


F 20 – photoelectric sensors and proximity sensors in miniature housings

The well-proven sensor series



 made in Germany

Of all SensoPart's sensor series, the F 20 is the one with the largest range of variants – so that it contains the right sensor for almost every application. F 20 sensors are therefore found in numerous sectors, for example in the automotive industry, in mechanical engineering, in the electronics and beverages industries, as well as in packaging machines and in the print and paper industries.

The applications of the F 20 series range from positioning tasks to the detection of transparent objects and the smallest of parts: the FR 20-RLO photoelectric proximity sensor reliably detects parts from a size of 0.2 mm. Thanks to its autocollimation principle, it covers the entire range without a blind zone and even “sees” through the smallest drilled holes or apertures.

Not only is the variety offered by the F 20 series impressive, but also its uncompromising industrial suitability. Every sensor is serially equipped with a robust metal plug, well thought-out mounting accessories, and simple adjustment via teach-in or via the control input – because it is often these details that decide on the suitability of a sensor in everyday operation.


TYPICAL F 20

- Largest choice of variants for numerous requirements
- Compact miniature housings for extremely limited mounting conditions
- Detection of transparent objects of any shape
- Most accurate small-part detection throughout the entire range from 0 mm
- Reliable suppression of highly reflective machine parts
- Laser, LED or infrared transmitter options, with teach-in or fixed settings
- User-friendly commissioning via electronic Teach-in button or control line
- Well thought-out mounting accessories for rapid and simple integration
- UL-certification



Compact and robust:

With its miniature housing, the F 20 is suitable for almost all applications. All sensors in this series are equipped with metal plugs so they are very tough and long-lived.

F 20 – Product Overview					
	Type of light	Adjustment	Scanning distance / range	Special features	Page
Photoelectric proximity sensors with background suppression					
FT 20 RLH	Laser 	Teach-in 	60 mm		316
FT 20 RLHD	Laser 	Teach-in 	110 mm	Long scanning distance	318
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FT 20 IH	Infrared	Teach-in 	150 mm		322
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Photoelectric proximity sensors					
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Retroreflective photoelectric sensors					
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FR 20 RLO	Laser 	Teach-in 	4 m	Very accurate object positioning, no blind zone	336
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Through-beam photoelectric sensors					
FS/FE 20 R	LED	Teach-in 	8 m		346
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FT 20 RLH

Laser photoelectric proximity sensor with background suppression



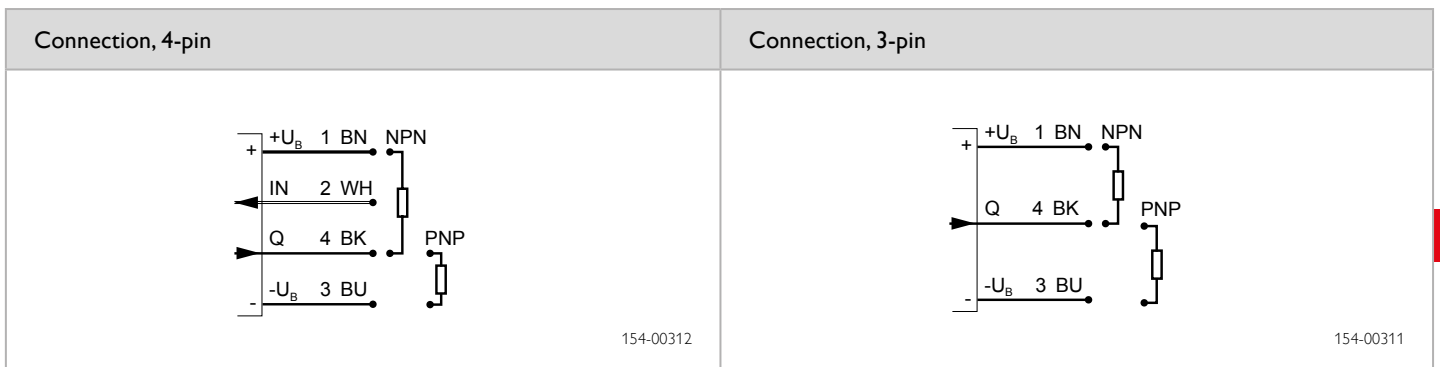
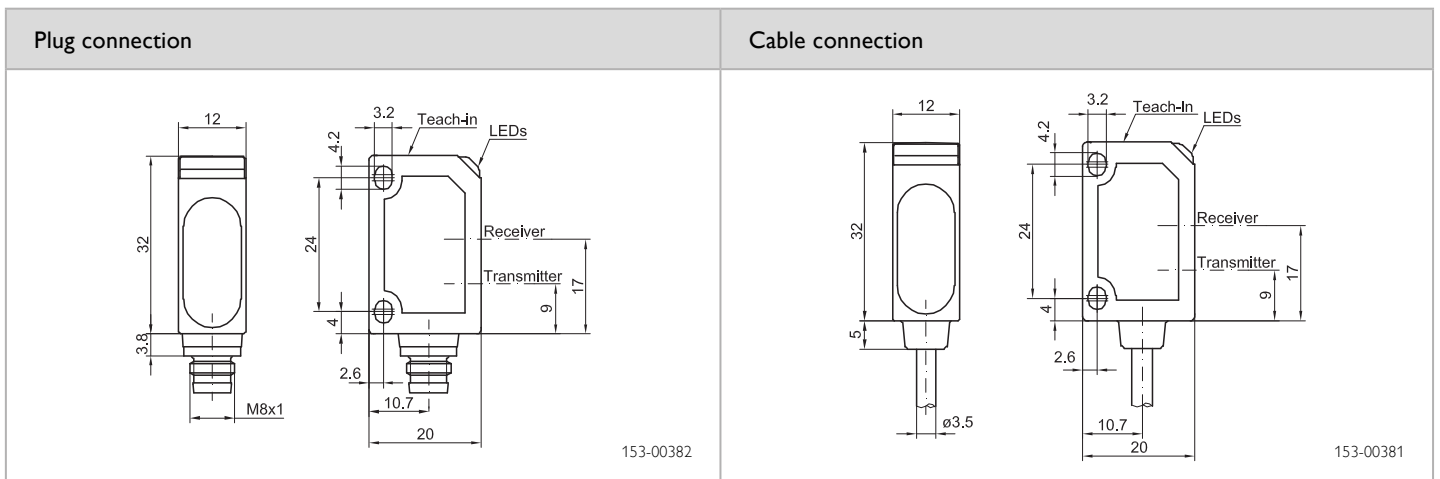
PRODUCT HIGHLIGHTS

- Detection of the smallest parts
- Precise background suppression
- Laser Protection Class 1
- Sensor adjustment via teach-in and control input
- Compact miniature housing

Optical data		Functions	
Scanning distance	20 ... 60 mm ¹	Indicator LED, green	Operating voltage indicator / contamination indicator
Type of light	Laser, red, 650 nm	Indicator LED, yellow	Switching output indicator / contamination indicator
Light spot size	See table	Scanning distance adjustment	Via Teach-in button and control input
Laser Class (DIN EN 60825-1:2008-5)	1	Teach-in modes	Mode 1: during running operation 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. scanning distance and N.O.
Electrical data		Mechanical data	
Operating voltage, +U _B	10 ... 30V DC	Dimensions	32 x 20 x 12 mm ³
No-load current, I ₀	≤ 30 mA	Enclosure rating	IP 67 ³
Output current, I _e	≤ 100 mA	Material, housing	ABS
Protective circuits	Reverse-polarity protection, U _B / short-circuit protection (Q)	Material, front screen	PMMA
Protection Class	2	Type of connection	See Selection Table
Power On Delay	≤ 300 ms	Ambient temperature: operation	-20 ... +60 °C
Switching output, Q	PNP/NPN (see Selection Table)	Ambient temperature: storage	-20 ... +80 °C
Output function	N.O./N.C.	Weight (plug device)	10 g
Switching frequency, f (ti/tp 1:1)	≤ 1000 Hz	Weight (cable device)	40 g
Response time	500 μs	Vibration and impact resistance	EN 60947-5-2
Control input, IN ²	+U _B = teach-in -U _B = button locked Open = normal operation		

¹ Reference material: grey, 18 % reflectivity ² Only 4-pin design ³ With connected IP 67 plug

Scanning distance	Switching output	Type of connection	Part number	Article number
20 ... 60 mm	PNP	Metal plug, M8x1, 3-pin	FT 20 RLH-PSM3	551-11019
20 ... 60 mm	NPN	Metal plug, M8x1, 3-pin	FT 20 RLH-NSM3	551-11020
20 ... 60 mm	PNP	Metal plug, M8x1, 4-pin	FT 20 RLH-PSM4	551-11014
20 ... 60 mm	NPN	Metal plug, M8x1, 4-pin	FT 20 RLH-NSM4	551-11016
20 ... 60 mm	PNP	Cable, 2 m, 4-wire	FT 20 RLH-PSK4	551-11015
20 ... 60 mm	NPN	Cable, 2 m, 4-wire	FT 20 RLH-NSK4	551-11017



Light spot size				
Scanning distance (mm)	20	35	40	60
Light spot diameter (mm)	1.5	0.1	0.5	2.5

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

FT 20 RLHD

Laser photoelectric proximity sensor with background suppression



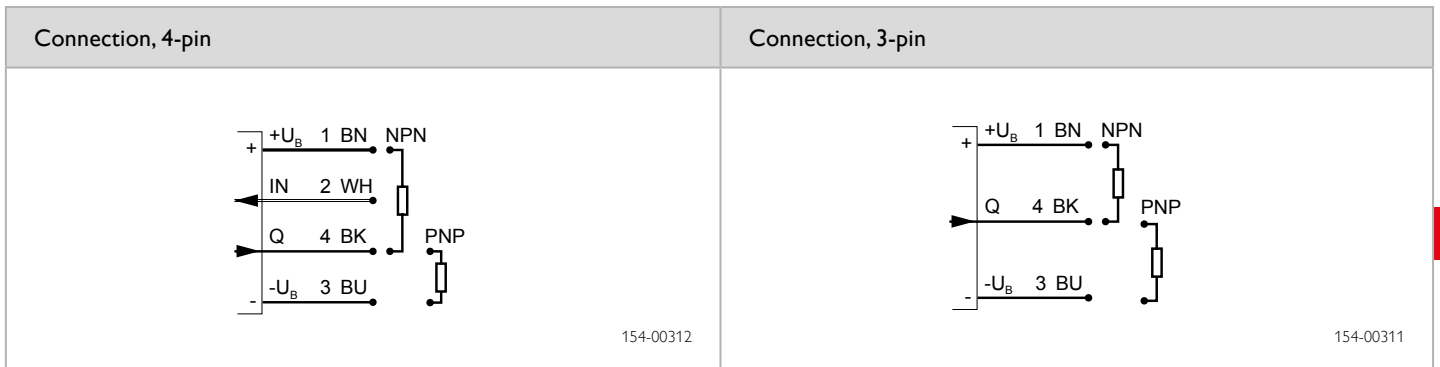
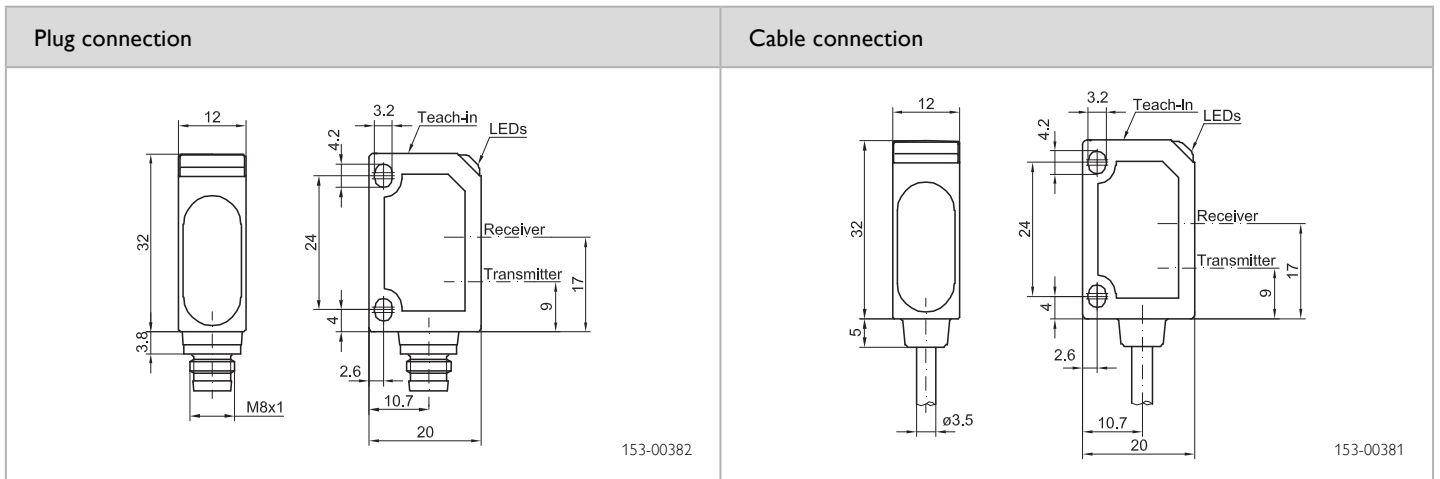
PRODUCT HIGHLIGHTS

- Detection of the smallest parts
- Precise background suppression
- Very small, easily visible laser light spot
- Sensor adjustment via teach-in and control input
- Compact miniature housing

Optical data		Functions	
Scanning distance	30 ... 110 mm ¹	Indicator LED, green	Operating voltage indicator / contamination indicator
Type of light	Laser, red, 650 nm	Indicator LED, yellow	Switching output indicator / contamination indicator
Light spot size ²	Ø < 0.7 mm	Scanning distance adjustment	Via Teach-in button and control input
Laser Class (DIN EN 60825-1:2008-5)	2	Teach-in modes	Mode 1: during running operation 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. scanning distance and N.O.
Electrical data		Mechanical data	
Operating voltage, +U _b	10 ... 30V DC	Dimensions	32 x 20 x 12 mm ³
No-load current, I ₀	≤ 30 mA	Enclosure rating	IP 67 ⁴
Output current, I _e	≤ 100 mA	Material, housing	ABS
Protective circuits	Reverse-polarity protection, U _b / short-circuit protection (Q)	Material, front screen	PMMA
Protection Class	2	Type of connection	See Selection Table
Power On Delay	≤ 300 ms	Ambient temperature: operation	-20 ... +60 °C
Switching output, Q	PNP/NPN (see Selection Table)	Ambient temperature: storage	-20 ... +80 °C
Output function	N.O./N.C.	Weight (plug device)	10 g
Switching frequency, f (ti/tp 1:1)	≤ 1000 Hz	Weight (cable device)	40 g
Response time	500 µs	Vibration and impact resistance	EN 60947-5-2
Control input, IN ³	+U _b = teach-in -U _b = button locked Open = normal operation		

¹ Reference material: grey, 18 % reflectivity ² In focus ³ Only 4-pin design ⁴ With connected IP 67 plug

Scanning distance	Switching output	Type of connection	Part number	Article number
30 ... 110 mm	PNP	Metal plug, M8x1, 3-pin	FT 20 RLHD-PSM3	551-11026
30 ... 110 mm	PNP	Metal plug, M8x1, 4-pin	FT 20 RLHD-PSM4	551-11022
30 ... 110 mm	NPN	Metal plug, M8x1, 4-pin	FT 20 RLHD-NSM4	551-11023
30 ... 110 mm	PNP	Cable, 2 m, 4-wire	FT 20 RLHD-PSK4	551-11024
30 ... 110 mm	NPN	Cable, 2 m, 4-wire	FT 20 RLHD-NSK4	551-11025



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

FT 20 RH

Photoelectric proximity sensor with background suppression



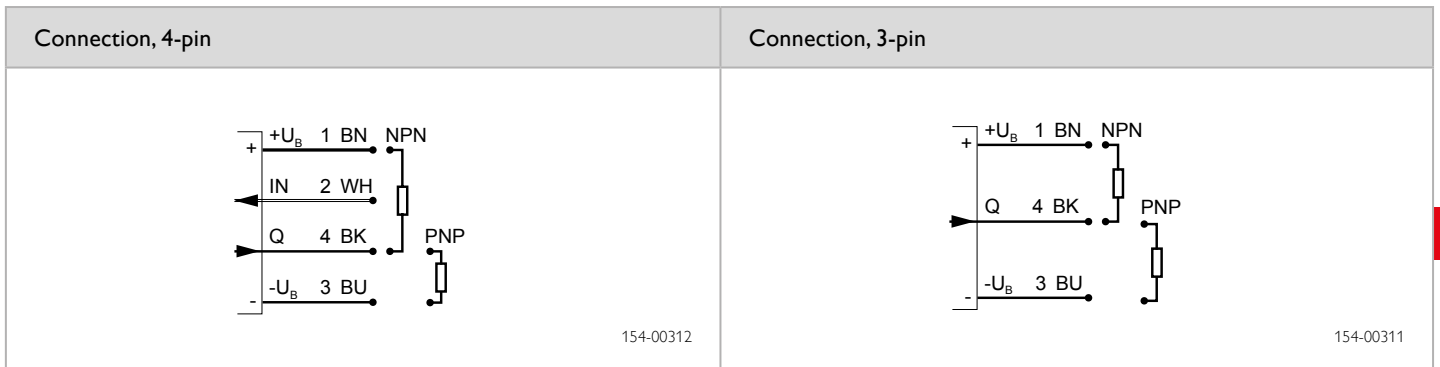
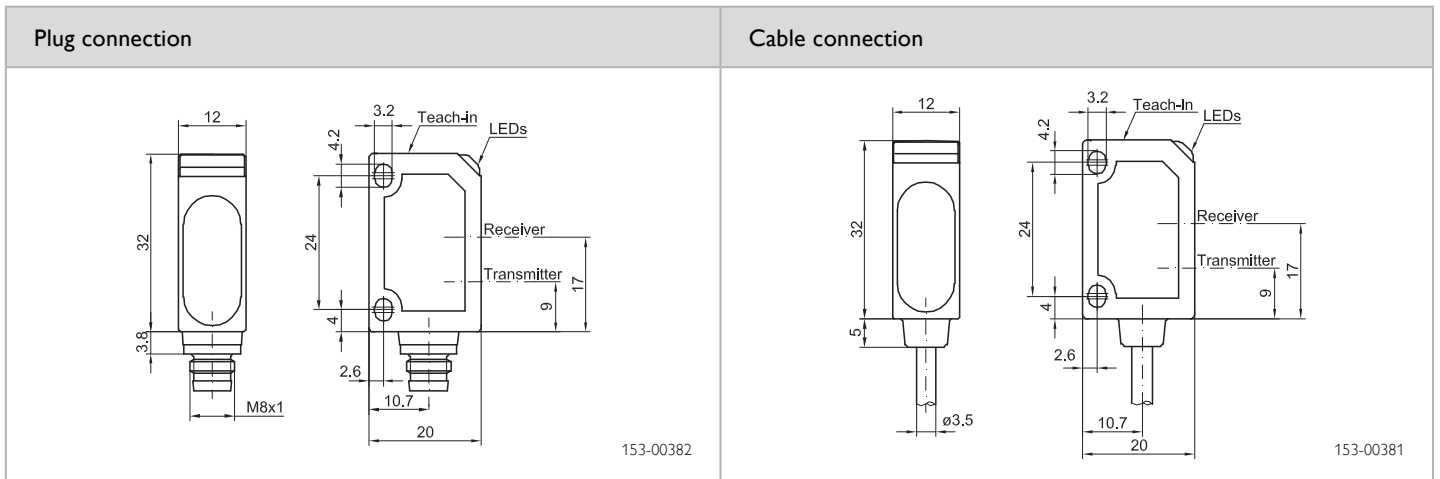
PRODUCT HIGHLIGHTS

- Precise background suppression
- Simple alignment thanks to easily visible light spot
- Compact miniature housing
- Large range of variants

Optical data		Functions	
Scanning distance	25 ... 100 mm ¹	Indicator LED, green	Operating voltage indicator / contamination indicator
Type of light	LED, red, 640 nm	Indicator LED, yellow	Switching output indicator / contamination indicator
Light spot size ²	< 5 x 5 mm ²	Scanning distance adjustment	Via Teach-in button and control input
		Teach-in modes	Mode 1: during running operation 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. scanning distance and N.O.
Electrical data		Mechanical data	
Operating voltage, +U _B	10 ... 30V DC	Dimensions	32 x 20 x 12 mm ³
No-load current, I ₀	≤ 25 mA	Enclosure rating	IP 67 ⁴
Output current, I _e	≤ 100 mA	Material, housing	ABS
Protective circuits	Reverse-polarity protection, U _B / short-circuit protection (Q)	Material, front screen	PMMA
Protection Class	2	Type of connection	See Selection Table
Power On Delay	≤ 300 ms	Ambient temperature: operation	-20 ... +60 °C
Switching output, Q	PNP/NPN (see Selection Table)	Ambient temperature: storage	-20 ... +80 °C
Output function	N.O./N.C.	Weight (plug device)	10 g
Switching frequency, f (ti/tp 1:1)	≤ 1000 Hz	Weight (cable device)	40 g
Response time	500 μs	Vibration and impact resistance	EN 60947-5-2
Control input, IN ³	+U _B = teach-in -U _B = button locked Open = normal operation		

¹ Reference material: grey, 18 % reflectivity ² At scanning distance of 60 mm ³ Only 4-pin design ⁴ With connected IP 67 plug

Scanning distance	Switching output	Type of connection	Part number	Article number
25 ... 100 mm	PNP	Metal plug, M8x1, 3-pin	FT 20 RH-PSM3	551-11004
25 ... 100 mm	NPN	Metal plug, M8x1, 3-pin	FT 20 RH-NSM3	551-11005
25 ... 100 mm	PNP	Metal plug, M8x1, 4-pin	FT 20 RH-PSM4	551-11000
25 ... 100 mm	NPN	Metal plug, M8x1, 4-pin	FT 20 RH-NSM4	551-11002
25 ... 100 mm	PNP	Cable, 2 m, 4-wire	FT 20 RH-PSK4	551-11001
25 ... 100 mm	NPN	Cable, 2 m, 4-wire	FT 20 RH-NSK4	551-11003



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

FT 20 IH

Infrared photoelectric proximity sensor with background suppression



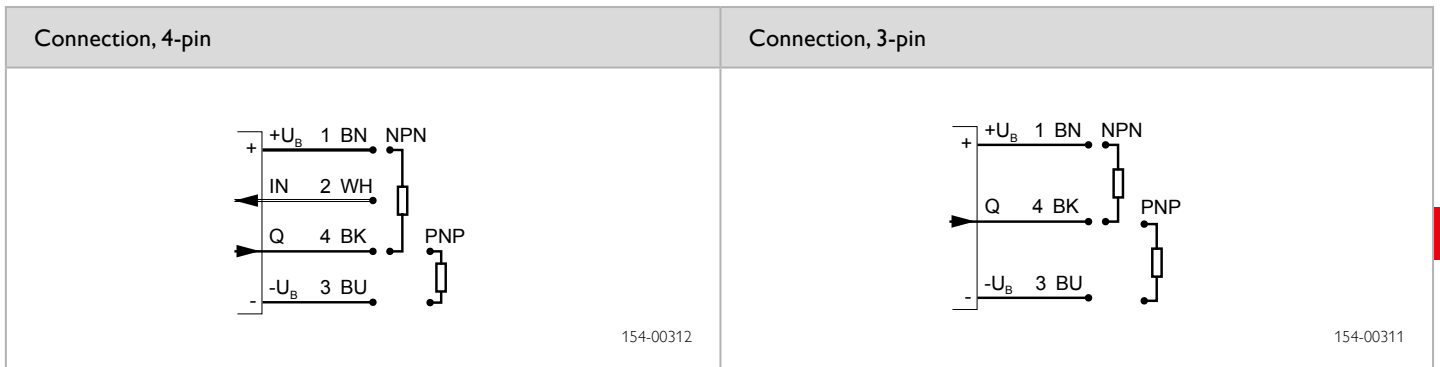
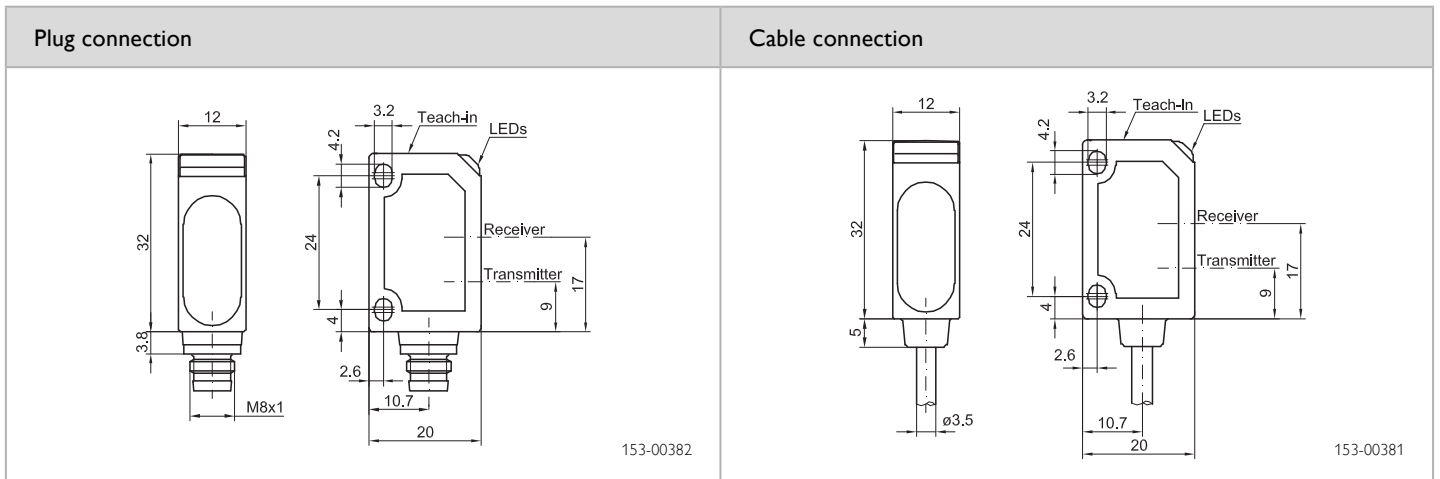
PRODUCT HIGHLIGHTS

- Precise background suppression
- Sensor adjustment via teach-in and control input
- Stable metal plug connection
- Compact miniature housing

Optical data		Functions	
Scanning distance	30 ... 150 mm ¹	Indicator LED, green	Operating voltage indicator / contamination indicator
Type of light	LED, infrared, 880 nm	Indicator LED, yellow	Switching output indicator / contamination indicator
		Scanning distance adjustment	Via Teach-in button and control input
		Teach-in modes	Mode 1: during running operation 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. scanning distance and N.O.
Electrical data		Mechanical data	
Operating voltage, +U _b	10 ... 30V DC	Dimensions	32 x 20 x 12 mm ³
No-load current, I ₀	≤ 30 mA	Enclosure rating	IP 67 ³
Output current, I _e	≤ 100 mA	Material, housing	ABS
Protective circuits	Reverse-polarity protection, U _b / short-circuit protection (Q)	Material, front screen	PMMA
Protection Class	2	Type of connection	See Selection Table
Power On Delay	≤ 300 ms	Ambient temperature: operation	-20 ... +60 °C
Switching output, Q	PNP/NPN (see Selection Table)	Ambient temperature: storage	-20 ... +80 °C
Output function	N.O./N.C.	Weight (plug device)	10 g
Switching frequency, f (ti/tp 1:1)	≤ 1000 Hz	Weight (cable device)	40 g
Response time	500 μs	Vibration and impact resistance	EN 60947-5-2
Control input, IN ²	+U _b = teach-in -U _b = button locked Open = normal operation		

¹ Reference material: grey, 18 % reflectivity ² Only 4-pin design ³ With connected IP 67 plug

Scanning distance	Switching output	Type of connection	Part number	Article number
30 ... 150 mm	PNP	Metal plug, M8x1, 3-pin	FT 20 IH-PSM3	551-11021
30 ... 150 mm	PNP	Metal plug, M8x1, 4-pin	FT 20 IH-PSM4	551-11010
30 ... 150 mm	NPN	Metal plug, M8x1, 4-pin	FT 20 IH-NSM4	551-11012
30 ... 150 mm	PNP	Cable, 2 m, 4-wire	FT 20 IH-PSK4	551-11011
30 ... 150 mm	NPN	Cable, 2 m, 4-wire	FT 20 IH-NSK4	551-11013



Accessories	
Connection cables	From Page A-32
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FT 23 RF

Photoelectric proximity sensor with background suppression, fixed focus



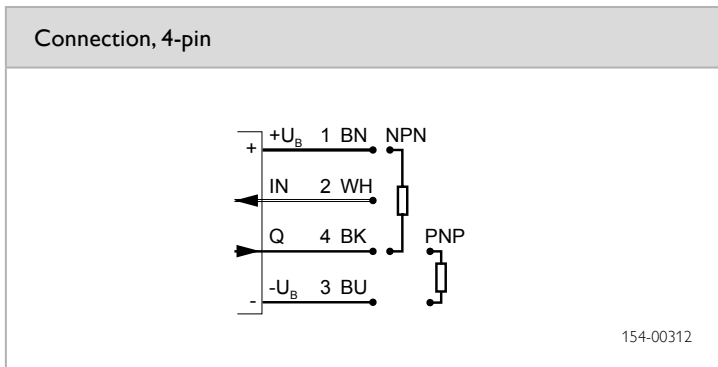
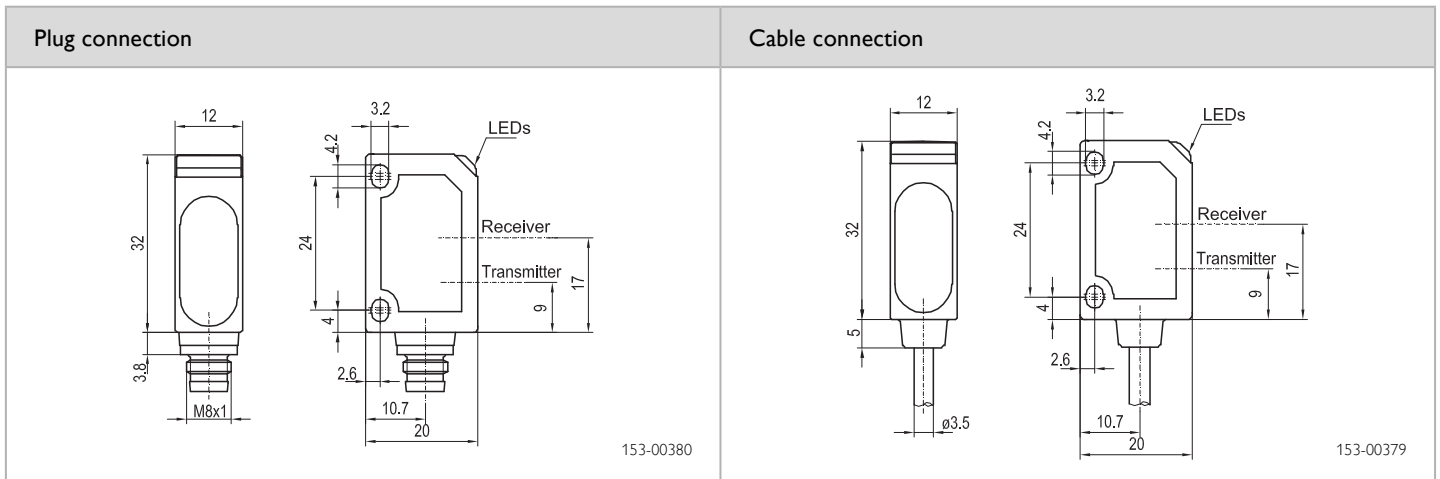
PRODUCT HIGHLIGHTS

- Economical solution for numerous applications
- Tamper-proof sensor design
- Simple alignment thanks to easily visible light spot
- Large range of variants

Optical data		Functions	
Scanning distance	60 mm ¹ / 80 mm ¹	Indicator LED, green	Operating voltage indicator / contamination indicator
Type of light	LED, red, 660 nm	Indicator LED, yellow	Switching output indicator / contamination indicator
Light spot size ²	5 x 5 mm ²	Adjustment possibilities	N.O./N.C. via control input
Electrical data		Mechanical data	
Operating voltage, +U _B	10 ... 30V DC	Dimensions	32 x 20 x 12 mm ³
No-load current, I ₀	≤ 25 mA	Enclosure rating	IP 67 ³
Output current, I _e	≤ 100 mA	Material, housing	ABS
Protective circuits	Reverse-polarity protection, U _B / short-circuit protection (Q)	Material, front screen	PMMA
Protection Class	2	Type of connection	See Selection Table
Power On Delay	≤ 300 ms	Ambient temperature: operation	-20 ... +60 °C
Switching output, Q	PNP/NPN (see Selection Table)	Ambient temperature: storage	-20 ... +80 °C
Output function	N.O./N.C.	Weight (plug device)	10 g
Switching frequency, f (ti/tp 1:1)	≤ 1000 Hz	Weight (cable device)	40 g
Response time	500 μs	Vibration and impact resistance	EN 60947-5-2
Control input, IN	+U _B = N.C. -U _B / Open = N.O.		

¹ Reference material: white, 90 % reflectivity ² At scanning distance of 60 mm ³ With connected IP 67 plug

Scanning distance	Switching output	Type of connection	Part number	Article number
60 mm	PNP	Metal plug, M8x1, 4-pin	FT 23 RF-PSM4	551-21012
60 mm	NPN	Metal plug, M8x1, 4-pin	FT 23 RF-NSM4	551-21018
60 mm	PNP	Cable, 2 m, 4-wire	FT 23 RF-PSK4	551-21017
60 mm	NPN	Cable, 2 m, 4-wire	FT 23 RF-NSK4	551-21019
80 mm	NPN	Metal plug, M8x1, 4-pin	FT 23 RF-PSM4-X03	551-21024



Accessories	
Connection cables	From Page A-32
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FT 20 RL

Diffuse laser photoelectric proximity sensor



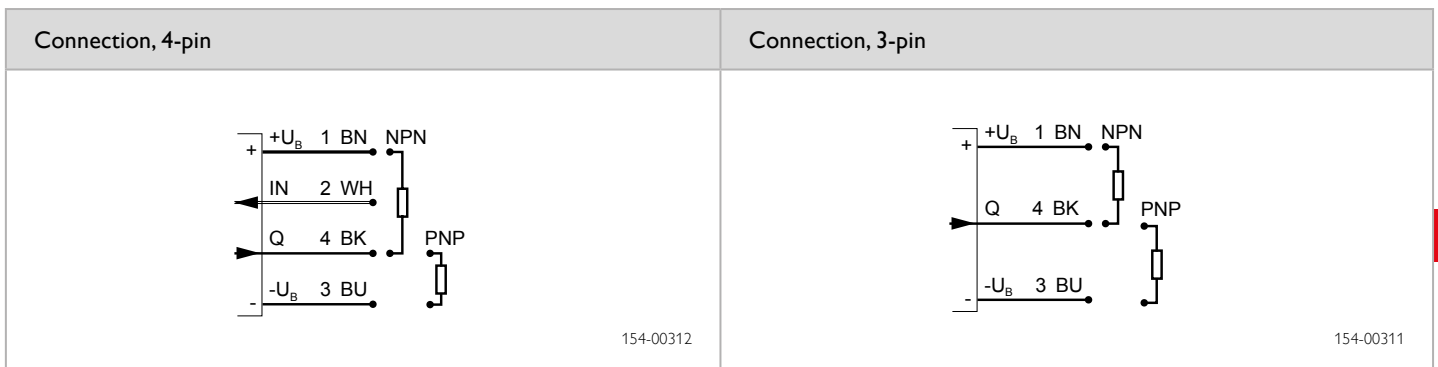
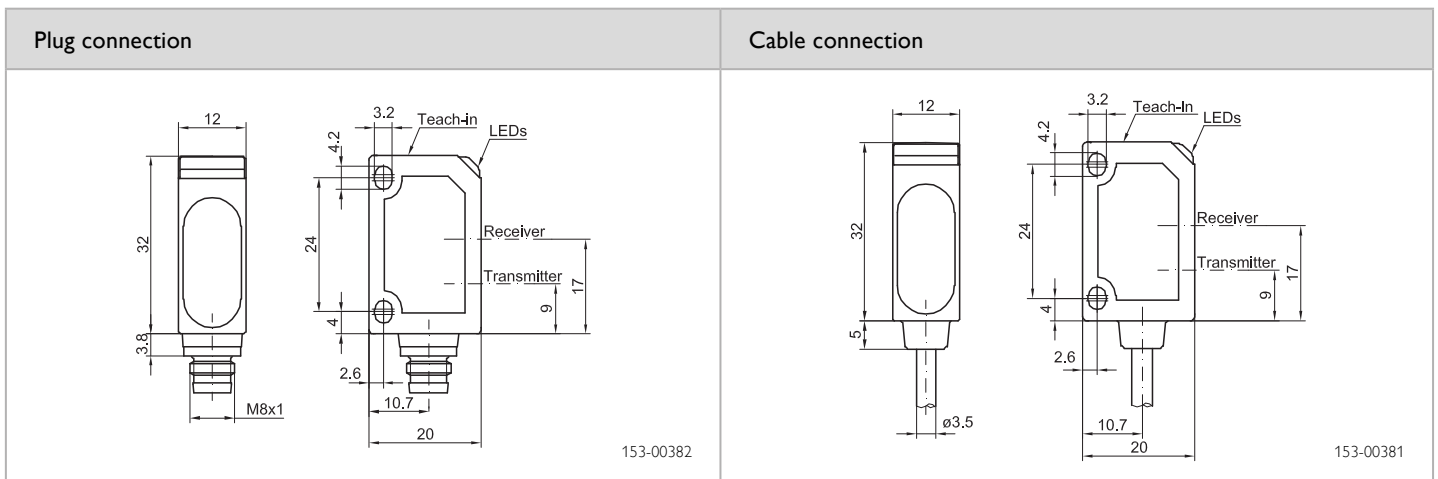
PRODUCT HIGHLIGHTS

- High switching frequency of 4000 Hz
- Very small, easily visible laser light spot
- Sensor adjustment via teach-in and control input
- Compact miniature housing

Optical data		Functions	
Scanning distance	40 ... 150 mm ¹	Indicator LED, green	Operating voltage indicator / contamination indicator
Type of light	Laser, red, 650 nm	Indicator LED, yellow	Switching output indicator / contamination indicator
Light spot size	See table	Sensitivity adjustment	Via Teach-in button and control input
Laser Class (DIN EN 60825-1:2008-5)	2	Teach-in modes	Mode 1: during running operation 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. scanning distance and N.O.
Electrical data		Mechanical data	
Operating voltage, +U _b	10 ... 30V DC	Dimensions	32 x 20 x 12 mm ³
No-load current, I ₀	≤ 25 mA	Enclosure rating	IP 67 ³
Output current, I _e	≤ 100 mA	Material, housing	ABS
Protective circuits	Reverse-polarity protection, U _b / short-circuit protection (Q)	Material, front screen	PMMA
Protection Class	2	Type of connection	See Selection Table
Power On Delay	≤ 300 ms	Ambient temperature: operation	-20 ... +60 °C
Switching output, Q	PNP/NPN (see Selection Table)	Ambient temperature: storage	-20 ... +80 °C
Output function	N.O./N.C.	Weight (plug device)	10 g
Switching frequency, f (ti/tp 1:1)	≤ 4000 Hz	Weight (cable device)	40 g
Response time	125 μs	Vibration and impact resistance	EN 60947-5-2
Control input, IN ²	+U _b = teach-in -U _b = button locked Open = normal operation		

¹ Reference material: white, 90 % reflectivity ² Only 4-pin design ³ With connected IP 67 plug

Scanning distance	Switching output	Type of connection	Part number	Article number
40 ... 150 mm	PNP	Metal plug, M8x1, 3-pin	FT 20 RL-PSM3	551-21022
40 ... 150 mm	PNP	Metal plug, M8x1, 4-pin	FT 20 RL-PSM4	551-21007
40 ... 150 mm	NPN	Metal plug, M8x1, 4-pin	FT 20 RL-NSM4	551-21009
40 ... 150 mm	PNP	Cable, 2 m, 4-wire	FT 20 RL-PSK4	551-21008
40 ... 150 mm	NPN	Cable, 2 m, 4-wire	FT 20 RL-NSK4	551-21010



Light spot size				
Scanning distance (mm)	40	80	120	150
Light spot diameter (mm)	2	0.4	1.5	3

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

FT 20 R

Diffuse photoelectric proximity sensor



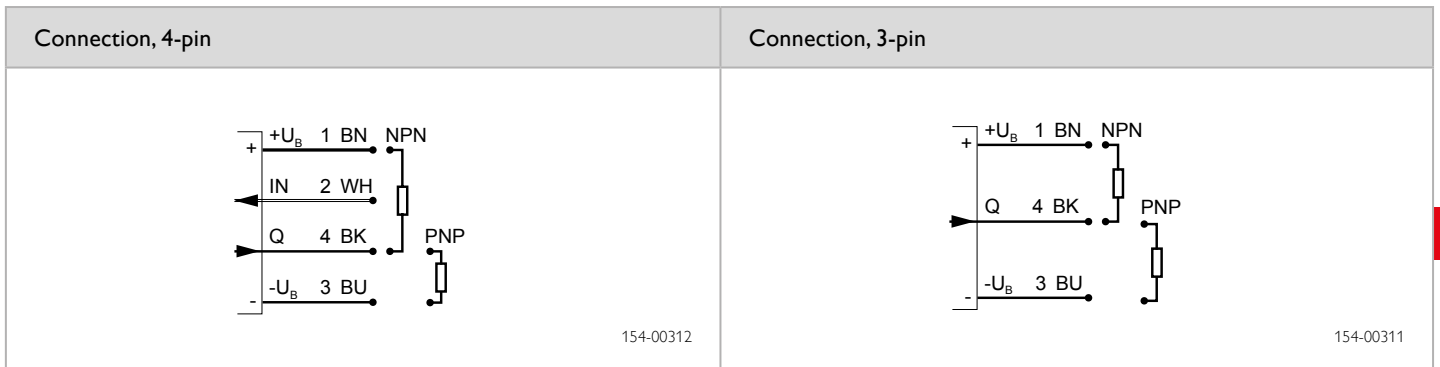
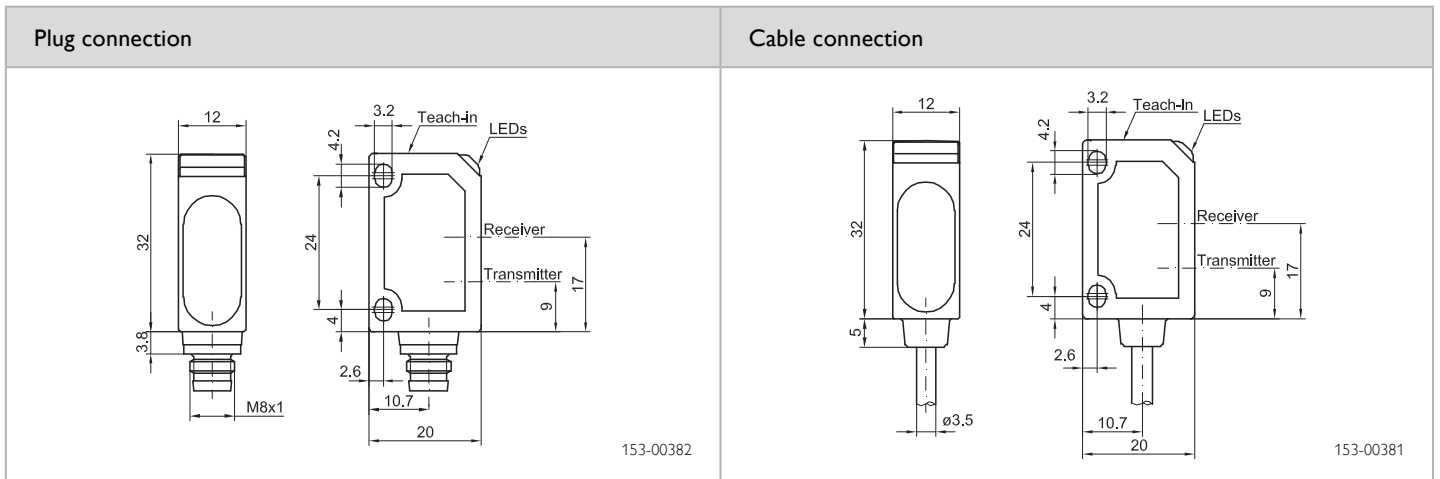
PRODUCT HIGHLIGHTS

- Sensor adjustment via teach-in and control input
- Simple alignment thanks to easily visible light spot
- Compact miniature housing
- Large range of variants

Optical data		Functions	
Scanning distance	20 ... 300 mm ¹	Indicator LED, green	Operating voltage indicator / contamination indicator
Type of light	LED, red, 660 nm	Indicator LED, yellow	Switching output indicator / contamination indicator
Light spot size ²	12 x 12 mm ²	Sensitivity adjustment	Via Teach-in button and control input
		Teach-in modes	Mode 1: during running operation 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. scanning distance and N.O.
Electrical data		Mechanical data	
Operating voltage, +U _b	10 ... 30V DC	Dimensions	32 x 20 x 12 mm ³
No-load current, I ₀	≤ 25 mA	Enclosure rating	IP 67 ⁴
Output current, I _e	≤ 100 mA	Material, housing	ABS
Protective circuits	Reverse-polarity protection, U _b / short-circuit protection (Q)	Material, front screen	PMMA
Protection Class	2	Type of connection	See Selection Table
Power On Delay	≤ 300 ms	Ambient temperature: operation	-20 ... +60 °C
Switching output, Q	PNP/NPN (see Selection Table)	Ambient temperature: storage	-20 ... +80 °C
Output function	N.O./N.C.	Weight (plug device)	10 g
Switching frequency, f (ti/tp 1:1)	≤ 1000 Hz	Weight (cable device)	40 g
Response time	500 μs	Vibration and impact resistance	EN 60947-5-2
Control input, IN ³	+U _b = teach-in -U _b = button locked Open = normal operation		

¹ Reference material: white, 90 % reflectivity ² At scanning distance of 160 mm ³ Only 4-pin design ⁴ With connected IP 67 plug

Scanning distance	Switching output	Type of connection	Part number	Article number
20 ... 300 mm	PNP	Metal plug, M8x1, 3-pin	FT 20 R-PSM3	551-21004
20 ... 300 mm	NPN	Metal plug, M8x1, 3-pin	FT 20 R-NSM3	551-21005
20 ... 300 mm	PNP	Metal plug, M8x1, 4-pin	FT 20 R-PSM4	551-21000
20 ... 300 mm	NPN	Metal plug, M8x1, 4-pin	FT 20 R-NSM4	551-21002
20 ... 300 mm	PNP	Cable, 2 m, 4-wire	FT 20 R-PSK4	551-21001
20 ... 300 mm	NPN	Cable, 2 m, 4-wire	FT 20 R-NSK4	551-21003



Accessories	
Connection cables	From Page A-32
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FT 23 R

Diffuse photoelectric proximity sensor, fixed setting



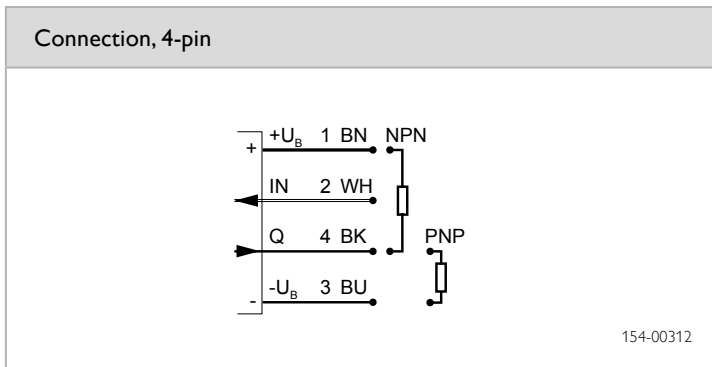
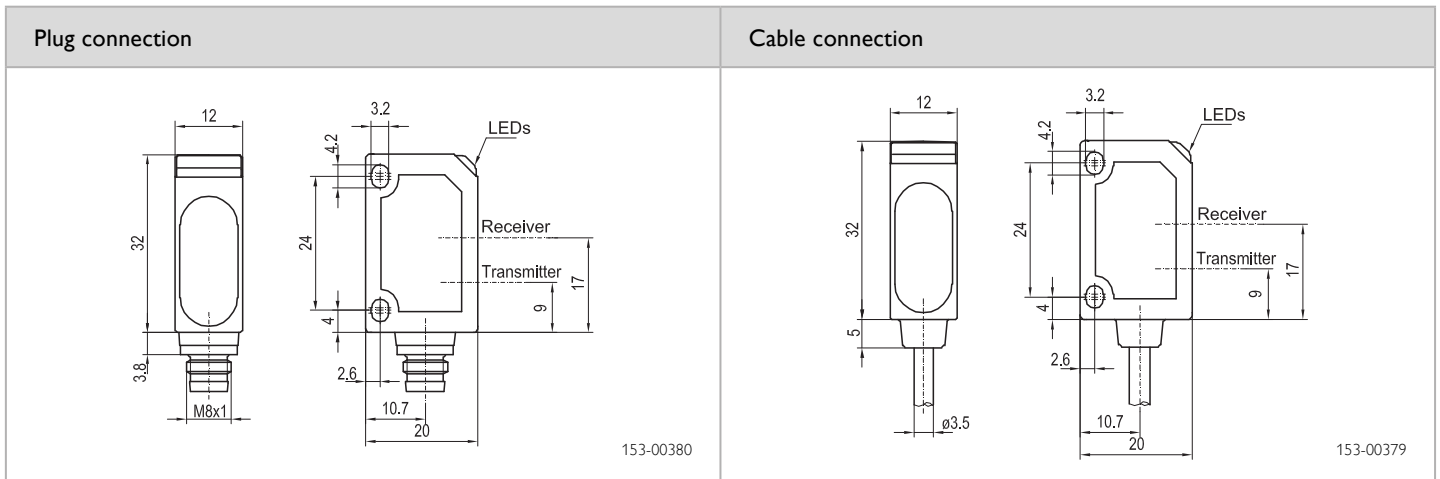
PRODUCT HIGHLIGHTS

- Economical solution for numerous applications
- Tamper-proof sensor design
- Simple alignment thanks to easily visible light spot
- Compact miniature housing

Optical data		Functions	
Scanning distance	20 ... 300 mm ¹	Indicator LED, green	Operating voltage indicator / contamination indicator
Type of light	LED, red, 660 nm	Indicator LED, yellow	Switching output indicator / contamination indicator
Light spot size ²	12 x 12 mm ²	Adjustment possibilities	N.O./N.C. via control input
Electrical data		Mechanical data	
Operating voltage, +U _B	10 ... 30V DC	Dimensions	32 x 20 x 12 mm ³
No-load current, I ₀	≤ 25 mA	Enclosure rating	IP 67 ³
Output current, I _e	≤ 100 mA	Material, housing	ABS
Protective circuits	Reverse-polarity protection, U _B / short-circuit protection (Q)	Material, front screen	PMMA
Protection Class	2	Type of connection	See Selection Table
Power On Delay	≤ 300 ms	Ambient temperature: operation	-20 ... +60 °C
Switching output, Q	PNP/NPN (see Selection Table)	Ambient temperature: storage	-20 ... +80 °C
Output function	N.O./N.C.	Weight (plug device)	10 g
Switching frequency, f (ti/tp 1:1)	≤ 1000 Hz	Weight (cable device)	40 g
Response time	500 μs	Vibration and impact resistance	EN 60947-5-2
Control input, IN	+U _B = N.C. -U _B / Open = N.O.		

¹ Reference material: white, 90 % reflectivity ² At scanning distance of 160 mm ³ With connected IP 67 plug

Scanning distance	Switching output	Type of connection	Part number	Article number
20 ... 300 mm	PNP	Metal plug, M8x1, 4-pin	FT 23 R-PSM4	551-21011
20 ... 300 mm	NPN	Metal plug, M8x1, 4-pin	FT 23 R-NSM4	551-21015
20 ... 300 mm	PNP	Cable, 2 m, 4-wire	FT 23 R-PSK4	551-21014
20 ... 300 mm	NPN	Cable, 2 m, 4-wire	FT 23 R-NSK4	551-21016



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

FR 20 RG1

Retroreflective photoelectric sensor for detecting transparent objects, autocollimation



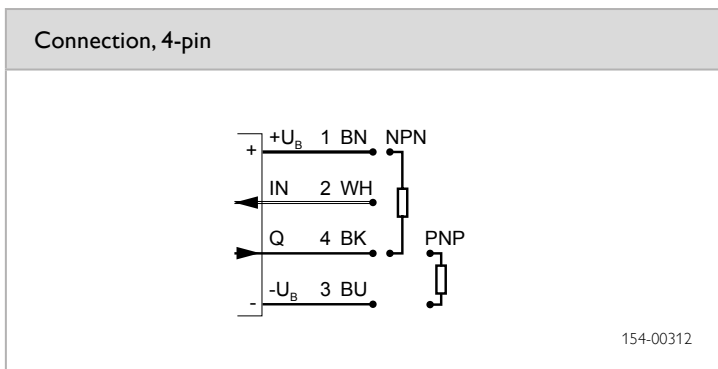
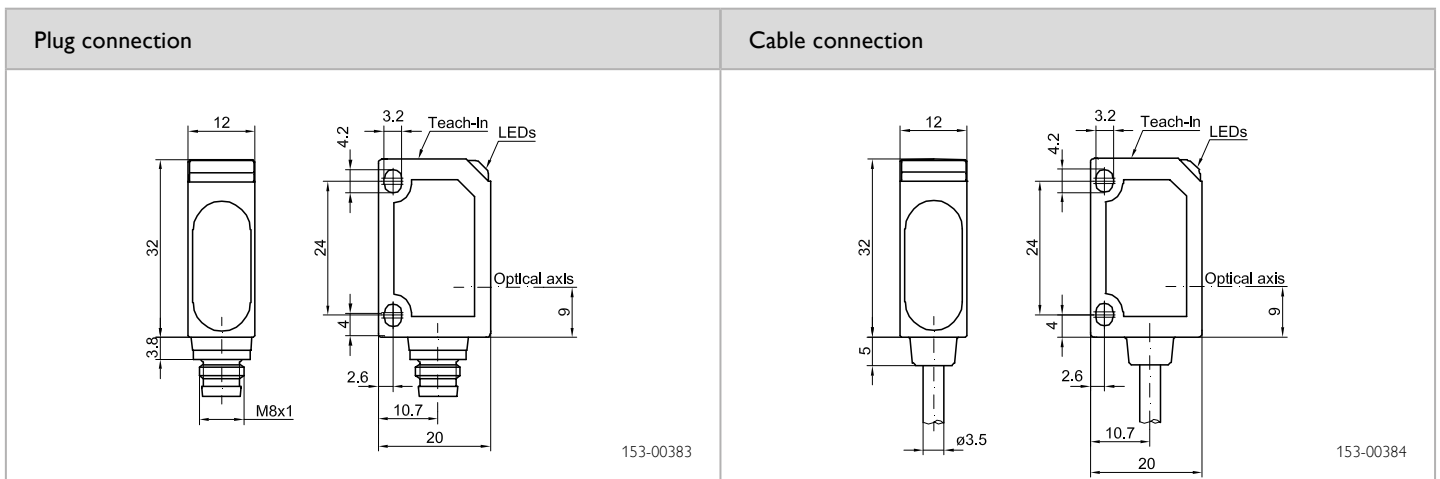
PRODUCT HIGHLIGHTS

- Autocollimation principle for reliable detection of transparent objects of any shape
- Particularly suitable for detecting bottles, ampoules, blisters and transparent foils
- Minimal blind zone thanks to autocollimation
- Temperature compensation for reliable switching over the entire temperature range

Optical data		Functions	
Operating range	5 ... 500 mm ¹	Indicator LED, green	Operating voltage indicator / contamination indicator
Type of light	LED, red, 660 nm	Indicator LED, yellow	Switching output indicator / contamination indicator
Light spot size ²	20 x 20 mm ²	Sensitivity adjustment	Via Teach-in button and control input
		Teach-in modes	Mode 1: during running operation 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 ... 30V DC	Dimensions	32 x 20 x 12 mm ³
No-load current, I ₀	≤ 25 mA	Enclosure rating	IP 67 ³
Output current, I _e	≤ 100 mA	Material, housing	ABS
Protective circuits	Reverse-polarity protection, U _B / short-circuit protection (Q)	Material, front screen	PMMA
Protection Class	2	Type of connection	See Selection Table
Power On Delay	≤ 300 ms	Ambient temperature: operation	-20 ... +60 °C
Switching output, Q	PNP/NPN (see Selection Table)	Ambient temperature: storage	-20 ... +80 °C
Output function	N.O./N.C.	Weight (plug device)	10 g
Switching frequency, f (ti/tp 1:1)	≤ 1000 Hz	Weight (cable device)	40 g
Response time	500 μs	Vibration and impact resistance	EN 60947-5-2
Control input, IN	+U _B = teach-in -U _B = button locked Open = normal operation		

¹ Reference material: R5/L reflector ² At range of 500 mm ³ With connected IP 67 plug

Operating range	Switching output	Type of connection	Part number	Article number
5 ... 500 mm	PNP	Metal plug, M8x1, 4-pin	FR 20 RG1-PSM4	553-51006
5 ... 500 mm	NPN	Metal plug, M8x1, 4-pin	FR 20 RG1-NSM4	553-51008
5 ... 500 mm	PNP	Cable, 2 m, 4-wire	FR 20 RG1-PSK4	553-51007
5 ... 500 mm	NPN	Cable, 2 m, 4-wire	FR 20 RG1-NSK4	553-51009



Accessories

Reflectors	From Page A-16
Connection cables	From Page A-32
Brackets	From Page A-4

FR 20 RG

Retroreflective photoelectric sensor for detecting transparent objects



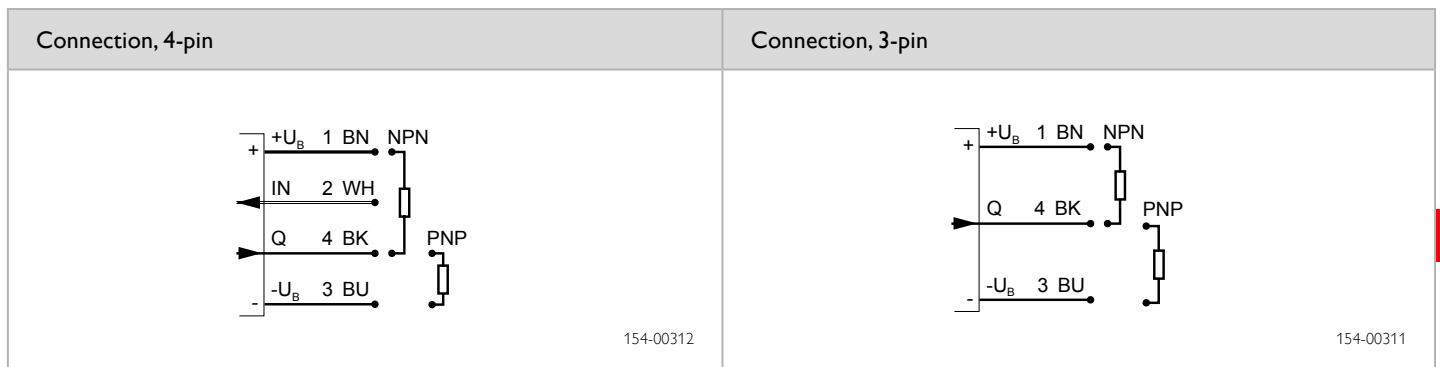
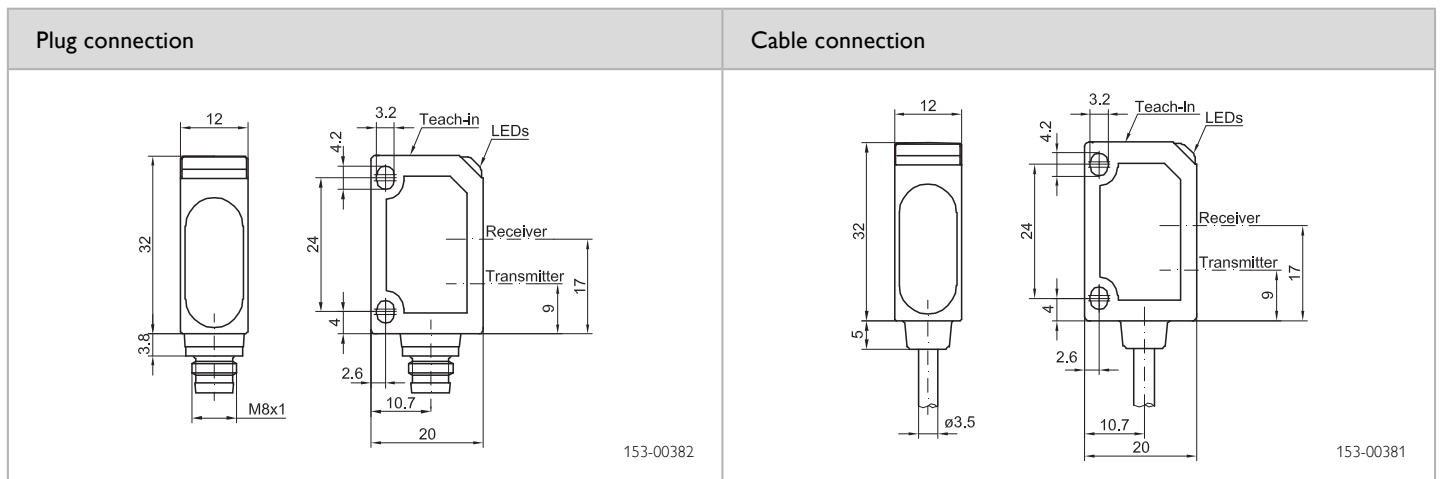
PRODUCT HIGHLIGHTS

- Particularly suitable for bottle detection
- Low switching hysteresis for the detection of transparent objects
- Sensor adjustment via teach-in and control input
- Stable metal plug connection
- Large range of variants

Optical data		Functions	
Limit range	700 mm ¹	Indicator LED, green	Operating voltage indicator / contamination indicator
Operating range	50 ... 500 mm ¹	Indicator LED, yellow	Switching output indicator / contamination indicator
Type of light	LED, red, 660 nm	Sensitivity adjustment	Via Teach-in button and control input
Light spot size ²	20 x 20 mm ²	Teach-in modes	Mode 1: during running operation 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 ... 30V DC	Dimensions	32 x 20 x 12 mm ³
No-load current, I ₀	≤ 25 mA	Enclosure rating	IP 67 ⁴
Output current, I _e	≤ 100 mA	Material, housing	ABS
Protective circuits	Reverse-polarity protection, U _B / short-circuit protection (Q)	Material, front screen	PMMA
Protection Class	2	Type of connection	See Selection Table
Power On Delay	≤ 300 ms	Ambient temperature: operation	-20 ... +60 °C
Switching output, Q	PNP/NPN (see Selection Table)	Ambient temperature: storage	-20 ... +80 °C
Output function	N.O./N.C.	Weight (plug device)	10 g
Switching frequency, f (ti/tp 1:1)	≤ 1000 Hz	Weight (cable device)	40 g
Response time	500 μs	Vibration and impact resistance	EN 60947-5-2
Control input, IN ³	+U _B = teach-in -U _B = button locked Open = normal operation		

¹ Reference material: R5 reflector ² At range of 500 mm ³ Only 4-pin design ⁴ With connected IP 67 plug

Operating range	Switching output	Type of connection	Part number	Article number
50 ... 500 mm	PNP	Metal plug, M8x1, 3-pin	FR 20 RG-PSM3	553-51004
50 ... 500 mm	NPN	Metal plug, M8x1, 3-pin	FR 20 RG-NSM3	553-51005
50 ... 500 mm	PNP	Metal plug, M8x1, 4-pin	FR 20 RG-PSM4	553-51000
50 ... 500 mm	NPN	Metal plug, M8x1, 4-pin	FR 20 RG-NSM4	553-51002
50 ... 500 mm	PNP	Cable, 2 m, 4-wire	FR 20 RG-PSK4	553-51001
50 ... 500 mm	NPN	Cable, 2 m, 4-wire	FR 20 RG-NSK4	553-51003



Accessories	
Reflectors	From Page A-16
Connection cables	From Page A-32
Brackets	From Page A-4

FR 20 RLO

Laser retroreflective photoelectric sensor, autocollimation



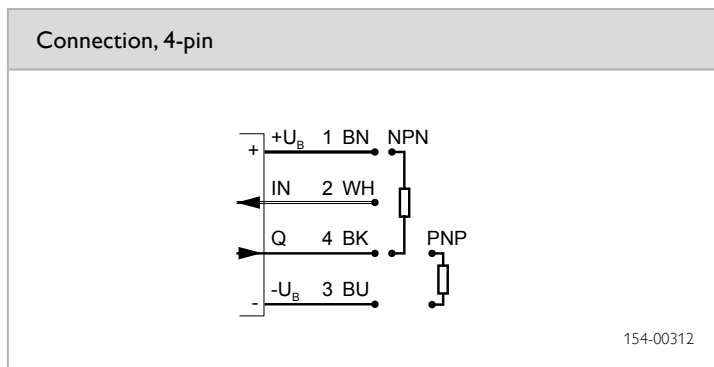
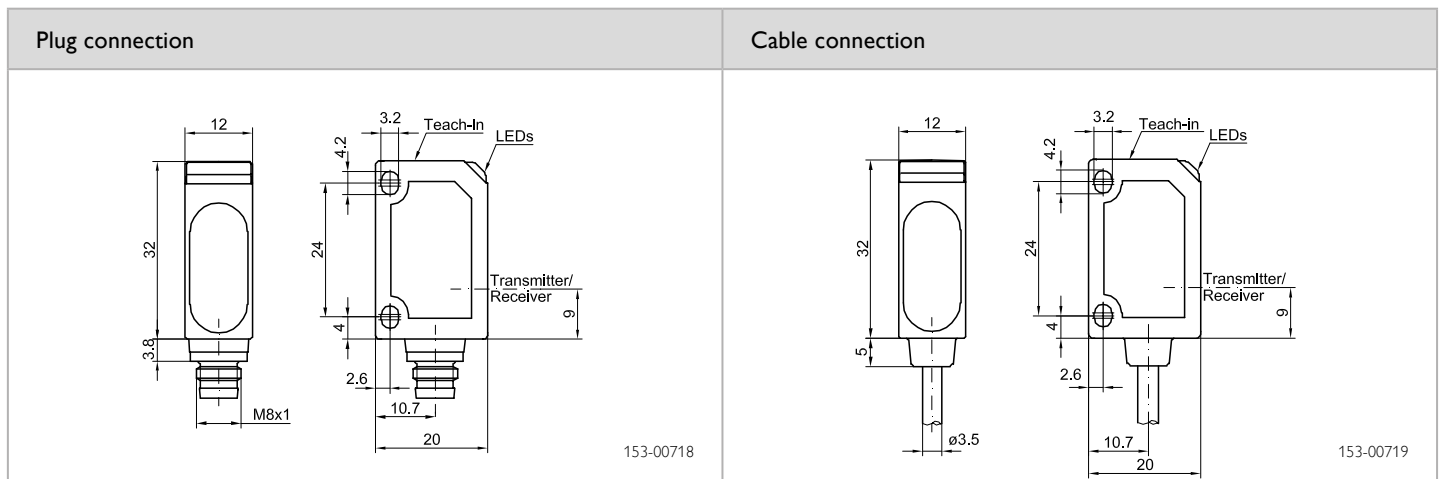
PRODUCT HIGHLIGHTS

- Most accurate small-part detection of tenphs of a mm
- Autocollimation – transmitter and receiver on a single axis
- Suitable for numerous, highly varied, reflectors and reflective tapes
- Highly accurate even at long ranges of up to 4 m

Optical data		Functions	
Operating range	0 ... 4 m ¹	Indicator LED, green	Operating voltage indicator / contamination indicator
Type of light	Laser, red, 650 nm	Indicator LED, yellow	Switching output indicator / contamination indicator
Laser Class (DIN EN 60825-1:2008-5)	1	Sensitivity adjustment	Via Teach-in button and control input
Light spot size ²	Ø 2 mm	Teach-in modes	Mode 1: during running operation 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 ... 30V DC	Dimensions	32 x 20 x 12 mm ³
No-load current, I ₀	≤ 25 mA	Enclosure rating	IP 67 ³
Output current, I _e	≤ 100 mA	Material, housing	ABS
Protective circuits	Reverse-polarity protection, U _B / short-circuit protection (Q)	Material, front screen	PMMA
Protection Class	2	Type of connection	See Selection Table
Power On Delay	≤ 300 ms	Ambient temperature: operation	-20 ... +60 °C
Switching output, Q	PNP/NPN (see Selection Table)	Ambient temperature: storage	-20 ... +80 °C
Output function	N.O./N.C.	Weight (plug device)	10 g
Switching frequency, f (ti/tp 1:1)	≤ 4000 Hz	Weight (cable device)	40 g
Response time	125 µs	Vibration and impact resistance	EN 60947-5-2
Control input, IN	+U _B = teach-in -U _B = button locked Open = normal operation		

¹ Reference material: R5/L reflector ² At range of 2.5 m ³ With connected IP 67 plug

Operating range	Switching output	Type of connection	Part number	Article number
0 ... 4 m	PNP	Metal plug, M8x1, 4-pin	FR 20 RLO-PSM4	555-31005
0 ... 4 m	NPN	Metal plug, M8x1, 4-pin	FR 20 RLO-NSM4	555-31006
0 ... 4 m	PNP	Cable, 2 m, 4-wire	FR 20 RLO-PSK4	555-31007
0 ... 4 m	NPN	Cable, 2 m, 4-wire	FR 20 RLO-NSK4	555-31008



Small part detection				
Smallest detectable part ⁵	≥ 1 mm	≥ 0.2 mm	≥ 0.2 mm	≥ 1 mm
Within operating range	0 ... 4000 mm	50 ... 500 mm	0 ... 500 mm	50 ... 2500 mm
Reference material	R5/L reflector (51 × 61 mm)	RD-25 KL reflector (∅ 25.2 mm)	RF-50 KL reflective tape (51 × 51 mm)	RF-100 KL reflective tape (230 × 230 mm)
Reflector distance	1000 ... 4000 mm	50 ... 500 mm	100 ... 500 mm	500 ... 2500 mm

⁵ Switching accuracy ≤ 2 mm at operating distance < 50 mm and objects < 0.5 mm

Accessories	
Reflectors	From Page A-16
Connection cables	From Page A-32
Brackets	From Page A-4

FR 20 RL

Laser retroreflective photoelectric sensor



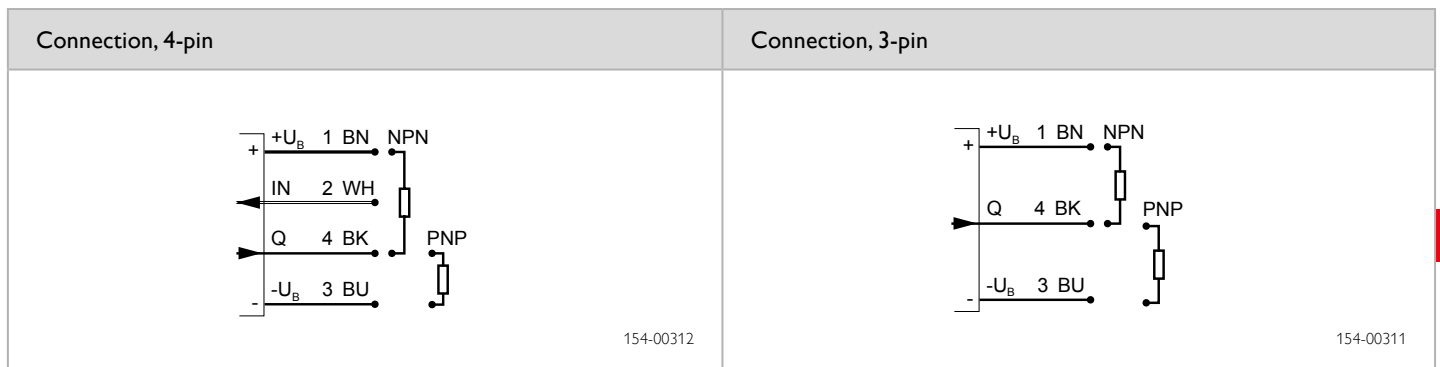
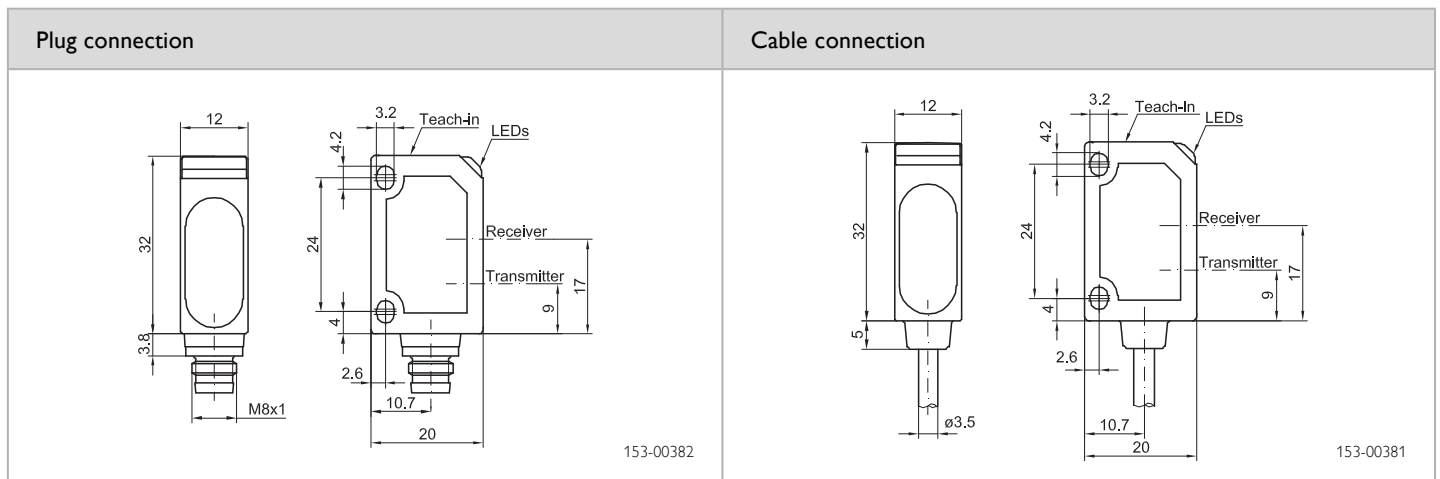
PRODUCT HIGHLIGHTS

- Detection of the smallest of parts
- Suitable for numerous, highly varied, reflectors and reflective tapes
- Very small, easily visible laser light spot
- Laser Protection Class 1

Optical data		Functions	
Operating range	0.07 ... 3 m ¹	Indicator LED, green	Operating voltage indicator / contamination indicator
Type of light	Laser, red, 650 nm	Indicator LED, yellow	Switching output indicator / contamination indicator
Laser Class (DIN EN 60825-1:2008-5)	1	Sensitivity adjustment	Via Teach-in button and control input
Light spot size ²	< 1 mm	Teach-in modes	Mode 1: during running operation 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 ... 30V DC	Dimensions	32 x 20 x 12 mm ³
No-load current, I ₀	≤ 25 mA	Enclosure rating	IP 67 ⁴
Output current, I _e	≤ 100 mA	Material, housing	ABS
Protective circuits	Reverse-polarity protection, U _b / short-circuit protection (Q)	Material, front screen	PMMA
Protection Class	2	Type of connection	See Selection Table
Power On Delay	≤ 300 ms	Ambient temperature: operation	-20 ... +60 °C
Switching output, Q	PNP/NPN (see Selection Table)	Ambient temperature: storage	-20 ... +80 °C
Output function	N.O./N.C.	Weight (plug device)	10 g
Switching frequency, f (ti/tp 1:1)	≤ 4000 Hz	Weight (cable device)	40 g
Response time	125 μs	Vibration and impact resistance	EN 60947-5-2
Control input, IN ³	+U _b = teach-in -U _b = button locked Open = normal operation		

¹ Reference material: R5/L reflector ² At range of 300 mm ³ Only 4-pin design ⁴ With connected IP 67 plug

Operating range	Switching output	Type of connection	Part number	Article number
0.07 ... 3 m	PNP	Metal plug, M8x1, 3-pin	FR 20 RL-PSM3	555-31004
0.07 ... 3 m	PNP	Metal plug, M8x1, 4-pin	FR 20 RL-PSM4	555-31000
0.07 ... 3 m	NPN	Metal plug, M8x1, 4-pin	FR 20 RL-NSM4	555-31002
0.07 ... 3 m	PNP	Cable, 2 m, 4-wire	FR 20 RL-PSK4	555-31001
0.07 ... 3 m	NPN	Cable, 2 m, 4-wire	FR 20 RL-NSK4	555-31003



Accessories	
Reflectors	From Page A-16
Connection cables	From Page A-32
Brackets	From Page A-4

FR 20 R

Retroreflective photoelectric sensor



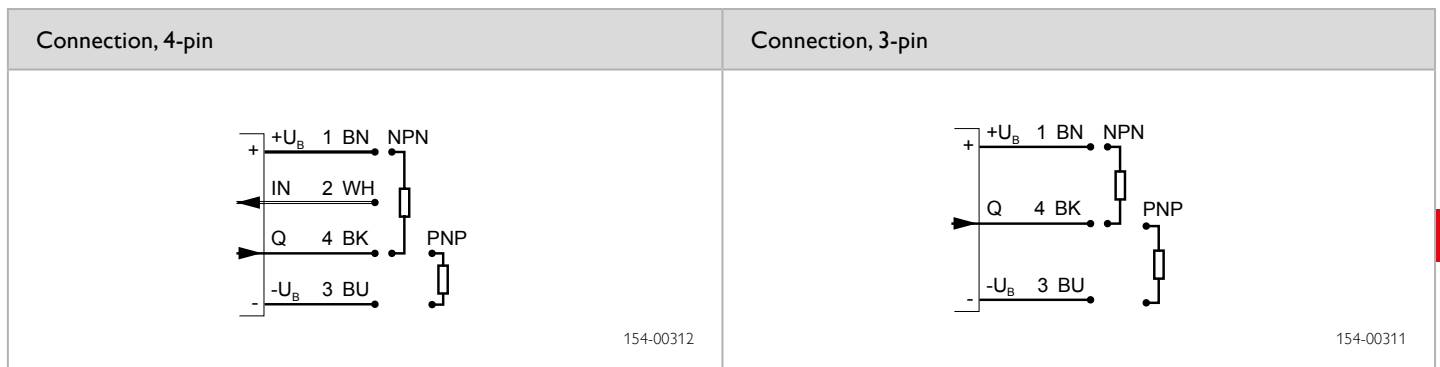
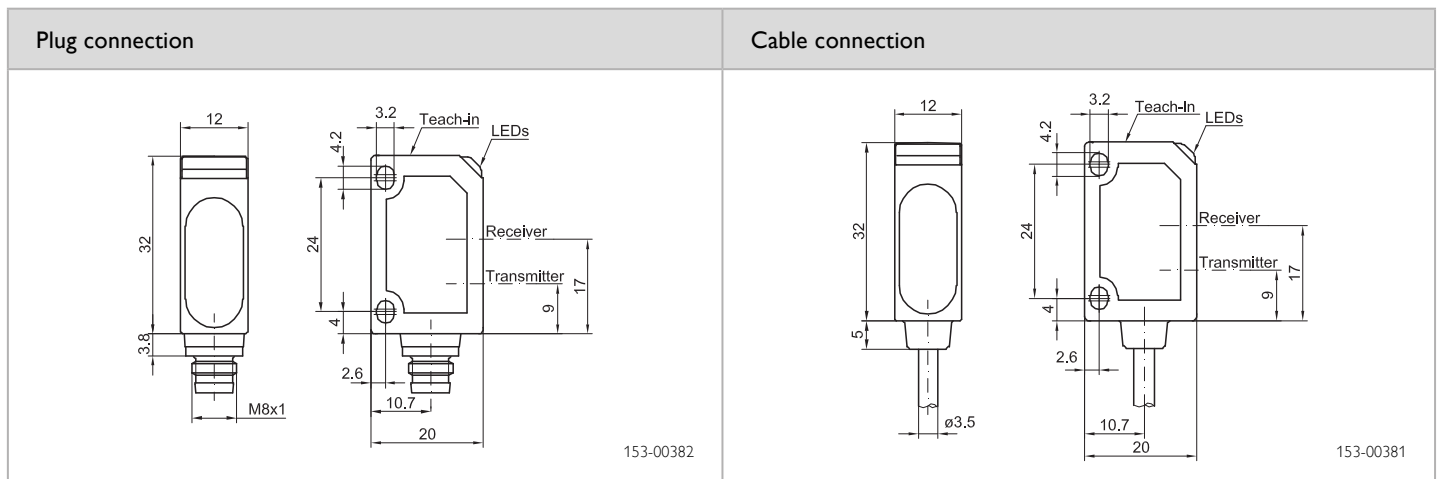
PRODUCT HIGHLIGHTS

- Simple alignment thanks to easily visible light spot
- Sensor adjustment via teach-in and control input
- Suitable for numerous, highly varied, reflectors and reflective tapes
- Compact miniature housing

Optical data		Functions	
Limit range	3 m ¹	Indicator LED, green	Operating voltage indicator / contamination indicator
Operating range	0.05 ... 2.5 m ¹	Indicator LED, yellow	Switching output indicator / contamination indicator
Type of light	LED, red, 660 nm	Sensitivity adjustment	Via Teach-in button and control input
Light spot size ²	75 x 75 mm ²	Teach-in modes	Mode 1: during running operation 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 ... 30V DC	Dimensions	32 x 20 x 12 mm ³
No-load current, I ₀	≤ 25 mA	Enclosure rating	IP 67 ⁴
Output current, I _e	≤ 100 mA	Material, housing	ABS
Protective circuits	Reverse-polarity protection, U _b / short-circuit protection (Q)	Material, front screen	PMMA
Protection Class	2	Type of connection	See Selection Table
Power On Delay	≤ 300 ms	Ambient temperature: operation	-20 ... +60 °C
Switching output, Q	PNP/NPN (see Selection Table)	Ambient temperature: storage	-20 ... +80 °C
Output function	N.O./N.C.	Weight (plug device)	10 g
Switching frequency, f (ti/tp 1:1)	≤ 1000 Hz	Weight (cable device)	40 g
Response time	500 μs	Vibration and impact resistance	EN 60947-5-2
Control input, IN ³	+U _b = teach-in -U _b = button locked Open = normal operation		

¹ Reference material: R5 reflector ² At range of 1.5 m ³ Only 4-pin design ⁴ With connected IP 67 plug

Operating range	Switching output	Type of connection	Part number	Article number
0.05 ... 2.5 m	PNP	Metal plug, M8x1, 3-pin	FR 20 R-PSM3	553-11009
0.05 ... 2.5 m	NPN	Metal plug, M8x1, 3-pin	FR 20 R-NSM3	553-11010
0.05 ... 2.5 m	PNP	Metal plug, M8x1, 4-pin	FR 20 R-PSM4	553-11000
0.05 ... 2.5 m	NPN	Metal plug, M8x1, 4-pin	FR 20 R-NSM4	553-11002
0.05 ... 2.5 m	PNP	Cable, 2 m, 4-wire	FR 20 R-PSK4	553-11001
0.05 ... 2.5 m	NPN	Cable, 2 m, 4-wire	FR 20 R-NSK4	553-11003



Accessories	
Reflectors	From Page A-16
Connection cables	From Page A-32
Brackets	From Page A-4

FR 20 RD

Retroreflective photoelectric sensor



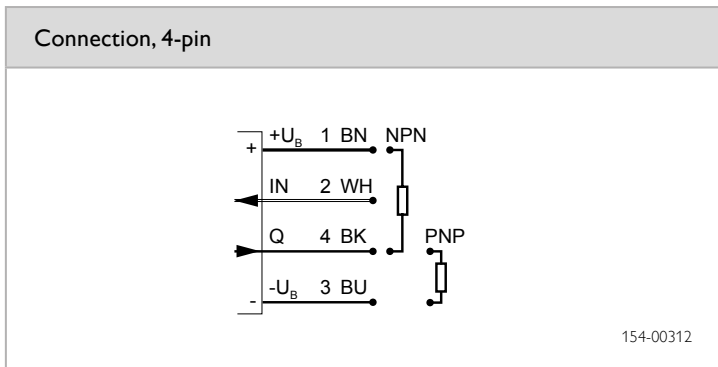
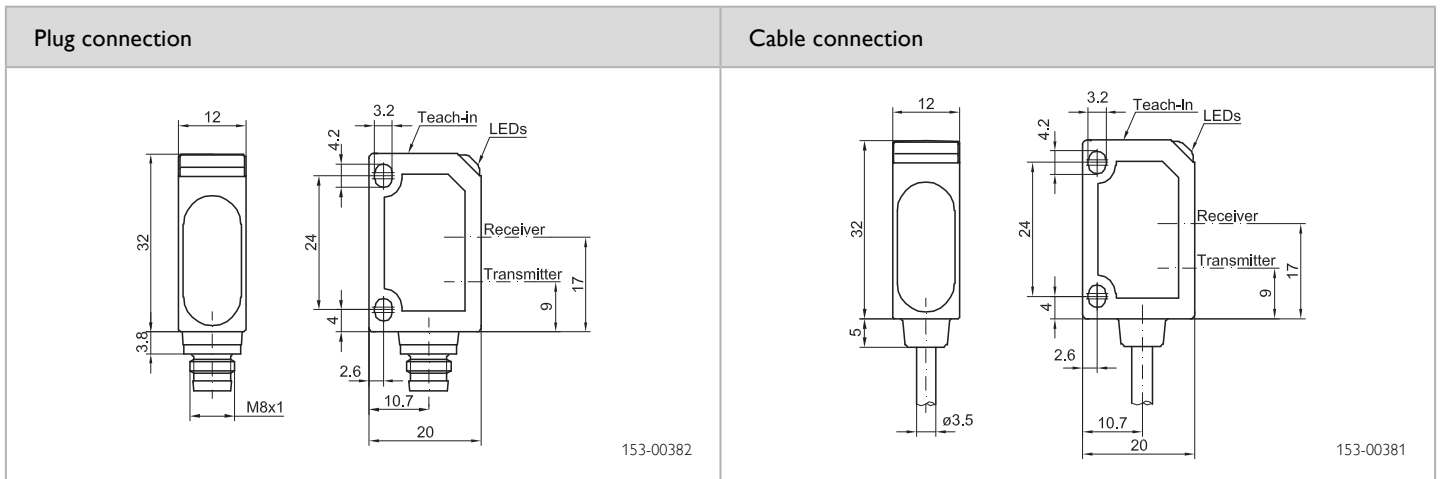
PRODUCT HIGHLIGHTS

- Simple alignment thanks to easily visible light spot
- Sensor adjustment via teach-in and control input
- Suitable for numerous, highly varied, reflectors and reflective tapes
- Compact miniature housing

Optical data		Functions	
Limit range	4 m ¹	Indicator LED, green	Operating voltage indicator / contamination indicator
Operating range	0.05 ... 3.5 m ¹	Indicator LED, yellow	Switching output indicator / contamination indicator
Type of light	LED, red, 660 nm	Sensitivity adjustment	Via Teach-in button and control input
Light spot size ²	75 x 75 mm ²	Teach-in modes	Mode 1: during running operation 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 ... 30V DC	Dimensions	32 x 20 x 12 mm ³
No-load current, I ₀	≤ 25 mA	Enclosure rating	IP 67 ³
Output current, I _e	≤ 100 mA	Material, housing	ABS
Protective circuits	Reverse-polarity protection, U _B / short-circuit protection (Q)	Material, front screen	PMMA
Protection Class	2	Type of connection	See Selection Table
Power On Delay	≤ 300 ms	Ambient temperature: operation	-20 ... +60 °C
Switching output, Q	PNP/NPN (see Selection Table)	Ambient temperature: storage	-20 ... +80 °C
Output function	N.O./N.C.	Weight (plug device)	10 g
Switching frequency, f (ti/tp 1:1)	≤ 1000 Hz	Weight (cable device)	40 g
Response time	500 µs	Vibration and impact resistance	EN 60947-5-2
Control input, IN	+U _B = teach-in -U _B = button locked Open = normal operation		

¹ Reference material: RD8 reflector ² At range of 1.5 m ³ With connected IP 67 plug

Operating range	Switching output	Type of connection	Part number	Article number
0.05 ... 3.5 m	PNP	Metal plug, M8x1, 4-pin	FR 20 RD-PSM4	553-11004
0.05 ... 3.5 m	NPN	Metal plug, M8x1, 4-pin	FR 20 RD-NSM4	553-11006
0.05 ... 3.5 m	PNP	Cable, 2 m, 4-wire	FR 20 RD-PSK4	553-11005
0.05 ... 3.5 m	NPN	Cable, 2 m, 4-wire	FR 20 RD-NSK4	553-11007



Accessories	
Reflectors	From Page A-16
Connection cables	From Page A-32
Brackets	From Page A-4

FR 23 R

Retroreflective photoelectric sensor, fixed setting



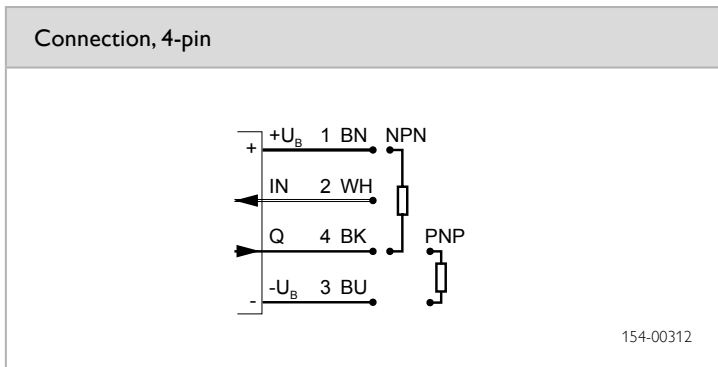
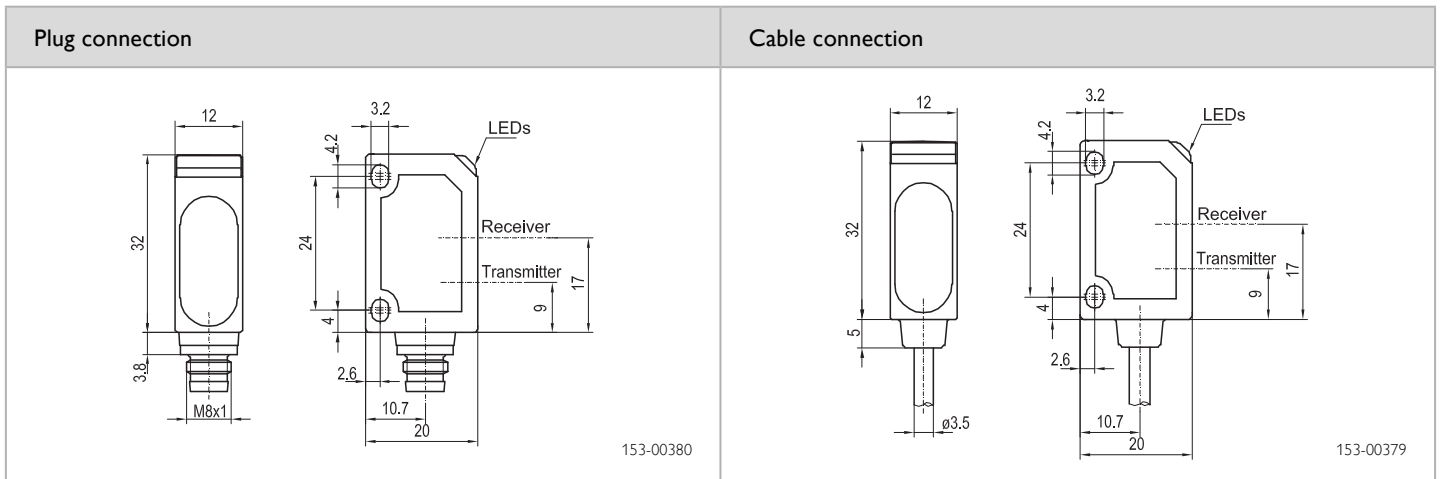
PRODUCT HIGHLIGHTS

- Economical solution for numerous applications
- Tamper-proof sensor design
- Simple alignment thanks to easily visible light spot
- Compact miniature housing

Optical data		Functions	
Limit range	3 m ¹	Indicator LED, green	Operating voltage indicator / contamination indicator
Operating range	0.05 ... 2.5 m ¹	Indicator LED, yellow	Switching output indicator / contamination indicator
Type of light	LED, red, 660 nm	Adjustment possibilities	N.O./N.C. via control input
Light spot size ²	75 x 75 mm ²		
Electrical data		Mechanical data	
Operating voltage, +U _B	10 ... 30V DC	Dimensions	32 x 20 x 12 mm ³
No-load current, I ₀	≤ 25 mA	Enclosure rating	IP 67 ³
Output current, I _e	≤ 100 mA	Material, housing	ABS
Protective circuits	Reverse-polarity protection, U _B / short-circuit protection (Q)	Material, front screen	PMMA
Protection Class	2	Type of connection	See Selection Table
Power On Delay	≤ 300 ms	Ambient temperature: operation	-20 ... +60 °C
Switching output, Q	PNP/NPN (see Selection Table)	Ambient temperature: storage	-20 ... +80 °C
Output function	N.O./N.C.	Weight (plug device)	10 g
Switching frequency, f (ti/tp 1:1)	≤ 1000 Hz	Weight (cable device)	40 g
Response time	500 μs	Vibration and impact resistance	EN 60947-5-2
Control input, IN	+U _B = N.C. -U _B / Open = N.O.		

¹ Reference material: R5 reflector ² At range of 1.5 m ³ With connected IP 67 plug

Operating range	Switching output	Type of connection	Part number	Article number
0.05 ... 2.5 m	PNP	Metal plug, M8x1, 4-pin	FR 23 R-PSM4	553-11012
0.05 ... 2.5 m	NPN	Metal plug, M8x1, 4-pin	FR 23 R-NSM4	553-11014
0.05 ... 2.5 m	PNP	Cable, 2 m, 4-wire	FR 23 R-PSK4	553-11013
0.05 ... 2.5 m	NPN	Cable, 2 m, 4-wire	FR 23 R-NSK4	553-11015



Accessories	
Reflectors	From Page A-16
Connection cables	From Page A-32
Brackets	From Page A-4

FS/FE 20 R

Through-beam photoelectric sensor



PRODUCT HIGHLIGHTS

- Sensor adjustment via teach-in and control input
- Simple alignment thanks to easily visible light spot
- Compact miniature housing
- Large range of variants

Optical data		Functions	
Limit range	0 ... 8.5 m	Indicator LED, green	Operating voltage indicator / contamination indicator
Operating range	0 ... 8 m	Indicator LED, yellow	Switching output indicator / contamination indicator
Type of light	LED, red, 660 nm	Sensitivity adjustment (receiver)	Via Teach-in button and control input
		Teach-in modes	Mode 1: during running operation 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		Mechanical data	
Operating voltage, +U _B	10 ... 30V DC	Dimensions	32 x 20 x 12 mm ³
No-load current, I ₀	≤ 25 mA	Enclosure rating	IP 67 ¹
Output current, I _e	≤ 100 mA	Material, housing	ABS
Protective circuits	Reverse-polarity protection, U _B / short-circuit protection (Q)	Material, front screen	PMMA
Protection Class	2	Type of connection	See Selection Table
Power On Delay	≤ 300 ms	Ambient temperature: operation	-20 ... +60 °C
Switching output, Q	PNP/NPN (see Selection Table)	Ambient temperature: storage	-20 ... +80 °C
Output function	N.O./N.C.	Weight (plug device)	10 g
Switching frequency, f (ti/tp 1:1)	≤ 500 Hz	Weight (cable device)	40 g
Response time	1 ms	Vibration and impact resistance	EN 60947-5-2
Control input, IN (receiver)	+ U _B = teach-in function - U _B = Teach-in button locked Open = normal operation		

¹With connected IP 67 plug

Operating range	Switching output	Type of connection	Part number	Article number
0 ... 8 m	PNP	Metal plug, M8x1, 4-pin	FE 20 R-PSM4	552-21000
0 ... 8 m	NPN	Metal plug, M8x1, 4-pin	FE 20 R-NSM4	552-21002
0 ... 8 m	–	Metal plug, M8x1, 4-polig	FS 20 R-M4	552-11000
0 ... 8 m	PNP	Cable, 2 m, 4-wire	FE 20 R-PSK4	552-21001
0 ... 8 m	NPN	Cable, 2 m, 4-wire	FE 20 R-NSK4	552-21003
0 ... 8 m	–	Cable, 2 m, 4-wire	FS 20 R-K4	552-11001

Plug connection (transmitter)	Cable connection (transmitter)
<p style="text-align: right;">153-00212</p>	<p style="text-align: right;">153-00211</p>
Plug connection (receiver)	Cable connection (receiver)
<p style="text-align: right;">153-00342</p>	<p style="text-align: right;">153-00341</p>

Connection, transmitter, 4-pin	Connection, receiver, 4-pin
<p style="text-align: right;">154-00318</p>	<p style="text-align: right;">154-00312</p>

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

FS/FE 23 R

Through-beam photoelectric sensor, fixed setting



PRODUCT HIGHLIGHTS

- Economical solution for numerous applications
- Tamper-proof sensor design
- Simple alignment thanks to easily visible light spot
- Compact miniature housing

Optical data		Functions	
Limit range	0 ... 4.5 m	Indicator LED, green	Operating voltage indicator / contamination indicator
Operating range	0 ... 4 m	Indicator LED, yellow	Switching output indicator / contamination indicator
Type of light	LED, red, 660 nm	Adjustment possibilities (receiver)	N.O./N.C. via control input
Electrical data		Mechanical data	
Operating voltage, +U _B	10 ... 30V DC	Dimensions	32 x 20 x 12 mm ³
No-load current, I ₀	≤ 25 mA	Enclosure rating	IP 67 ¹
Output current, I _e	≤ 100 mA	Material, housing	ABS
Protective circuits	Reverse-polarity protection, U _B / short-circuit protection (Q)	Material, front screen	PMMA
Protection Class	2	Type of connection	See Selection Table
Power On Delay	≤ 300 ms	Ambient temperature: operation	-20 ... +60 °C
Switching output, Q	PNP/NPN (see Selection Table)	Ambient temperature: storage	-20 ... +80 °C
Output function	N.O./N.C.	Weight (plug device)	10 g
Switching frequency, f (ti/tp 1:1)	≤ 500 Hz	Weight (cable device)	40 g
Response time	1 ms	Vibration and impact resistance	EN 60947-5-2
Control input, IN (receiver)	+U _B = N.C. -U _B / Open = N.O.		

¹ With connected IP 67 plug

Operating range	Switching output	Type of connection	Part number	Article number
0 ... 4 m	PNP	Metal plug, M8x1, 4-pin	FE 23 R-PSM4	552-11007
0 ... 4 m	NPN	Metal plug, M8x1, 4-pin	FE 23 R-NSM4	552-11009
0 ... 4 m	–	Metal plug, M8x1, 4-pin	FS 23 R-M4	552-11004
0 ... 4 m	PNP	Cable, 2 m, 4-wire	FE 23 R-PSK4	552-11008
0 ... 4 m	NPN	Cable, 2 m, 4-wire	FE 23 R-NSK4	552-11010
0 ... 4 m	–	Cable, 2 m, 4-wire	FS 23 R-K4	552-11005

Plug connection (transmitter)	Cable connection (transmitter)
<p style="text-align: right;">153-00212</p>	<p style="text-align: right;">153-00211</p>
Plug connection (receiver)	Cable connection (receiver)
<p style="text-align: right;">153-00418</p>	<p style="text-align: right;">153-00423</p>

Connection, transmitter, 4-pin	Connection, receiver, 4-pin
<p style="text-align: right;">154-00318</p>	<p style="text-align: right;">154-00312</p>

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