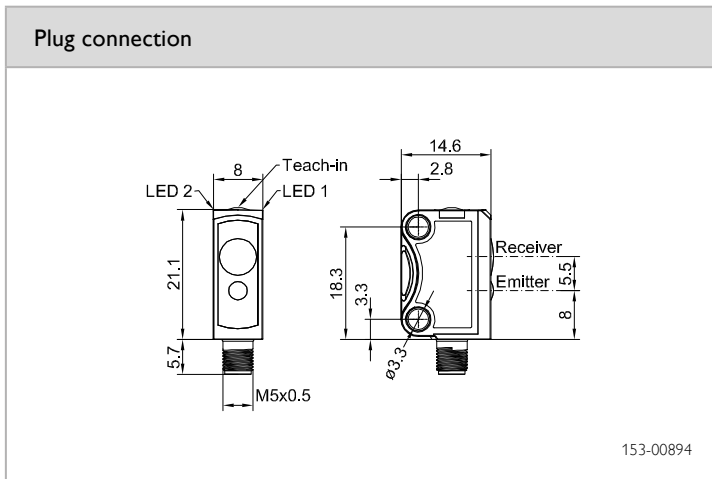## PRODUCT HIGHLIGHTS

- Sub-miniature sensor with <u>wide</u> laser light spot and <u>adjustable</u> 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[3]
No-load current, I_0	≤ 12 mA	Enclosure rating	IP 67[3]
Output current, le	≤ 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-PS-KM3	600-11149

Including dovetail clamp mounting MBD F 10 for all types

Version: 10/2013. Subject to changes; diagrams similar

Plug connection

Teach-in
LED 2
LED 1
8
14.6
2.8
21.1
18.3
3.3
Receiver
Emitter
5.5
8
5.7
ø3.3
M5x0.5

153-00894

Cable connection

Teach-in
LED 2
LED 1
8
14.6
2.8
21.1
18.3
3.3
Receiver
Emitter
5.5
8
4.6
ø3.3
ø2.6
ø4.9

153-00895

Connection, 4-pin

+	+U$_B$	1 BN	NPN
	IN	2 WH	
	Q	4 BK	PNP
-	-U$_B$	3 BU	

154-00508

Connection, 3-pin

+	+U$_B$	1 BN	NPN
	Q	4 BK	PNP
-	-U$_B$	3 BU	

154-00509

Light spot size

horizontal (x)

vertical (y)

Size [mm]
Distance [mm]

155-01331

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-32
Brackets	From Page A-4

FT 10-B-RLF

Laser photoelectric proximity sensor with background suppression, fixed focus

CE

IP 67

ECOLAB

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	
Scanning distance	6 … 15 mm[1]
	6 … 30 mm[1]
Type of light	Laser, red, 655 nm
Light spot size (total detection area)	1 × 3 mm[2]
Laser Class (DIN EN 60825-1:2008-5)	1

Functions		
Indicator LED, green		Operating voltage indicator
Indicator LED, yellow		Switching output indicator
Adjustment possibilities		N.O. / N.C. via control input

Electrical data	
Operating voltage, $+U_B$	10 … 30 V DC[2]
No-load current, I_0	≤ 12 mA
Output current, le	≤ 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)	≤ 1000 Hz
Response time	500 µs
Control input, IN (only 4-pin design)	$+U_B$ = N.C. $-U_B$ / Open = N.O.

Mechanical data	
Dimensions	21.1 × 14.6 × 8 mm[3]
Enclosure rating	IP 67[3]
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. 3 g
Weight (cable device)	Ca. 22 g
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: 10/2013. 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

All types include MBD F 10 dovetail clamp mounting.

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-32
Brackets	From Page A-4

FT 10-RH

Photoelectric proxmity sensor with background suppression (available from Q4/2013)

CE
IP 67
ECOLAB
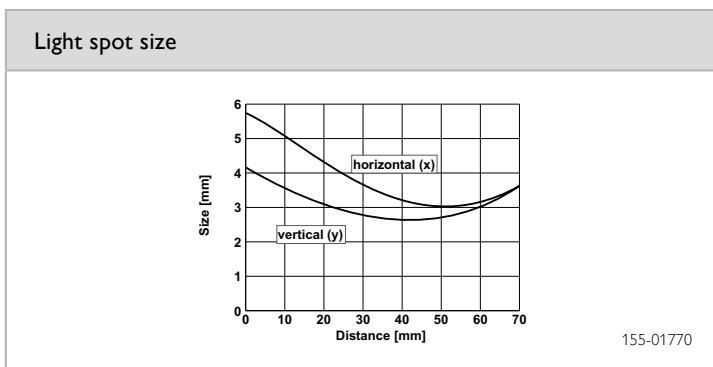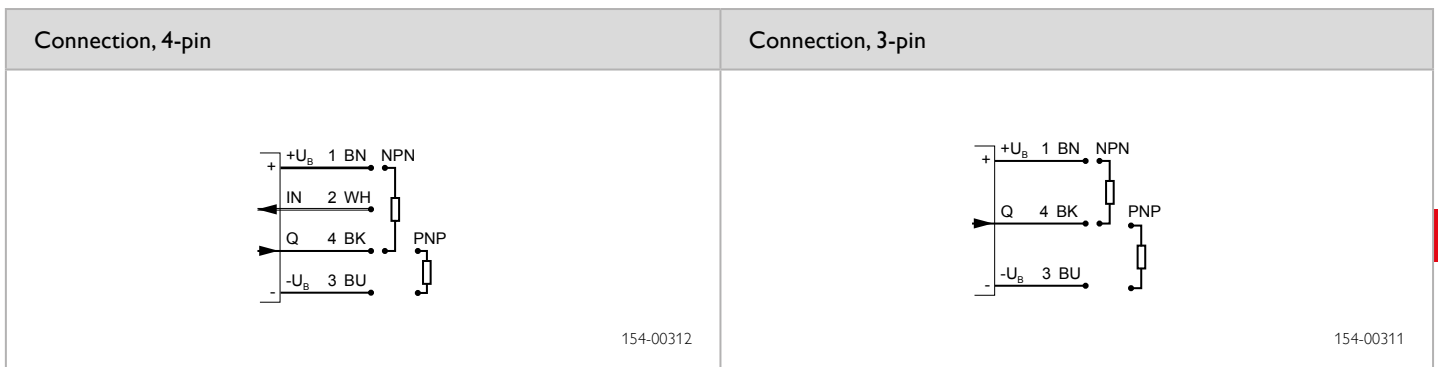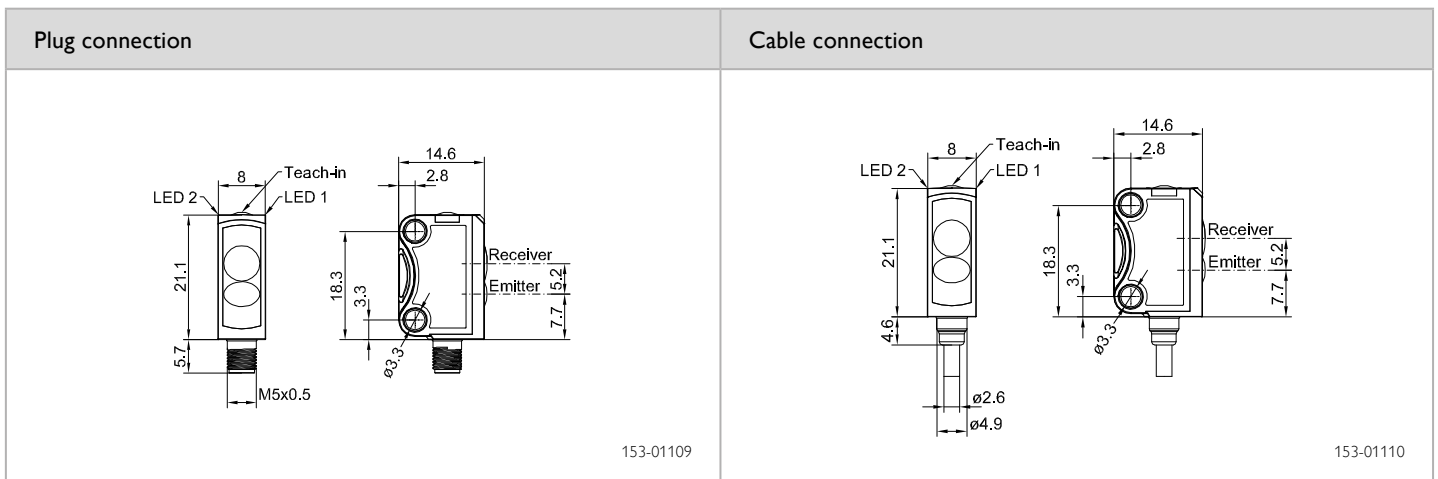◐ IO-Link

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
- IO-Link interface for easy parameterisation and central data logging

Optical data

Scanning distance	5 … 70 mm[1]
Adjustment range	10 … 70 mm[1]
Used light	LED, red
Light spot size	See diagram

Functions

Indicator LED, green	Operating voltage indicator
Indicator LED, yellow	Switching output indicator
Scanning distance adjustment	Via Teach-in button and control input[3]
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

Operating voltage, $+U_B$	10 … 30 V DC[2]
No-load current, I_0	≤ 30 mA
Output current, le	≤ 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 × 14,6 × 8 mm[3]
Enclosure rating	IP 67[4]
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)	approx. 3 g
Weight (cable device)	approx. 22 g
Weight (pigtail)	approx. 10 g

[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
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: 10/2013. Subject to changes; diagrams similar

Plug connection

14.6
2.8
8
Teach-in
LED 2
LED 1
21.1
18.3
3.3
Receiver
Emitter
5.2
7.7
5.7
ø3.3
M5x0.5

153-01109

Cable connection

14.6
2.8
8
Teach-in
LED 2
LED 1
21.1
18.3
3.3
Receiver
Emitter
5.2
7.7
4.6
ø3.3
ø2.6
ø4.9

153-01110

Connection, 4-pin

+U_B 1 BN   NPN
IN   2 WH
Q   4 BK   PNP
-U_B 3 BU

154-00312

Connection, 3-pin

+U_B 1 BN   NPN
Q   4 BK   PNP
-U_B 3 BU

154-00311

8

Light spot size

horizontal (x)

vertical (y)

Size [mm]

Distance [mm]

155-01770

Accessories

Connection cables	From Page A-32
Brackets	From Page A-4

FT 10-RF

Photoelectric proxmity sensor with background suppression, fixed focus
(available from Q4/2013)

CE
IP 67
ECOLAB

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
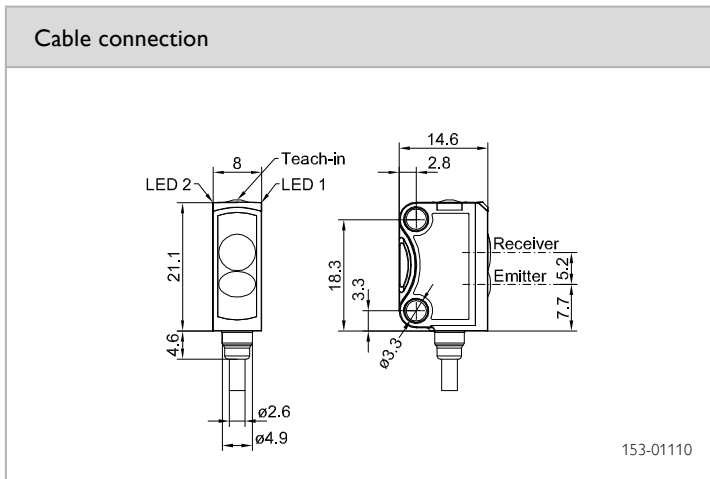- Simple mounting and adjustment through innovative dovetail clamp mounting

Optical data	
Scanning distance	1 … 15 mm[1]
	1 … 30 mm[1]
	1 … 50 mm[1]
Used light	LED, red
Light spot size	See diagram

Functions	
Indicator LED, green	Operating voltage indicator
Indicator LED, yellow	Switching output indicator
Adjustment possibilities	N.O. / N.C. via control input[3]

Electrical data	
Operating voltage, $+U_B$	10 … 30 V DC[2]
No-load current, I_0	≤ 30 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 (see Selection Table)
Output function	N.O. / N.C.
Switching frequency, f (ti/tp 1:1)	≤ 1000 Hz
Response time	500 µs
Control input, IN[3]	$+U_B$ = N.C.
	$-U_B$ / Open = N.O.

Mechanical data	
Dimensions	21,1 x 14,6 x 8 mm[3]
Enclosure rating	IP 67[4]
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 (cable device)	approx. 22 g
Weight (pigtail)	approx. 10 g

[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
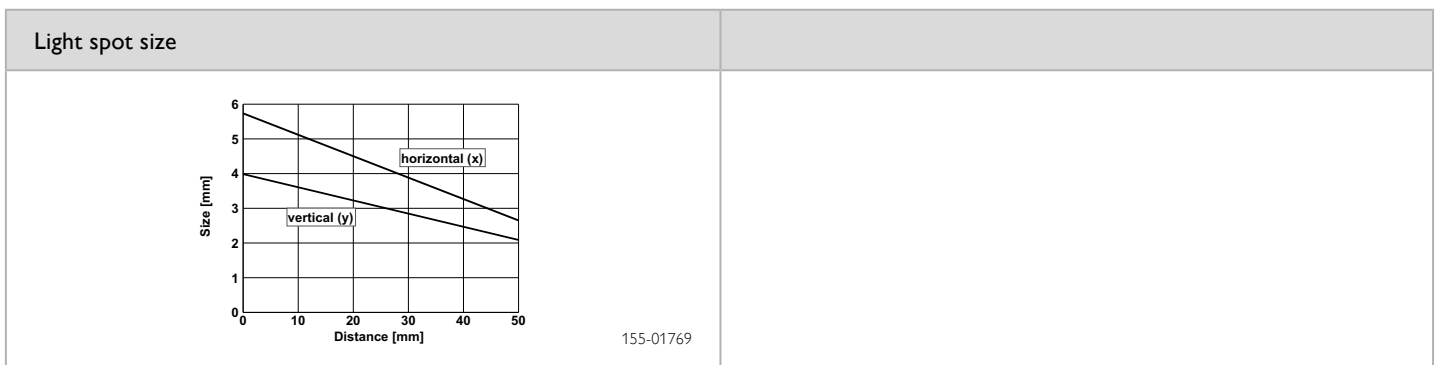
Scanning distance	Switching output	Type of connection	Part number	Article number
1 … 15 mm[1]	PNP	Cable, 2 m, 4-wire	FT 10-RF1-PS-K4	600-11008
1 … 15 mm[1]	NPN	Cable, 2 m, 4-wire	FT 10-RF1-NS-K4	600-11011
1 … 30 mm[1]	PNP	Cable, 2 m, 4-wire	FT 10-RF2-PS-K4	600-11014
1 … 30 mm[1]	NPN	Cable, 2 m, 4-wire	FT 10-RF2-NS-K4	600-11017
1 … 50 mm[1]	PNP	Cable, 2 m, 4-wire	FT 10-RF3-PS-K4	600-11020
1 … 50 mm[1]	NPN	Cable, 2 m, 4-wire	FT 10-RF3-NS-K4	600-11023
1 … 15 mm[1]	PNP	Pigtail, 200 mm with M8 plug, 4-pin	FT 10-RF1-PS-KM4	600-11009
1 … 15 mm[1]	NPN	Pigtail, 200 mm with M8 plug, 4-pin	FT 10-RF1-NS-KM4	600-11012
1 … 30 mm[1]	PNP	Pigtail, 200 mm with M8 plug, 4-pin	FT 10-RF2-PS-KM4	600-11015
1 … 30 mm[1]	NPN	Pigtail, 200 mm with M8 plug, 4-pin	FT 10-RF2-NS-KM4	600-11018
1 … 50 mm[1]	PNP	Pigtail, 200 mm with M8 plug, 4-pin	FT 10-RF3-PS-KM4	600-11021
1 … 50 mm[1]	NPN	Pigtail, 200 mm with M8 plug, 4-pin	FT 10-RF3-NS-KM4	600-11024
1 … 15 mm[1]	PNP	Pigtail, 200 mm with M8 plug, 3-pin	FT 10-RF1-PS-KM3	600-11010
1 … 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
1 … 30 mm[1]	PNP	Pigtail, 200 mm with M8 plug, 3-pin	FT 10-RF2-PS-KM3	600-11016
1 … 30 mm[1]	NPN	Pigtail, 200 mm with M8 plug, 3-pin	FT 10-RF2-NS-KM3	600-11019
1 … 50 mm[1]	PNP	Pigtail, 200 mm with M8 plug, 3-pin	FT 10-RF3-PS-KM3	600-11022
1 … 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	Detection range			Accessories	
	FT 10-RF1	FT 10-RF2	FT 10-RF3	Connection cables	From Page A-32
white (90 %)	1 … 15 mm	1 … 30 mm	1 … 50 mm	Brackets	From Page A-4
grey (18 %)	3 … 15 mm	4 … 30 mm	1 … 50 mm		
black (6 %)	4 … 15 mm	4 … 30 mm	1 … 50 mm		

FT 10-BF Bluelight

Bluelight photoelectric proxmity sensor with background suppression, fixed focus
(available from Q4/2013)

CE
IP 67
ECOLAB

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
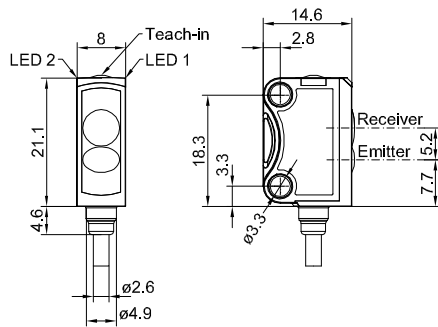- Simple mounting and adjustment through innovative dovetail clamp mounting

Optical data		Functions	
Scanning distance	1 … 30 mm[1]	Indicator LED, green	Operating voltage indicator
Optimum scanning distance	15 … 20 mm	Indicator LED, yellow	Switching output indicator
Used light	LED, blue	Adjustment possibilities	N.O. / N.C. via control input[3]
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[3]
No-load supply current I_0	≤ 30 mA	Enclosure rating	IP 67[4]
Output current le	≤ 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 … +40 °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 designg   [4] with connected IP 67 plug

Scanning distance	Switching output	Type of connection	Part number	Article number
1 … 30 mm[1]	PNP	Cable, 2 m, 4-wire	FT 10-BF2-PS-K4	600-11026
1 … 30 mm[1]	NPN	Cable, 2 m, 4-wire	FT 10-BF2-NS-K4	600-11029
1 … 30 mm[1]	PNP	Pigtail, 200 mm with M8 plug, 4-pin	FT 10-BF2-PS-KM4	600-11027
1 … 30 mm[1]	NPN	Pigtail, 200 mm with M8 plug, 4-pin	FT 10-BF2-NS-KM4	600-11030
1 … 30 mm[1]	PNP	Pigtail, 200 mm with M8 plug, 3-pin	FT 10-BF2-PS-KM3	600-11028
1 … 30 mm[1]	NPN	Pigtail, 200 mm with M8 plug, 3-pin	FT 10-BF2-NS-KM3	600-11031

Including dovetail clamp mounting MBD F 10 for all types

Version: 10/2013. Subject to changes; diagrams similar

Cable connection

Teach-in

LED 2 — LED 1

8

21.1

4.6

14.6
2.8

18.3
3.3

ø3.3

Receiver
Emitter

5.2

7.7

ø2.6
ø4.9

153-01110

Connection, 4-pin

+U_B 1 BN   NPN

+

IN   2 WH

Q   4 BK   PNP

-U_B 3 BU

154-00312

Connection, 3-pin

+U_B 1 BN   NPN

+

Q   4 BK   PNP

-U_B 3 BU

-

154-00311

8

Light spot size

horizontal (x)

vertical (y)

Size [mm]

Distance [mm]
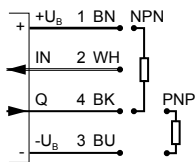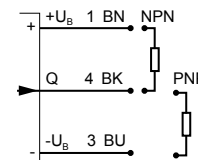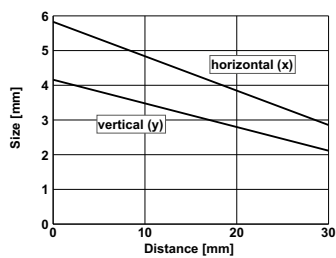
155-01768

Accessories

Connection cables	From Page A-32
Brackets	From Page A-4

FR 10-RL

Laser retroreflective photoelectric sensor

CE
IP 67
ECOLAB

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
Laser Class (DIN EN 60825-1:2008-5)	1		Mode 2: during standing process
		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 × 14.6 × 8 mm[3]
No-load current, I_0	≤ 12 mA	Enclosure rating	IP 67[3]
Output current, le	≤ 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

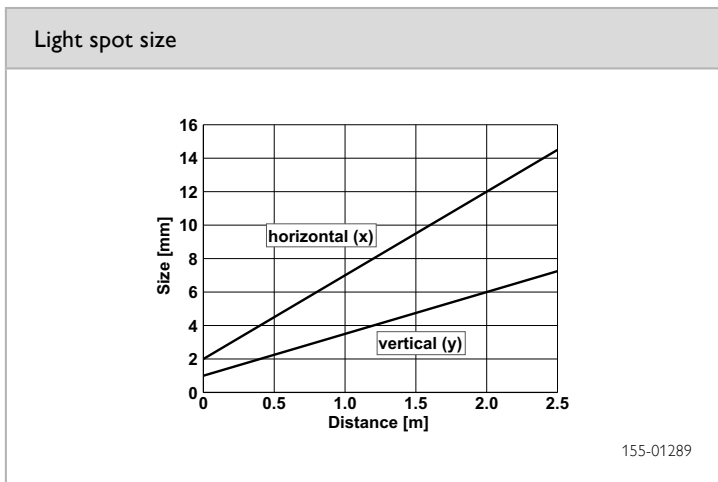Including dovetail clamp mounting MBD F 10 for all types

Version: 10/2013. Subject to changes; diagrams similar

Plug connection

14.6
2.8
8
Teach-in
LED 2
LED 1
21.1
18.3
3.3
5.7
M5x0.5
ø3.3
Receiver
Emitter
5.5
8

153-00894

Cable connection

14.6
2.8
8
Teach-in
LED 2
LED 1
21.1
18.3
3.3
4.6
ø3.3
ø2.6
ø4.9
Receiver
Emitter
5.5
8

153-00895

Connection, 4-pin

+U$_B$ 1 BN NPN
+
IN 2 WH
Q 4 BK PNP
-U$_B$ 3 BU

154-00508

Connection, 3-pin

+U$_B$ 1 BN NPN
+
Q 4 BK PNP
-U$_B$ 3 BU
-

154-00509

Light spot size

Size [mm]
horizontal (x)
vertical (y)
Distance [m]

155-01289

Reflector / reflective foil *	Operating range	Accessories	
R5/L	0.1 … 2 m	Reflectors	From Page A-16
R2-2LB	0.1 … 2 m	Connection cables	From Page A-32
RF-50 KL*	0.06 … 0.75 m	Brackets	From Page A-4
RF-100-KL*	0.1 … 2 m		

8

FR 10-R

Retroreflective photoelectric sensor (available from Q4/2013)

CE
IP 67
ECOLAB

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
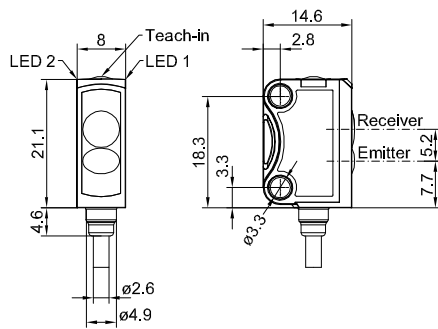- Simple mounting and adjustment through innovative dovetail clamp mounting

Optical data			Functions		
Scanning distance	0.1 … 1.6 m[1]		Indicator LED green		Operating voltage indicator
Used light	LED, red		Indicator LED yellow		Switching output indicator
Light spot size	See diagram		Sensitivity adjustment		Via Teach-in button and control input[3]
			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[3]
No-load current, I_0	≤ 30 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)	≤ 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

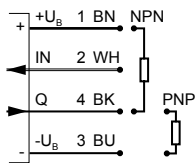| Operating range	Switching output	Type of connection	Part number	Article number-Nr.
0.1 … 1.6 m[1]	PNP	Cable, 2 m, 4-wire	FR 10-R-PS-K4	603-11001
0.1 … 1.6 m[1]	NPN	Cable, 2 m, 4-wire	FR 10-R-NS-K4	603-11004
0.1 … 1.6 m[1]	PNP	Pigtail, 200 mm with M8 plug, 4-pin	FR 10-R-PS-KM4	603-11002
0.1 … 1.6 m[1]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

Version: 10/2013. Subject to changes; diagrams similar

Cable connection

153-01110

Connection, 4-pin

+U$_B$	1 BN	NPN
IN	2 WH	
Q	4 BK	PNP
-U$_B$	3 BU	

154-00312

Connection, 3-pin

+U$_B$	1 BN	NPN
Q	4 BK	PNP
-U$_B$	3 BU	
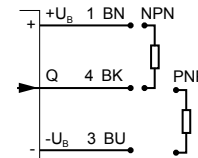
154-00311

Light spot size
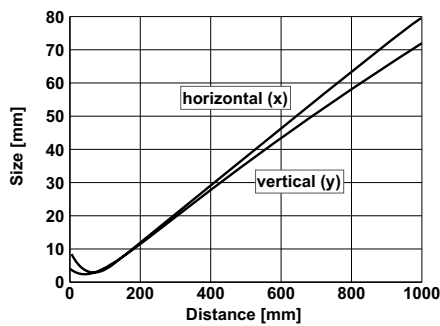
155-01767

Reflector / reflective foil *	Operating range	Accessories	
R5	0.1 … 1.6 m	Connection cables	From Page A-32
R1	0.1 … 1 m	Brackets	From Page A-4

8

FS/FE 10-RL

Laser through-beam photoelectric sensor
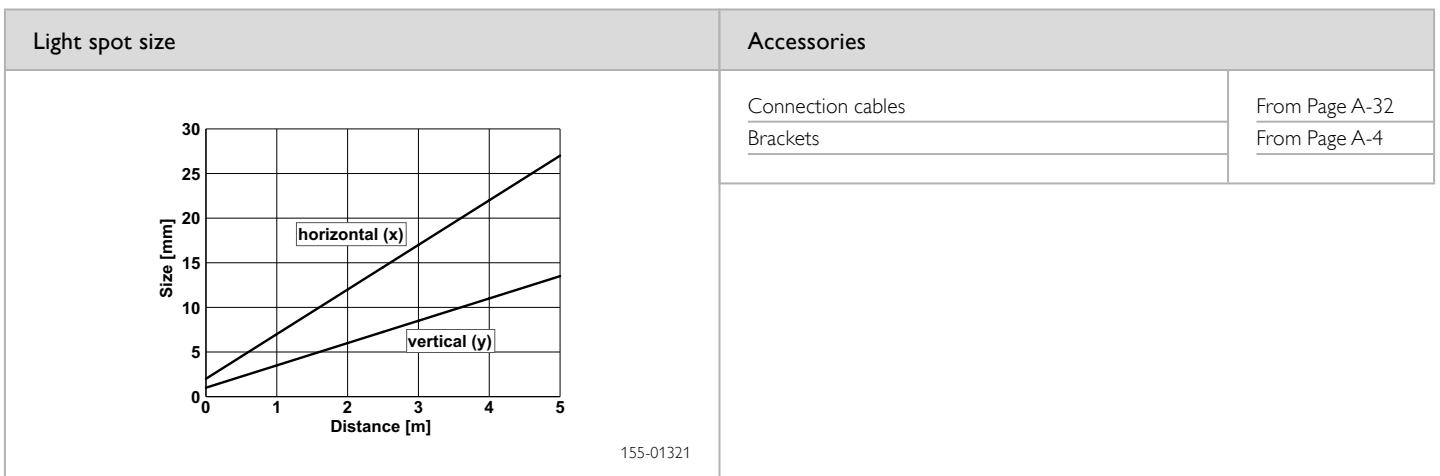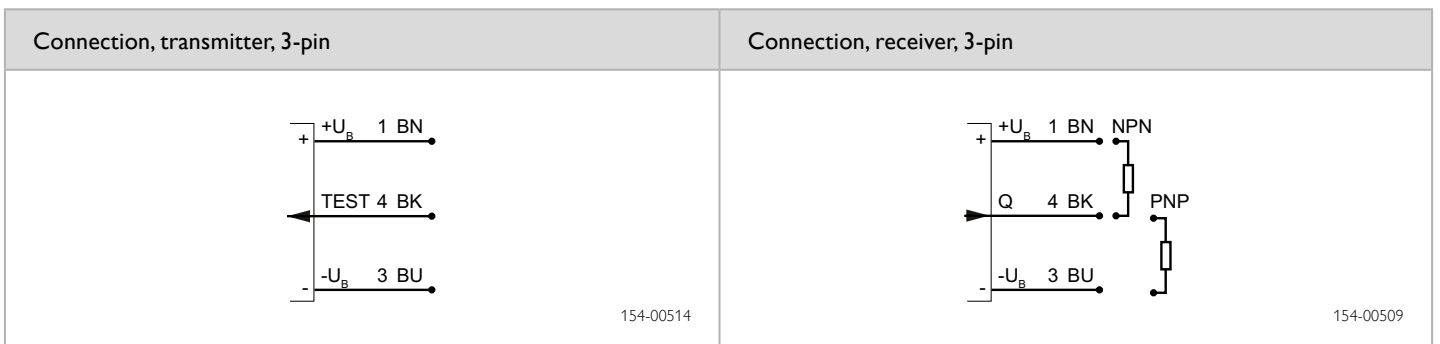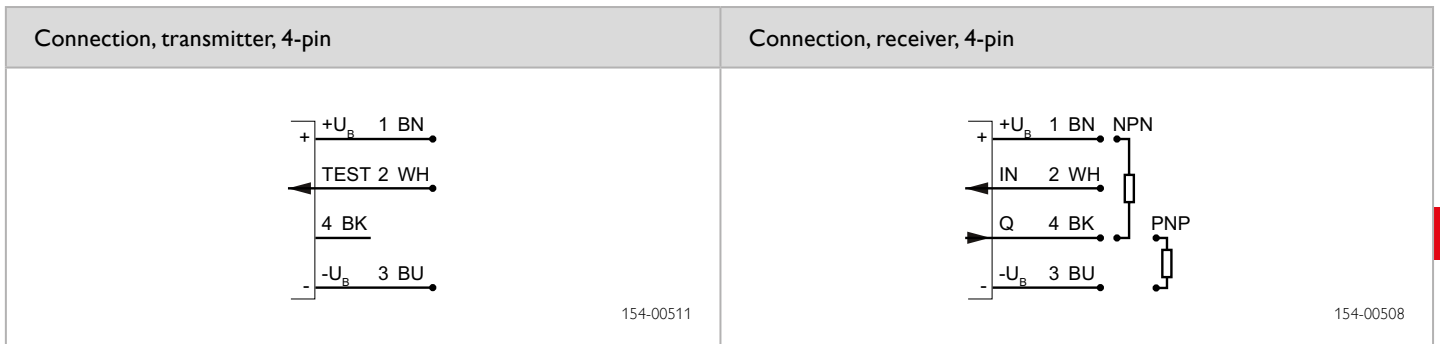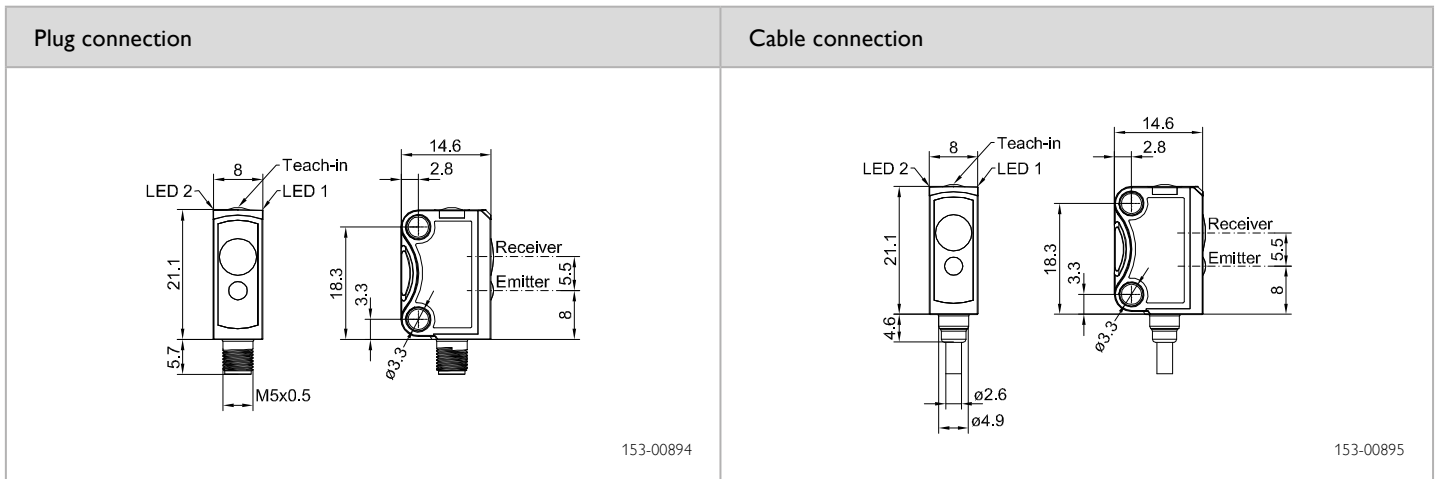

CE

IP 67

ECOLAB

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, le	≤ 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)	≤ 4000 Hz
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 × 14.6 × 8 mm³
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, M5×0.5, 4-pin	FS/FE 10-RL-PS-E4	Sensor pair (transmitter & receiver)	611-51000
1 … 3 m	NPN	Plug, M5×0.5, 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: 10/2013. Subject to changes; diagrams similar

Plug connection

153-00894

Cable connection

153-00895

Connection, transmitter, 4-pin

+U_B   1 BN

TEST 2 WH

4 BK

-U_B   3 BU

154-00511

Connection, receiver, 4-pin

+U_B   1 BN   NPN

IN   2 WH

Q   4 BK   PNP

-U_B   3 BU

154-00508

Connection, transmitter, 3-pin

+U_B   1 BN

TEST 4 BK

-U_B   3 BU

154-00514

Connection, receiver, 3-pin

+U_B   1 BN   NPN

Q   4 BK   PNP

-U_B   3 BU

154-00509

Light spot size

horizontal (x)

vertical (y)

155-01321

Accessories

Connection cables	From Page A-32
Brackets	From Page A-4

8

FS 10-RL / FE 10-RL

Laser through-beam photoelectric sensor

CE
IP 67
ECOLAB

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)	≤ 4000 Hz
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 mm³
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

Including dovetail clamp mounting MBD F 10 for all types

Version: 10/2013. Subject to changes; diagrams similar

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
153-00894	153-00895

Connection, transmitter, 4-pin	Connection, receiver, 4-pin
154-00511	154-00508

Connection, transmitter, 3-pin	Connection, receiver, 3-pin
154-00514	154-00509

Light spot size

Accessories

Connection cables	From Page A-32
Brackets	From Page A-4

155-01321