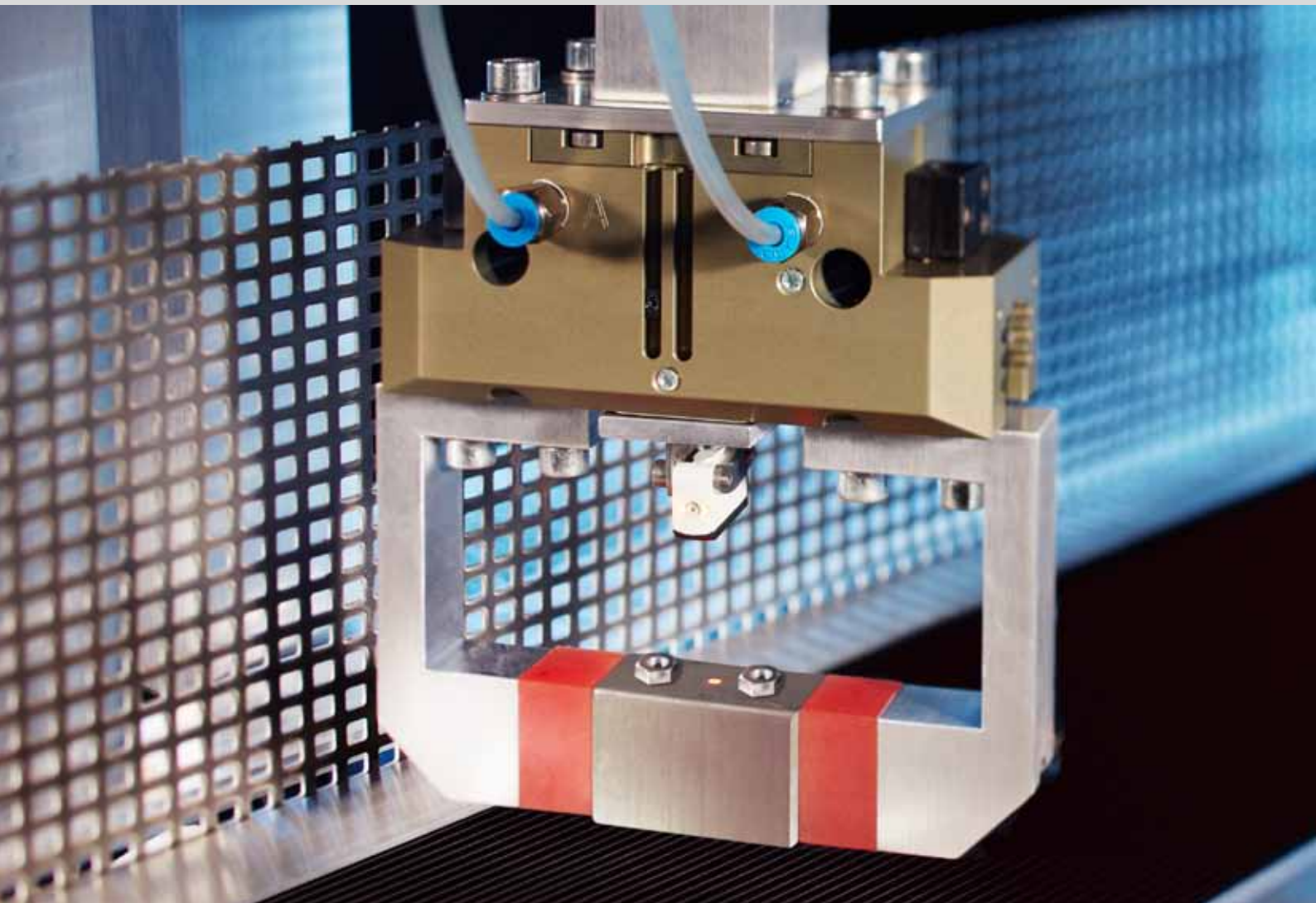# Our smallest

F 10 – fits in every robot arm

Small multi-talent

There's always space for a sensor from the F 10 family

In the robot's arm: Thanks to its miniaturised housing and low weight the sensors of the F 10 series are predestined for use where space is very limited – integrated in a robot arm, for example.

Applications
- Where space is limited
- In handling and assembly systems
- In highly integrated machines
- As an alternative to fibre-optic systems

Typical sectors
- Special machine construction
- Semiconductor and electronics production
- Laboratory automation
- Pharmaceutical industry and medical technology
- Solar industry
- Packaging machines
- Print and paper industry

There is simply no space for conventional sensors in many applications. No problem for the F 10. It fits into almost any space. Whether in handling and positioning applications, during the production of solar cells, or for the placement of semiconductor components – an F 10 is capable of maximum performance even in the most difficult of installation situations. Thus the photo-electric proximity sensor with background suppression – just 21.1 x 14.6 x 8 mm³ in size and weighing only 3 grams – even fits into a robot gripper without being a burden. Its precisely adjustable background suppression allows flexible teach-in for the most varied of applications, and nothing can distract it from the target object. Even bright or highly reflective machine parts in the background have no effect on switching behaviour. F 10 sensors have all the robustness of bigger sensors thanks to their glass-fibre-reinforced plastic housings and tension-resistant cables.

With their small dimensions and powerful features, as well as the great variety of functional principles, the laser and LED sensors of the F 10 series not only open up completely new application potentials, but also represent an alternative to considerably more expensive fibre-optic systems. They are at home wherever high demands must be met in the most restricted of spaces.

Blue light:
The new F 10 Bluelight radiates enhanced process stability, especially for monitoring the presence of solar wafers and strongly light-absorbing objects.

The smart alternative:
Instead of a transmitter and a receiver, as frequently required in a fibre-optic system, the proximity sensors of the F 10 family require no counterpart – and can therefore offer considerably easier and more space-saving mounting.

Installation made easy:
The sensors of the F 10 series can be sunk into a profile to save space. They are thus protected and perfectly integrated in the machine design.

Small housings – great performance

F 10 sensor with bluelight

The F 10 Bluelight sensor originally developed for the solar industry is a true all-rounder.
Thanks to its blue LED emitter, the F 10 Bluelight sensor series guarantees much greater detection reliability in special applications - whether with very dark or transparent objects - as application tests have proved. The F 10 Bluelight series comprises two fixed focus devices which can detect objects between 2 to 30 mm and 2 to 50 mm respectively, with expert precision. Backgrounds are ignored thanks to SensoPart's background suppression technology.

TYPICAL F 10

F 10 Bluelight with extra reliable detection with:

• very dark objects

• transparent objects

• large scanning angles

BlueLight

From production to further processing and final inspection
Missing or non-moulded inserts can often cause costly tool damage.

Optical presence detection of electronic trays
Insufficiently or incorrectly filled trays frequently cause malfunctions and downtimes during production.

Optical presence detection of black plastic tubes
The F 10 series plays a decisive role in the plastics industry when it comes to simple applications involving very dark or transparent objects, or installation in small spaces.

Automation with sensors
SensoPart offers a wide variety of photoelectric and proximity sensors, including special versions such as the F 10 Bluelight with blue LED emitter for the detection of poorly reflective objects, e.g. black injection-moulded parts.

Mastering challenges

The F 10 family cannot be distracted from what matters –
thanks to optimum adjustable background suppression

Polished panelling sheets on machines, blinking warning lamps
on passing vehicles, moving machine parts, sunbeams through a
window: all these are background effects that can make detect-
ing the actual target object considerably more difficult and
represent a challenge for any sensor. Even under these condi-
tions, however, one can rely on the proximity sensors of the
F 10 sub-miniature family with background suppression and the
ASIC technology developed by SensoPart. Because the sensors
only see what they are supposed to see: the object, regardless
of its material, shape and colour – and nothing else!

### Object detection by means of distance measurement

SensoPart proximity sensors with background suppression can
always differentiate between the object and the background,
even in strongly reflective environments. The sensor measures
the distance to object P_1 and to any background P_2 using the
triangulation process and not the object's reflectivity. The signal
P_2' coming from the background is then suppressed.

ON   OFF

± 0.125 mm
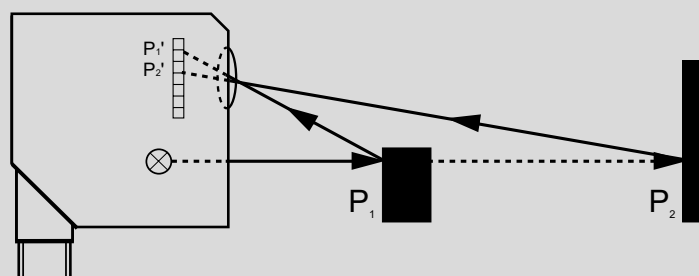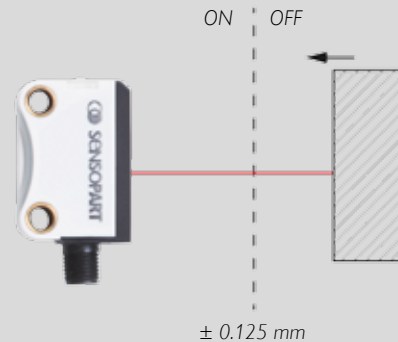
Maximum switching accuracy

The F 10 sensors with background suppression can resolve a change in distance (object shift) of 0.25 mm in the switching point – a standard for maximum positioning accuracy regardless of the object's colour or surface.
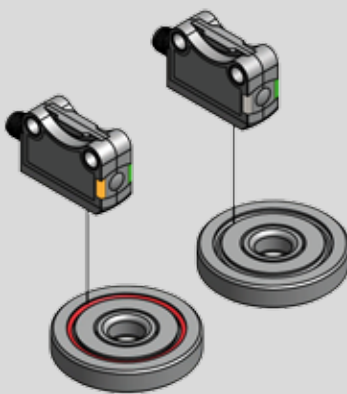
Millimetre accuracy:
The FT 10-RLH even detects height differences of just 1 mm, found for example when monitoring the presence of a sealing washer, without difficulty.

Teach-in

Mini-sensor with maximum user-friendliness:
Simple commissioning with an electronic teach-in button and easily visible status LEDs is far from normal at this size.

Precise detection

Our laser sensors – with their precise, clearly contoured light spots – even detect minute parts reliably. Thus the F 10 series' sub-miniature photoelectric proximity sensor with background suppression easily detects a wire with a diameter of 0.5 mm from a distance of 60 mm.

## Teach-in – greater stability, greater reliability

Despite the small, compact housing of the F 10 family it still offers the user-friendliness of its larger brothers: the entire F 10 series of sensors can be uniformly commissioned via teach-in. In addition, electronic data storage ensures that the switching point does not shift as a result of vibrations or impacts, as can occur when using devices adjusted by potentiometer. Moreover, the sensor can be adjusted and locked from a central control unit – and is therefore absolutely tamperproof.

F 10 – family of sub-miniature sensors

Small housings, great performance
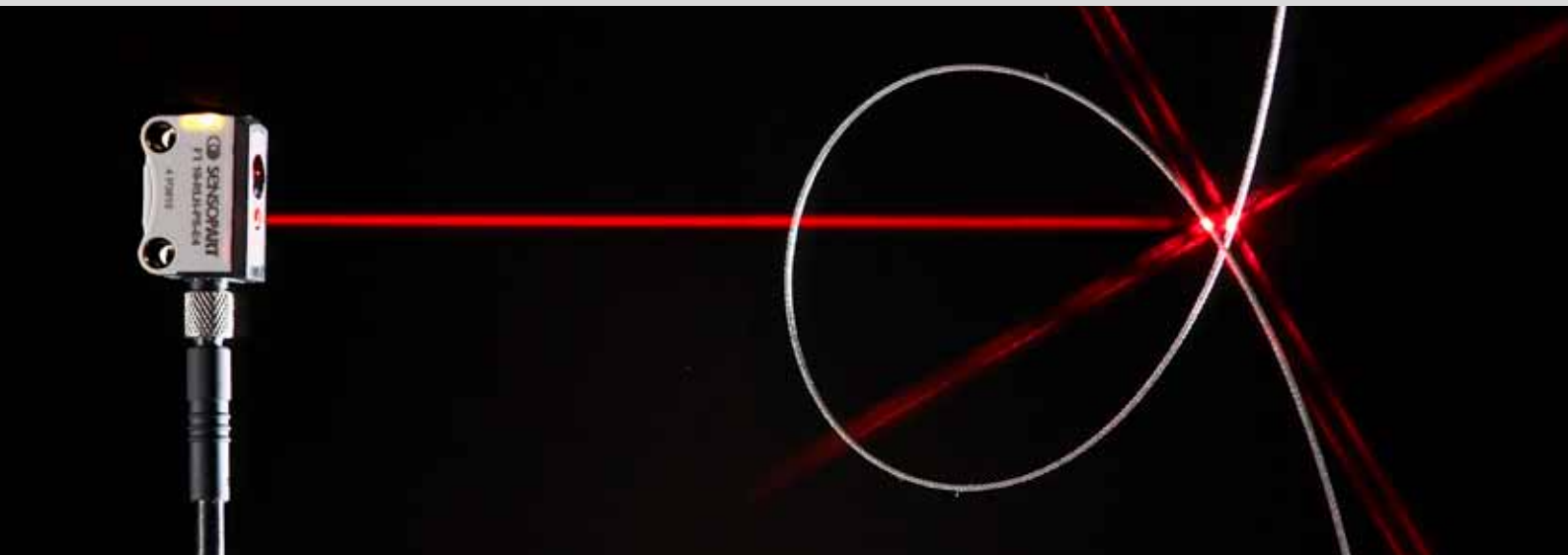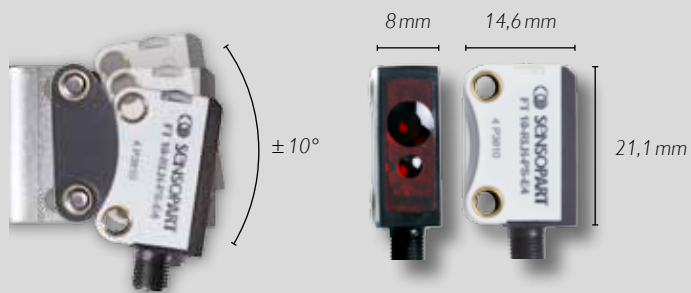
Simple mounting:
Mounting using a dovetail that permits fine retro-adjustment of the sensor is particularly recommended when space is limited.

8 mm   14,6 mm

± 10°   21,1 mm

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.

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	10
FT 10-RLHR	Laser	Teach-in	60 mm	Broad-beam light spot	12
FT 10-B-RLF	Laser	Fixed focus	15 mm/30 mm		14
FT 10-RH	LED	Teach-in	70 mm		16
FT 10-RF	LED	Fixed focus	15 mm/30 mm/50 mm		18
FT 10-BF Bluelight	LED, blue	Fixed focus	30 mm	Blue transmission LED for strongly light-absorbing objects	20
Retroreflective photoelectric sensors					
FR 10-RL	Laser	Teach-in	2 m	Long range, precise small-part detection	22
FR 10-R	LED	Teach-in	1,6 m	Long range	24
Through-beam photoelectric sensors					
FS/FE 10-RL	Laser	Teach-in	3 m	Sensor pair, very accurate object positioning	26
FS 10-RL/FE 10-RL	Laser	Teach-in	3 m	Transmitter/receiver, very accurate object positioning	28

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			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)	1×3 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	$21.1 \times 14.6 \times 8$ 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-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
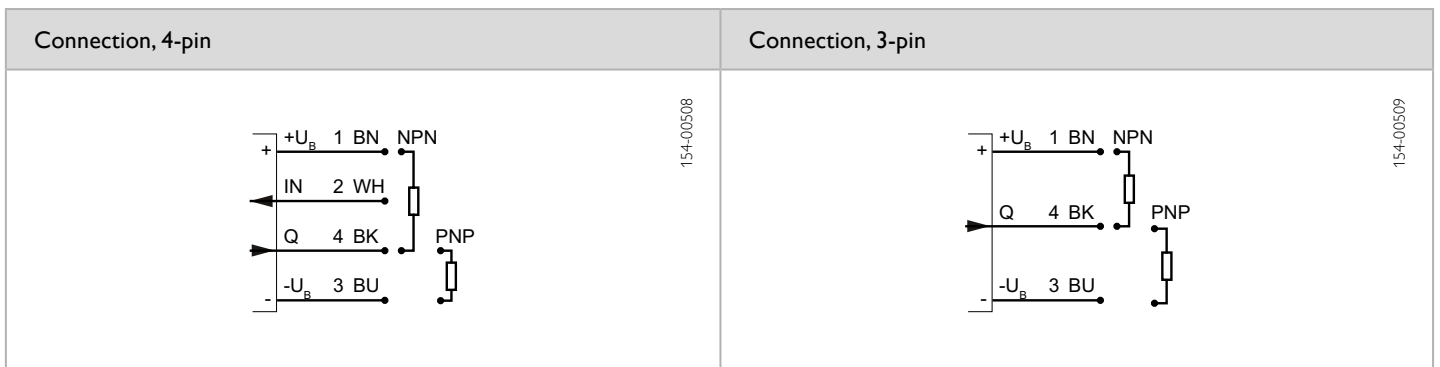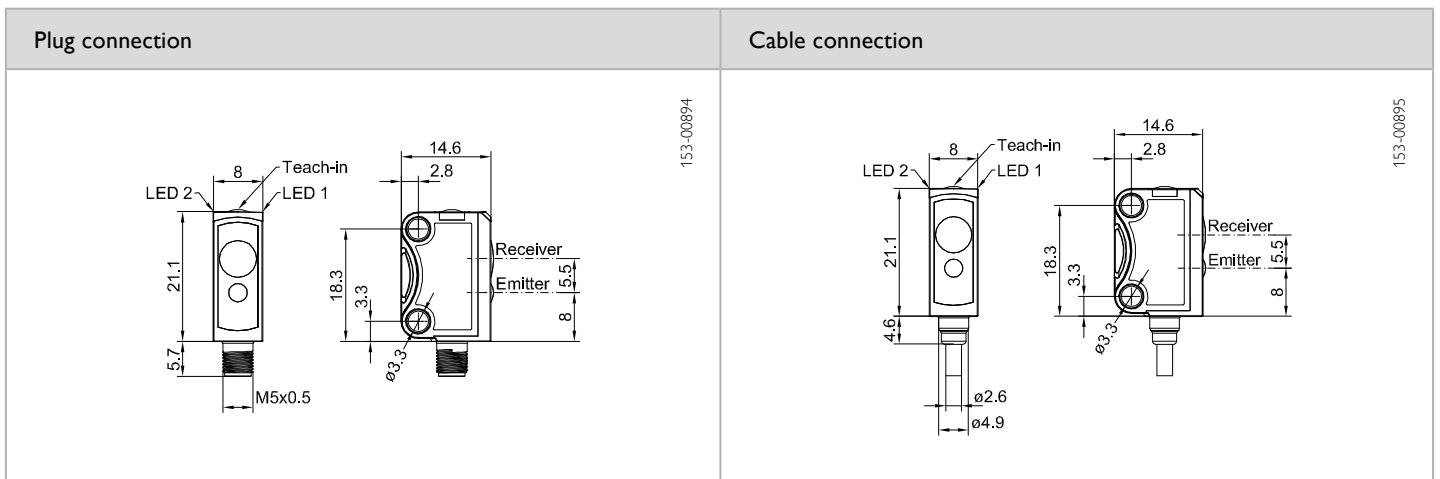
Version: 10/2015. Subject to changes; diagrams similar

Plug connection

153-00894

Cable connection

153-00895

Connection, 4-pin

154-00508

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

Connection, 3-pin

154-00509

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

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

Accessories	
Connection cables	From page 30
Brackets	

FT 10-RLHR

Laser photoelectric proximity sensor with background suppression

CE

IP 67

ECOLAB

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	
Scanning distance	6 … 60 mm[1]
Adjustment range	10 … 60 mm[1]
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
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 x 14.6 x 8 mm
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

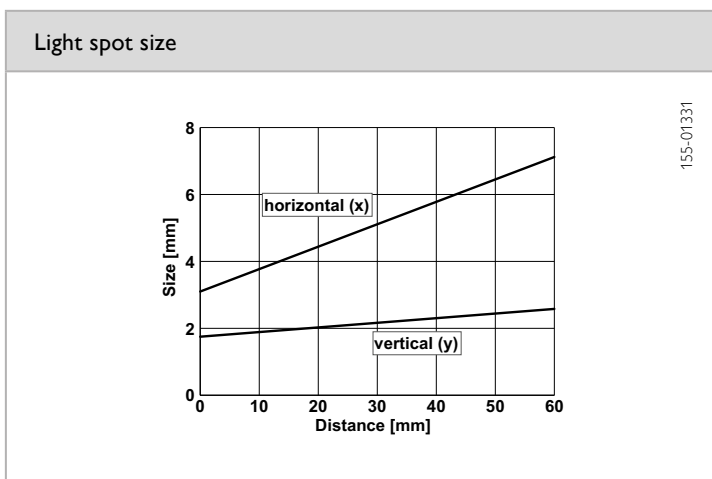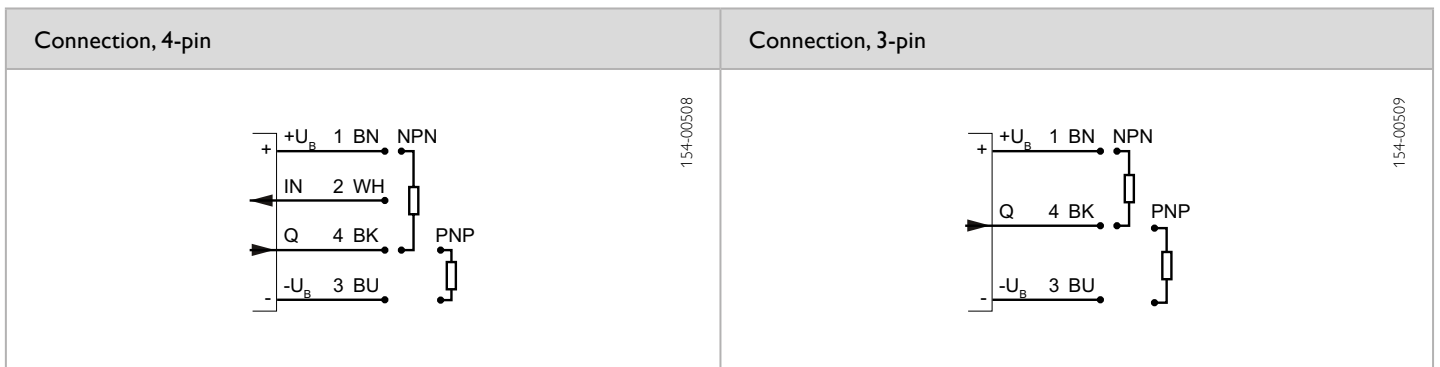[1] Reference material white, 90 % reflectivity   [2] Max. 10 % ripple, within U_B, ~ 50 Hz / 100 Hz   [3] With connected IP 67 plug

Scanning distance	Switching output	Type of connection	Part number	Article number
6 … 60 mm	PNP	Plug, M5x0.5, 4-pin	FT 10-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
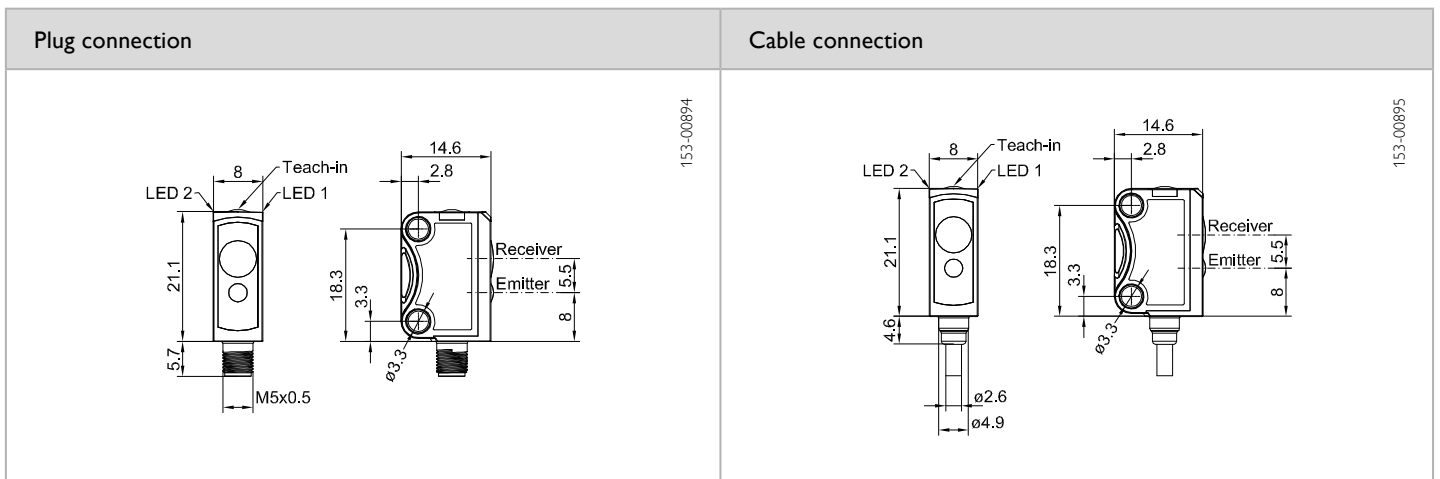
Version: 10/2015. Subject to changes; diagrams similar

Plug connection

Teach-in
LED 2
LED 1
8
21.1
5.7
M5x0.5

14.6
2.8
18.3
3.3
ø3.3
Receiver
Emitter
5.5
8

153-00894

Cable connection

Teach-in
LED 2
LED 1
8
21.1
4.6
ø2.6
ø4.9

14.6
2.8
18.3
3.3
ø3.3
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

155-01331

Size [mm] vs Distance [mm]

horizontal (x)

vertical (y)

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

Accessories

Connection cables	From page 30
Brackets	

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
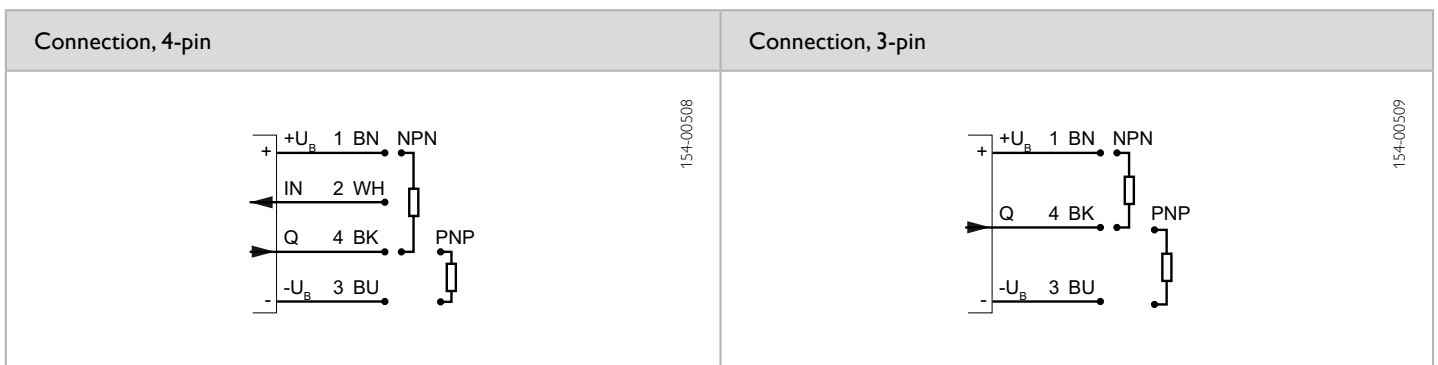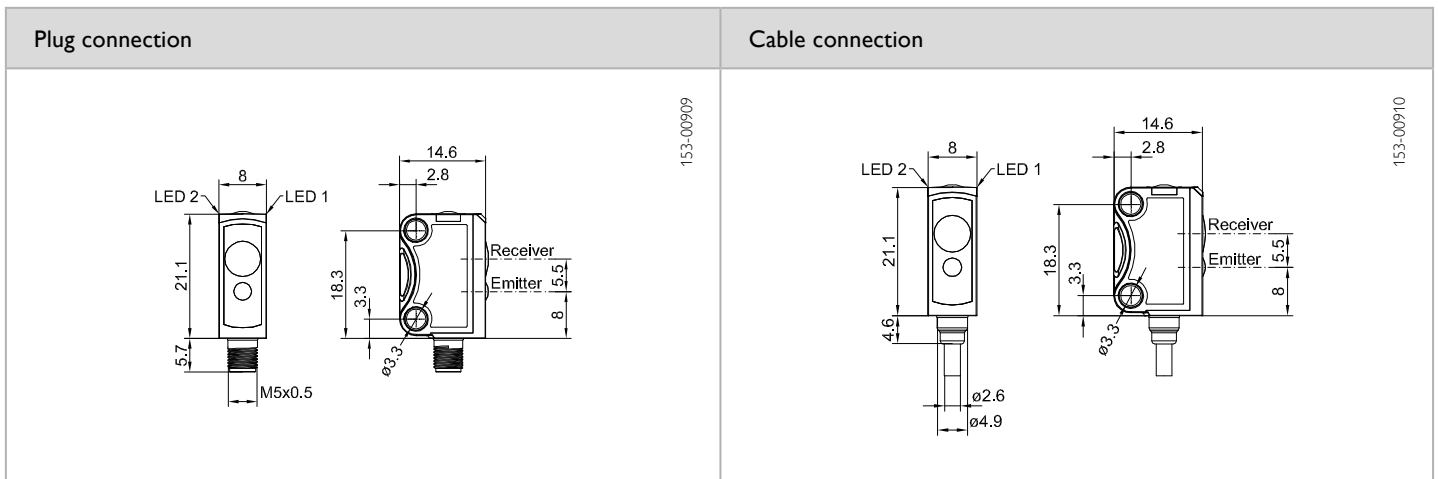- Robust, glass-fibre-reinforced plastic housings

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	$21.1 \times 14.6 \times 8$ mm
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: 10/2015. 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	Cable connection

153-00909

153-00910

Connection, 4-pin	Connection, 3-pin

154-00508

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 30
Brackets	

FT 10-RH

Photoelectric proxmity sensor with background suppression

CE
IP 67
ECOLAB

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, 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

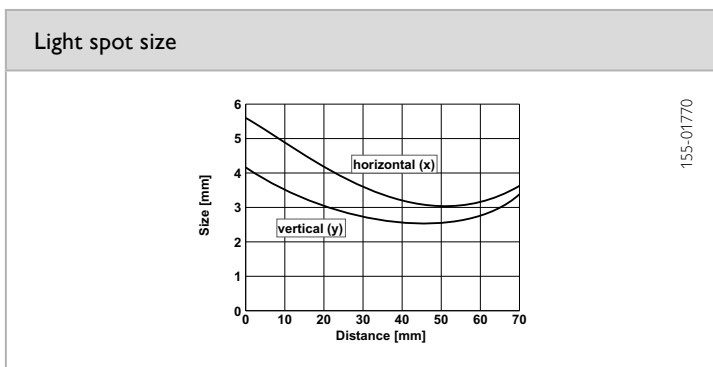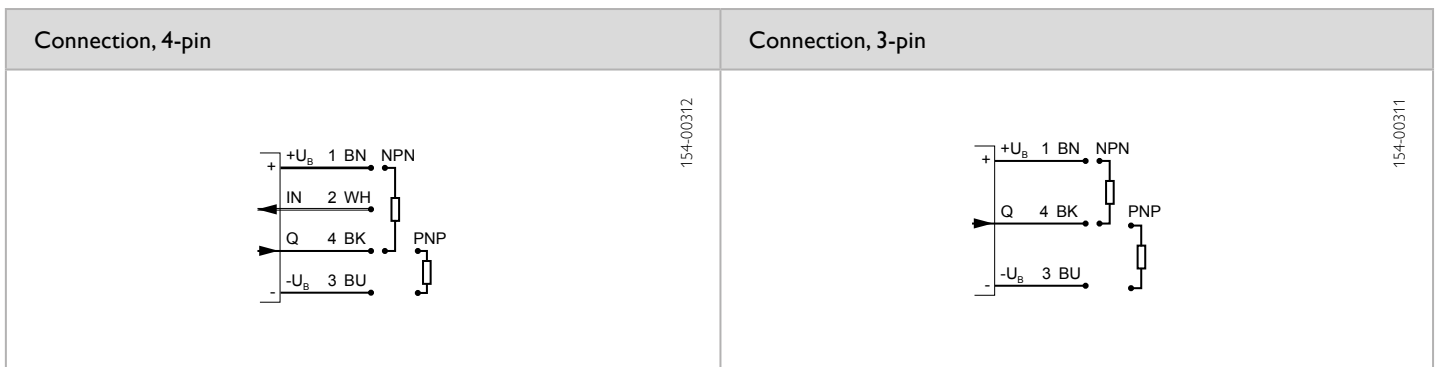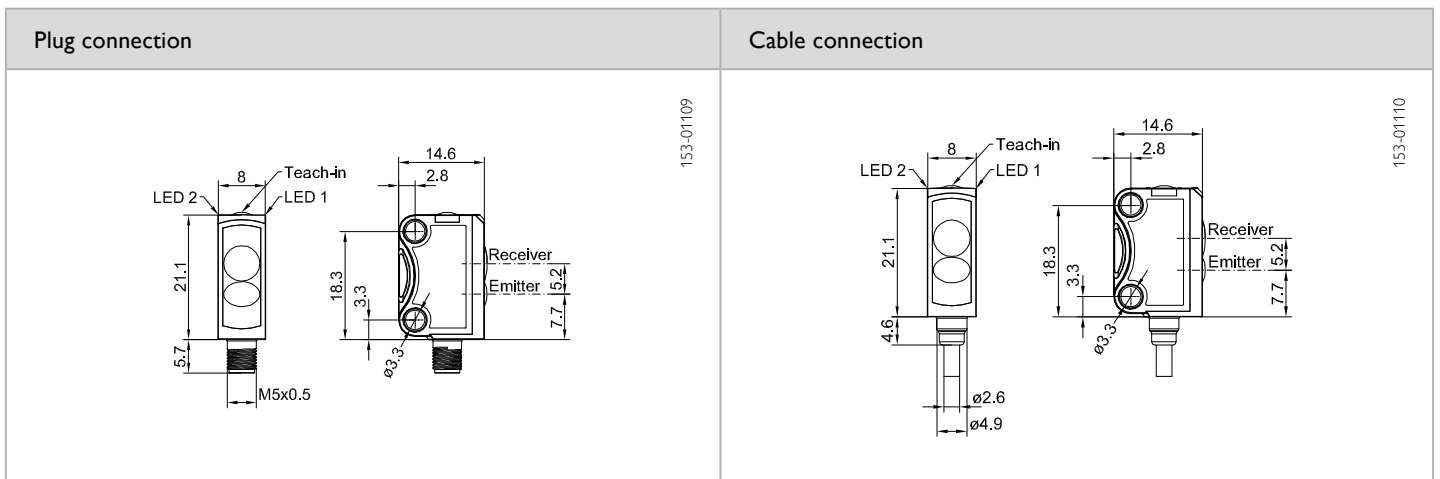|	
Dimensions	21,1 x 14,6 x 8 mm
Enclosure rating	IP 67[6]
Material, housing	PUR
Material, front screen	PMMA
Type of connection	See Selection Table
Ambient temperature: operation	-20 … +60 °C
Ambient temperature: storage	-20 … +80 °C
Weight (plug device)	approx. 3 g
Weight (cable device)	approx. 22 g
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: 10/2015. Subject to changes; diagrams similar

Plug connection

153-01109

Cable connection

153-01110

Connection, 4-pin

154-00312

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

Connection, 3-pin

154-00311

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

Light spot size

155-01770

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

Accessories

Connection cables	From page 30
Brackets	

FT 10-RF

Photoelectric proxmity sensor with background suppression, fixed focus

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

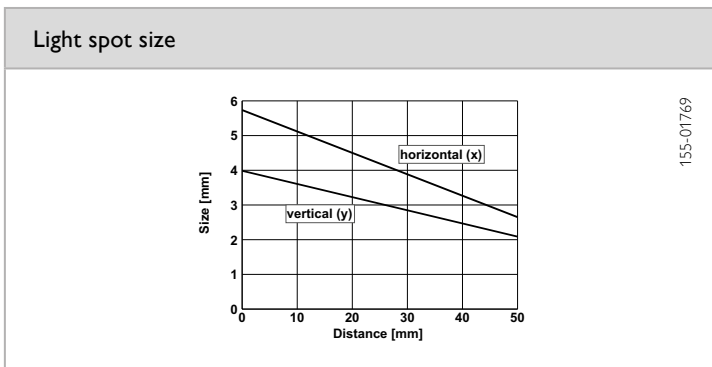| Optical data			Functions		
Scanning distance	2 … 15 mm[1]		Indicator LED, green		Operating voltage indicator
	2 … 30 mm[1]		Indicator LED, yellow		Switching output indicator
	2 … 50 mm[1]		Adjustment possibilities		N.O. / N.C. via control input[3]
Used light	LED, red, 650 nm				
Light spot size	See 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 current, I_0	≤ 20 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 … +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 = 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: 10/2015. 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
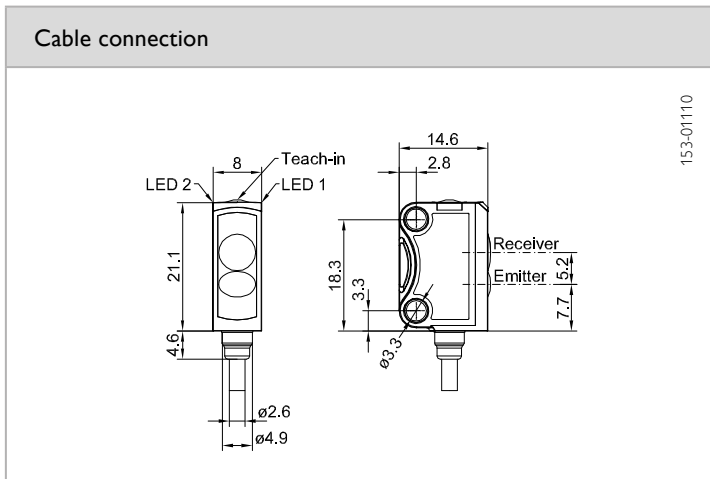
Connection, 4-pin

154-00312

Connection, 3-pin

154-00311

Light spot size

155-01769

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

FT 10-BF

Bluelight photoelectric proxmity sensor with background suppression, fixed focus

CE

IP 67

ECOLAB

BlueLight

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	
Scanning distance	2 … 30 mm[1] / 2 … 50 mm[1]
Optimum scanning distance	15 … 20 mm
Used light	LED, blue, 450 nm
LED risk group (DIN 62471)	2
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 supply current I_0	≤ 20 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 (see Selection Table)
Output function	N.O. /N.C.
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.

Mechanical data	
Dimensions	21,1 x 14,6 x 8 mm
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. 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

Version: 10/2015. Subject to changes; diagrams similar

Cable connection

153-01110

LED 2 — Teach-in — LED 1

8 · 21.1 · 4.6 · ø2.6 · ø4.9

14.6 · 2.8 · 18.3 · 3.3 · ø3.3 · Receiver · Emitter · 5.2 · 7.7

Connection, 4-pin

154-00312

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

Connection, 3-pin

154-00311

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

Light spot size

155-01769

horizontal (x)

vertical (y)

Size [mm] / Distance [mm]
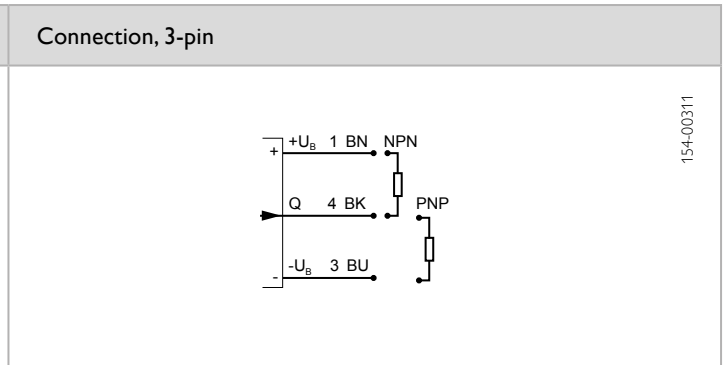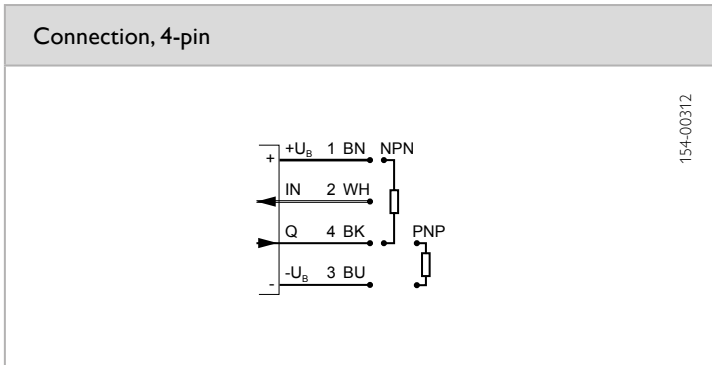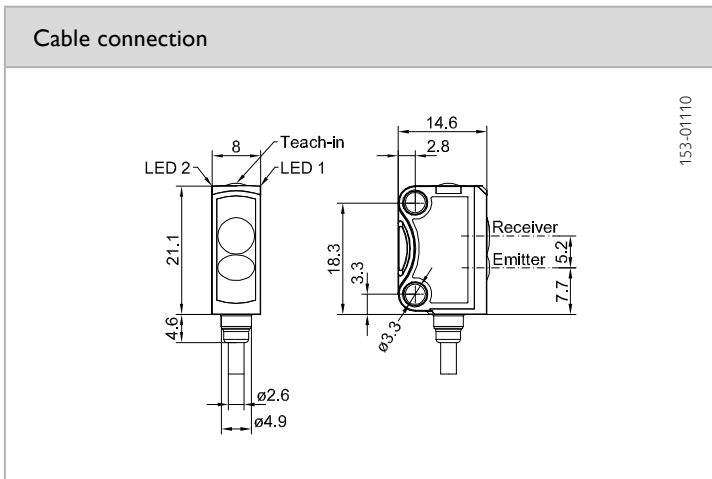
Accessories

| Connection cables | From page 30 |
| Brackets | |

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	
Limit range	0.1 … 2.5 m[1]
Operating range	0.1 … 2 m[1]
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	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[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. / N.C.
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 x 14.6 x 8 mm
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: 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: 10/2015. Subject to changes; diagrams similar

Plug connection

153-00894

Cable connection

153-00895

Connection, 4-pin

154-00508

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

Connection, 3-pin

154-00509

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

Light spot size

155-01289
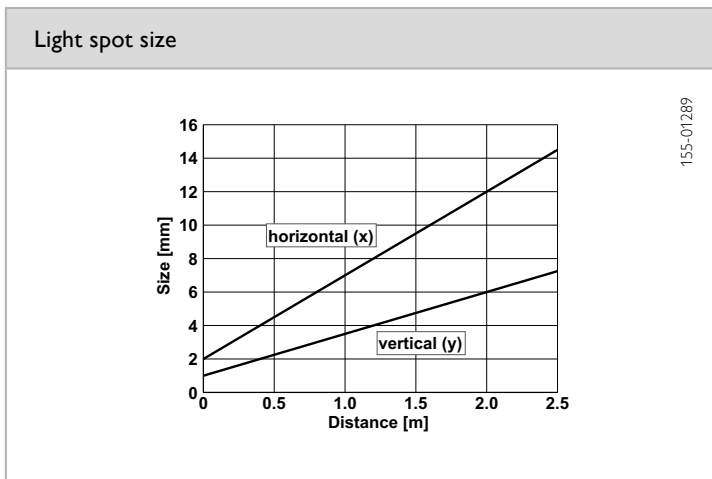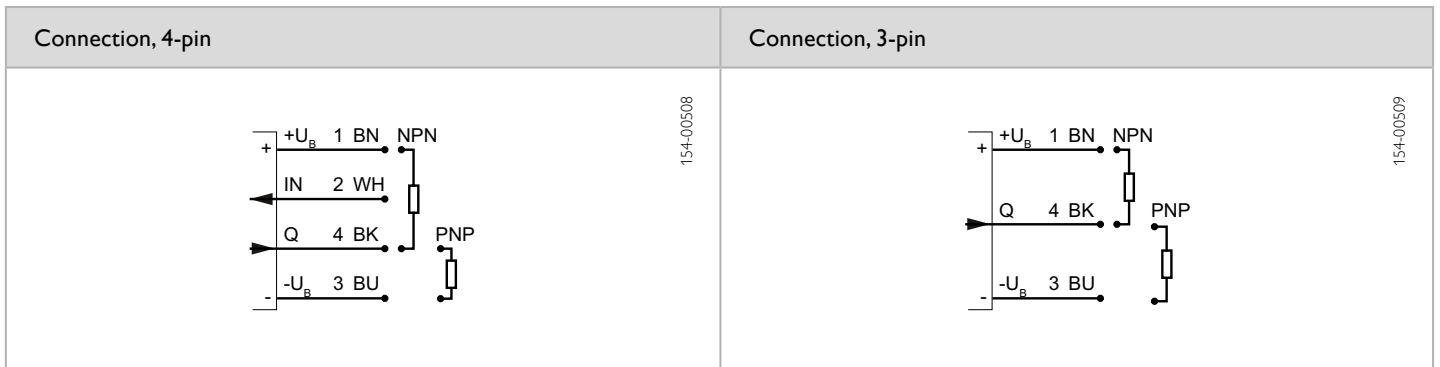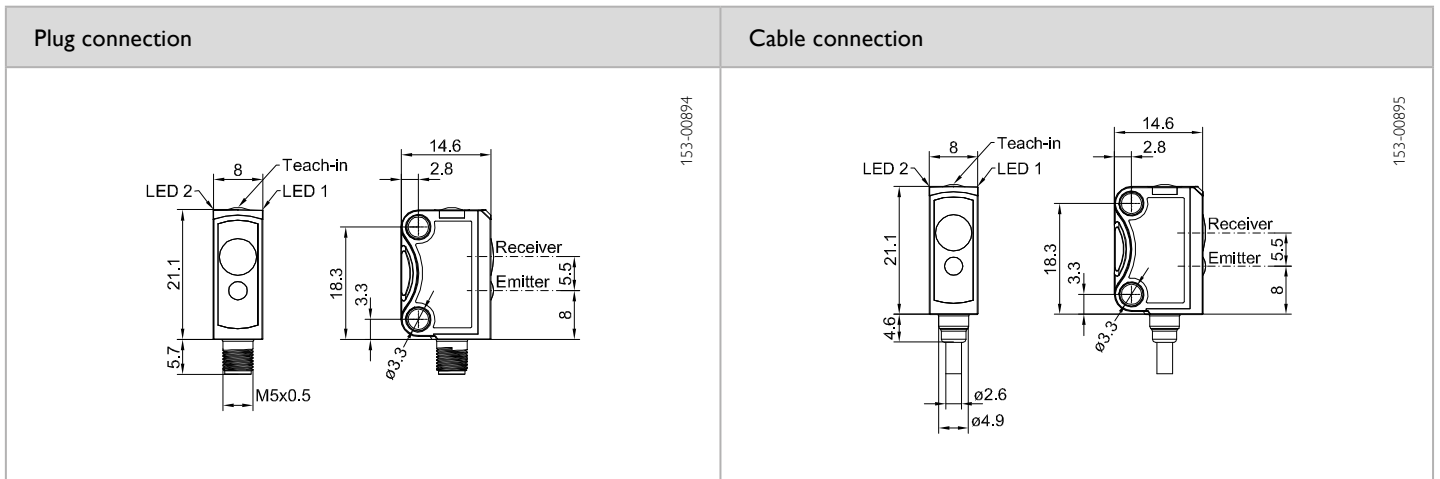
Reflector / Reflective foil*	Operating range	Accessories	
R5/L	0.1 … 2 m	Reflectors	
R2-2LB	0.1 … 2 m	Connection cables	From page 30
R3-2LK	0.1 … 2 m	Brackets	
RF-50 KL*	0.06 … 0.75 m		
RF-100 KL*	0.1 … 2 m		

FR 10-R

Retroreflective photoelectric sensor

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	
Operating range	0.1 … 1.6 m[1]
Used light	LED, red, 650 nm
Light spot size	See diagram
Polarising filter	Yes

Functions	
Indicator LED green	Operating voltage indicator
Indicator LED yellow	Switching output indicator
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	
Operating voltage, $+U_B$	10 … 30 V DC[2]
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 (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]	$+U_B$ = teach-in $-U_B$ = button locked Open = normal operation

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

[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: 10/2015. Subject to changes; diagrams similar

Cable connection

153-01110

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

Connection, 4-pin

154-00312

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

Connection, 3-pin

154-00311

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

Light spot size

155-01767

horizontal (x)

vertical (y)

Size [mm] vs Distance [m]
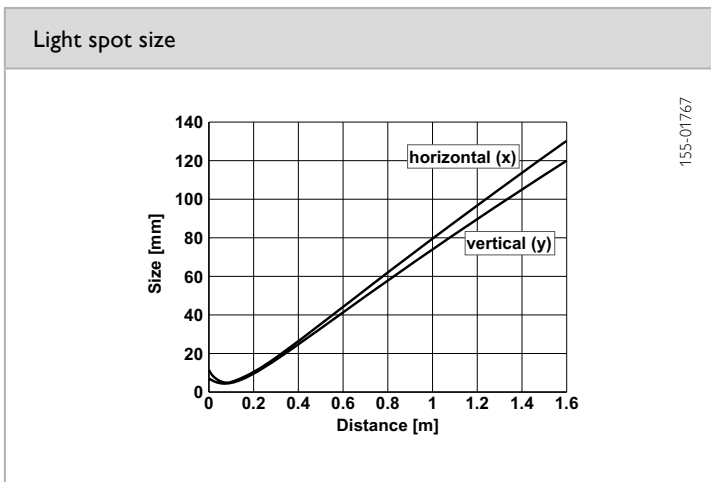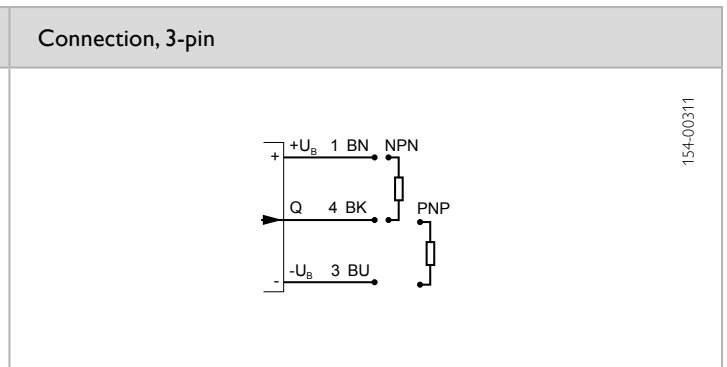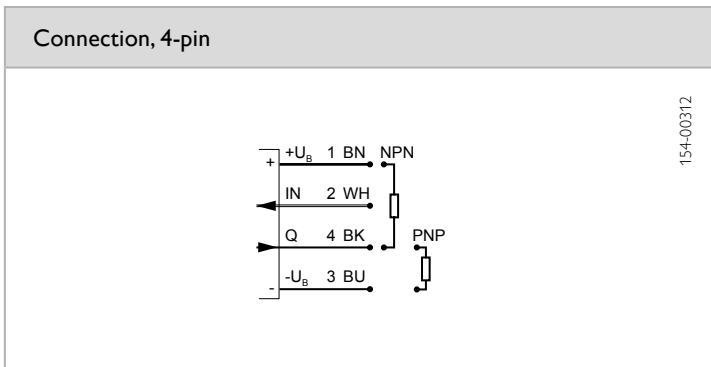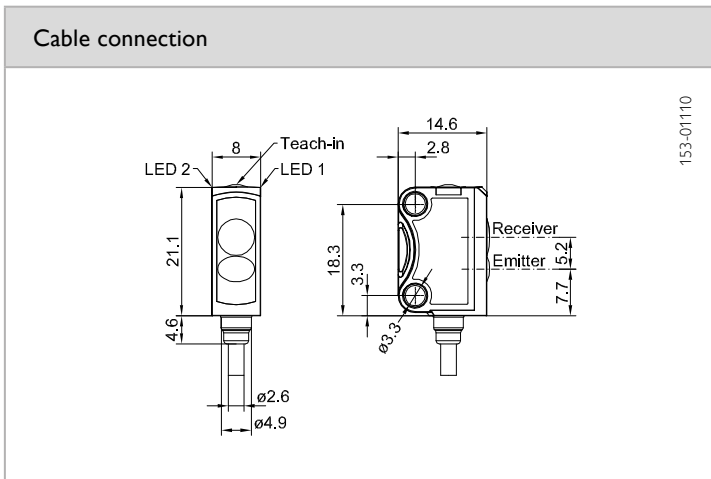
Reflector / Reflective foil*	Operating range (min./max. reflector distance)	Accessories	
R5	0.1 … 1.6 m	Reflectors	
R1	0.1 … 1 m	Brackets	From page 30
R2-2LB1	0,15 … 0,5 m		
R3-2LK1	0,15 … 0,5 m		
RF-100 KL*	0,15 … 1 m		

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 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, 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: 10/2015. Subject to changes; diagrams similar

Plug connection

153-00894

Cable connection

153-00895

Connection, transmitter, 4-pin

154-00511

+U_B   1 BN

TEST 2 WH

4 BK

-U_B   3 BU

Connection, receiver, 4-pin

154-00508

+U_B   1 BN   NPN

IN   2 WH

Q   4 BK   PNP

-U_B   3 BU

Connection, transmitter, 3-pin

154-00514

+U_B   1 BN

TEST 4 BK

-U_B   3 BU

Connection, receiver, 3-pin

154-00509

+U_B   1 BN   NPN

Q   4 BK   PNP

-U_B   3 BU

Light spot size

155-01321

horizontal (x)

vertical (y)

Accessories

| Connection cables | From page 30 |
| Brackets | |

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)	≤ 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

Version: 10/2015. 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
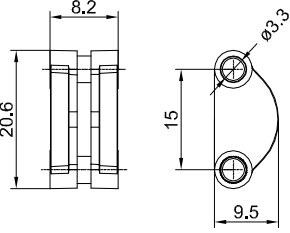
Plug connection

153-00894

Cable connection

153-00895
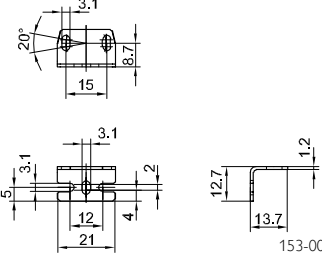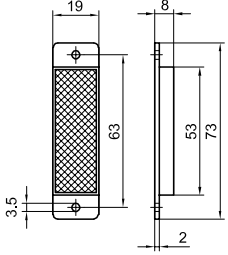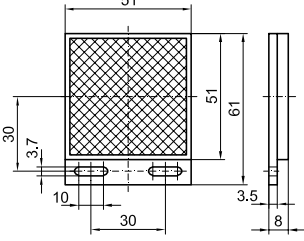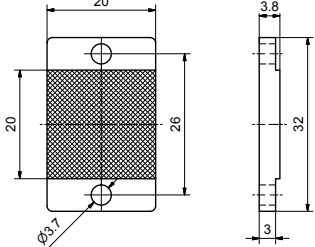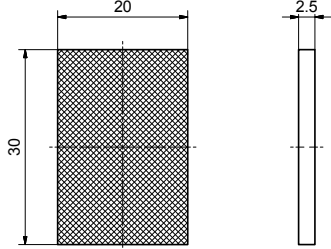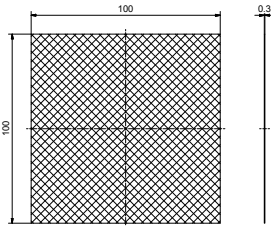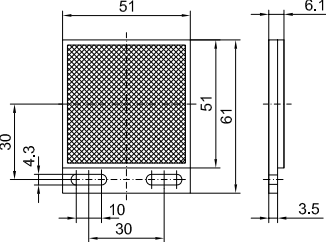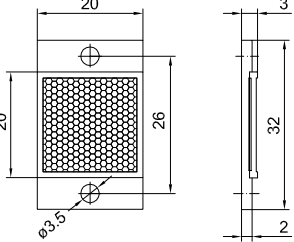
Connection, transmitter, 4-pin

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 30
Brackets	

Accessories

Brackets

Brackets

		Part number / Article number	MBD F10 / 660-01001
		Description	Dovetail clamp mounting, adjustable ± 10°, with screws Material: PBT
	153-00899	Suitable for	F 10

		Part number / Article number	MS F 10 / 660-01000
		Description	Mounting bracket with screws 1× mounting plate M3 1× mounting plate ø 3.1 mm Material: stainless steel V2A
	153-00907	Suitable for	F 10

Reflectors for retroreflective photoelectric sensor

		Part number / Article number	R1 / 904-51532
		Description	Reflector in housing
		Dimensions	19 x 73 x 8 mm³
		Mounting	2 mounting holes M3
		Temperature range	-20 … +60 °C
	153-00068	Suitable for	Retroreflective photoelectric sensor (LED)

		Part number / Article number	R5 / 904-51533
		Description	Reflector in housing
		Dimensions	51 x 61 x 8 mm³
		Mounting	2 mounting holes
		Temperature range	-20 … +60 °C
	153-00069	Suitable for	Retroreflective photoelectric sensor (LED)

		Part number / Article number	R2-2LB1 / 904-51595
		Description	Reflector in housing, with very fine structure
		Dimensions	20 x 32 x 3.8 mm³
		Mounting	2 mounting holes
		Temperature range	-20 … +60 °C
	153-001046	Suitable for	Retroreflective photoelectric sensor (LED)

		Part number / Article number	R3-2LK1 / 904-51596
		Description	Reflector in housing with very fine structure
		Dimensions	20 x 30 x 2.5 mm³
		Mounting	Self-adhesive
		Temperature range	-20 … +60 °C
	153-01047	Suitable for	Retroreflective photoelectric sensor (LED)

Version: 10/2015. Subject to changes; diagrams similar

Reflectors for retroreflective photoelectric sensor

Part number / Article number	RF-100 KL / 904-51644
Description	Reflective tape 100 × 100 mm, to cut to size
Dimensions	100 × 100 mm^2
Mounting	Self-adhesive
Temperature range	-40 … +70 °C
Suitable for	Retroreflective photoelectric sensor (LED & laser)

153-01125

Part number / Article number	R5/L / 904-51543
Description	Reflector in housing
Dimensions	51 × 61 × 6.1 mm^3
Mounting	2 mounting holes (slots)
Temperature range	-20 … +60 °C
Suitable for	Retroreflective photoelectric sensor (laser)

153-00242

Part number / Article number	R2-2LB / 904-51586
Description	Reflector in housing
Dimensions	20 × 32 × 3 mm^3
Mounting	2 mounting holes
Temperature range	-20 … +60 °C
Suitable for	Retroreflective photoelectric sensor (laser)

153-00773

Connection cables

Part number	Article number	Description
M5, 4-pin		
CN4 FG-2m-PUR	902-51793	2 m, straight, PUR
CN4 FG-5m-PUR	902-51791	5 m, straight, PUR
CN4 FW-2m-PUR	902-51794	2 m, 90°, PUR
CN4 FW-5m-PUR	902-51792	5 m, 90°, PUR
M8, 3-pin		
K3-2m-G-PUR	902-50679	2 m, straight, PUR
K3-5m-G-PUR	902-51614	5 m, straight, PUR, suitable for drag chains
K3-10m-G-PUR	902-50694	10 m, straight, PUR, suitable for drag chains
K3-2m-W-PUR	902-50681	2 m, 90°, PUR, suitable for drag chains
K3-5m-W-PUR	902-51615	5 m, 90°, PUR, suitable for drag chains
K3-2m-W-PL-PUR	902-50683	2 m, 90°, PUR, with indicator LED
K3-5m-W-PL-PUR	902-51616	5 m, 90°, PUR, with indicator LED, suitable for drag chains
K3-10m-W-PL-PUR	902-50693	10 m, 90°, PUR, with indicator LED, suitable for drag chains
M8, 4-pin		
K4-2m-G-PUR	902-50801	2 m, straight, PUR, suitable for drag chains
K4-5m-G-PUR	902-51617	5 m, straight, PUR, suitable for drag chains
K4-10m-G-PUR	902-51610	10 m, straight, PUR, suitable for drag chains
K4-2m-W-PUR	902-50803	2 m, 90°, PUR, suitable for drag chains
K4-5m-W-PUR	902-51618	5 m, 90°, PUR, suitable for drag chains
K4-10m-W-PUR	902-51629	10 m, 90°, PUR, suitable for drag chains
K4-2m-W-PL-PUR	902-51642	2 m, 90°, PUR, with indicator LED
K4-5m-W-PL-PUR	902-51643	5 m, 90°, PUR, with indicator LED

We look ahead

Yesterday, today and in the future

''We gauge ourselves not by what is possible today, but by our vision of what can be achieved'' – this has been our motto since the foundation of SensoPart in 1994. Our goal is to always be a step ahead and to be able to offer our customers the most innovative sensor for industrial automation.

With our easy to integrate VISOR® Vision sensors and our compact laser sensors with an amazing background suppression made in Germany, we stick up to this motto.

Get ready – we still have a lot of ideas for the future.

SENSOR TECHNOLOGY	VISION
Light barriers	Vision sensors
Proximity switches	Smart cameras
Laser sensors	Vision systems
Miniature sensors	Object detection
Distance sensors	Object measurement
Colour sensors	Colour detection
Contrast sensors	Code reading
Anti-collision sensors	Lighting
Slot sensors	Lenses
Fibre-optic amplifiers	
Inductive sensors	
Capacitive sensors	
Ultrasonic sensors	