

F 10 – sub-miniature laser sensors
from Page 200

FT 10-RLH-PS-KM4

- The world's smallest adjustable laser photoelectric proximity sensor with background suppression

>> Page 202

FSIFE 10-RL-...

- Very precise front edge detection thanks to high scanning rate and fine laser beam

>> Page 210

F 25 – the new generation miniature sensor family
from Page 214

FT 25-RLH-PS-M4M

- Extremely accurate small-part detection thanks to tiny laser light spot
- Precise background suppression through SensoPart ASIC technology

>> Page 216

FT 25-RHD-PNS-M4M

- Photoelectric proximity sensor with adjustable background suppression
- Long scanning distance of 400 mm with miniature housing

>> Page 220

F 55 – photoelectric sensors and proximity sensors with high-quality housings
from Page 244

FT 55-RHM-PS-L4

- Photoelectric proximity sensor with background suppression
- Stainless steel housings for use in the food industry

>> Page 254

FT 55-RL2-PS-L4

- Laser photoelectric proximity sensor
- Detection of the slightest contrast differences at a scanning distance of up to 1.2 m

>> Page 256

F 20 – photoelectric sensors and proximity sensors in miniature housings
from Page 274

FR 20 RLO-PSM4

- Autocollimation laser retro-reflective photoelectric sensor
- Extremely accurate small-part detection from range of 0 mm
- High scanning accuracy due to high switching frequency of 4 kHz and precise light spot

>> Page 296

F 50 – photoelectric sensors and proximity sensors in compact housings
from Page 310

FT 50 RLHD-PAL4

- Laser photoelectric proximity sensor with background suppression
- Long scanning distance of 300 mm with compact housing and extremely accurate small-part detection

>> Page 314

F 88 – the photoelectric sensor and proximity sensor family for harsh operating conditions
from Page 326

FT 88-IH-RAT-PM

- Infrared photoelectric proximity sensor with background suppression
- Relay output with toggle switch
- Very high scanning distance of 2 m
- Simple adjustment of time functions

>> Page 334

FT 92 – proximity sensors with long ranges
from Page 346

FT 92 IL-PSL4

- Infrared laser photoelectric proximity sensor with background suppression
- Very long range of 6 m thanks to time-of-flight technology
- Simple sensor alignment by means of integrated red-light pilot laser

>> Page 348

Photoelectric sensors and proximity sensors in cylindrical housings
from Page 350

FMH 18

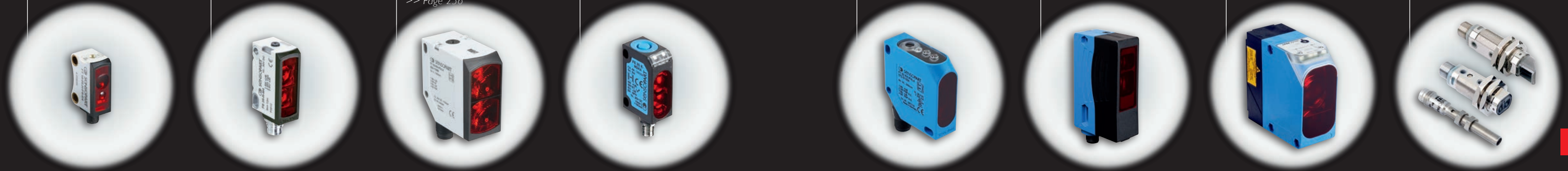
- Best sensor in cylindrical housing with background suppression

>> Page 354

FR 18-2 RM-PS-L4

- Retroreflective photoelectric sensor
- Standard M18 sleeve in robust full-metal housing

>> Page 374



Photoelectric sensors and proximity sensors are the standard sensors in automation technology. At SensoPart you will find the right sensor for almost every conceivable application. Our product portfolio offers a comprehensive selection of differing sizes, ranges and switching variants. Regardless of whether you choose a sub-miniature sensor for restricted machine conditions or a large housing with a particularly long range or scanning distance – all our sensors share excellent performance data, high reliability and solid workmanship “made in Germany”.

Our photoelectric sensors and proximity sensors offer, for example, precise background suppression, extremely accurate small-part detection or reliable detection of transparent objects. And they operate extremely reliably in harsh industrial conditions: our current sensor series have tightly sealed (IP 69K / IP 67) plastic housings and are immune to cleaning according to the Ecolab standard.

Mounting and alignment are easy and rapid with products from SensoPart: well thought-out, user-friendly accessories such as the dovetail mounting offered by some of our series, the adjustment possibilities via Teach-in button and control input, or the Auto-detect function (only available from SensoPart), with which sensors can automatically determine whether PNP or NPN wiring is present – so that only one sensor variant is required.

The SensoPart portfolio not only contains powerful, reliable and solid products for standard applications, but also real highlights. Our new FT 25-RHD proximity sensor, for example: its highly precise background suppression, the lowest black/white-shift currently available on the market, and the long scanning distance ensure absolutely reliable switching behaviour – without impairment by varying object surfaces and colours, or critical backgrounds. Or our FT 10-RLH sub-miniature laser scanner – the only one of its size with adjustable background suppression. Or ... see for yourself on the following pages!

TYPICAL SENSOPART

- SensoPart develops, produces and sells retroreflective photoelectric sensors with the best background suppression on the market – thanks to SensoPart ASIC technology
- Highly developed laser technology – precise and small laser light spots for extremely accurate small-part detection
- Sensors with the best black/white-shift for reliable switching behaviour regardless of object colour and surface
- Patented sensor designs and mounting systems
- Differing transmission light sources for the most varied of requirements: laser, LED, or infrared light transmitters
- Wide variety of adjustment possibilities: potentiometer, teach-in, external control line or fixed pre-setting
- Cuboid or cylindrical housing options
- Robust workmanship: glass-fibre-reinforced plastic housings (IP 69K / IP 67) or metal housings, stable plug connections made of plastic and metal, as well as metal-reinforced drilled holes for mounting
- Internationally recognised UL-certification
- Ecolab-certification
- Safe operation thanks to Laser Class 1
- Intelligent mounting solutions for easy mounting and adjustment
- IO-Link

By far the best object detection

Our sensors detect almost any object in any surroundings thanks to the distance principle



Your advantages

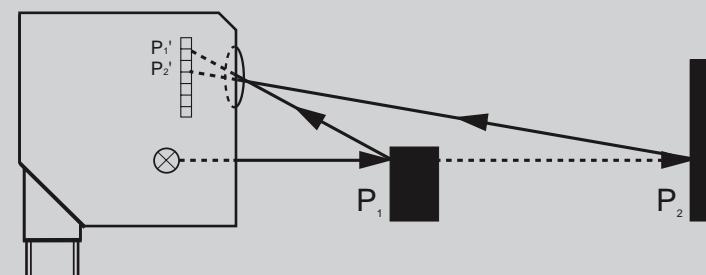
- Reliable object detection
- High process stability
- An economical solution

A challenge for every sensor

Polished covering panels on machinery, blinking warning lamps on passing vehicles, moving machine parts, sunlight coming through a window – all these are background effects that can make detection of the actual target object considerably more difficult. So it is a major advantage if one uses sensors that one can rely on: proximity sensors with background suppression from SensoPart. They only see what they are supposed to see: the object itself – regardless of the material, shape and colour – and nothing else!

Object detection by means of distance measurement

SensoPart proximity sensors with background suppression can always differentiate between object and background even in strongly reflective environments. The sensor measures the distance to the object, P_1 , and to the possible background, P_2 , according to the triangulation process and not the reflectivity of the object. The signal, P_2 , coming from the background is then cut out. SensoPart has implemented the detection principle of distance measurement with incomparable precision. This high quality could be achieved because we have developed an optoelectronic, integrated circuit (an ASIC), in which the optical receiver cell and the evaluation electronics are integrated in the smallest of spaces



Technology provides the technical edge

Thanks to its tiny dimensions, the ASIC microchip even fits into the sub-miniature sensors of the F 10 series. Thus SensoPart offers the world's smallest laser sensor with adjustable background suppression.

With the latest generation F 10, F 25, and F 55 series, SensoPart offers photoelectric proximity sensors with the best background suppression currently available.

Your advantage is our priority

Reliable object detection

- Regardless of size, shape, colour, material and surface properties of the target object
- Detection using the distance measurement principle: precise and reliable

High process stability

- Reliable suppression of undesirable reflections and ambient light
- Suppression of moving parts in the background (e.g. conveyor belts, machine parts, persons)
- Reliable detection of the target object even when close to the background

The economical solution

- Usable in all task areas
- Rapid commissioning thanks to simple teach-in
- High machine run-times through quality sensors from SensoPart, made in Germany

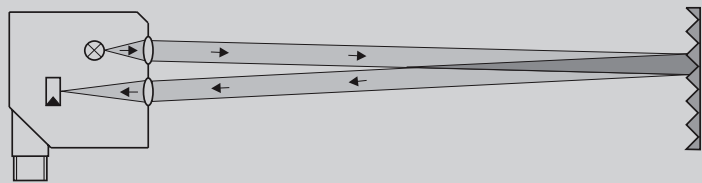
1 Reliable detection of the thinnest tubes in front of metallic backgrounds thanks to focused laser light spot and precise background suppression.

2 Detection of black foam rubber pads against reflective backgrounds.

3 Strongly reflective CDs are reliably detected against metallic backgrounds and with ambient light effects.

4 Solar wafers with shimmering blue surfaces against polished metal surfaces with ambient light reflections are reliably detected.

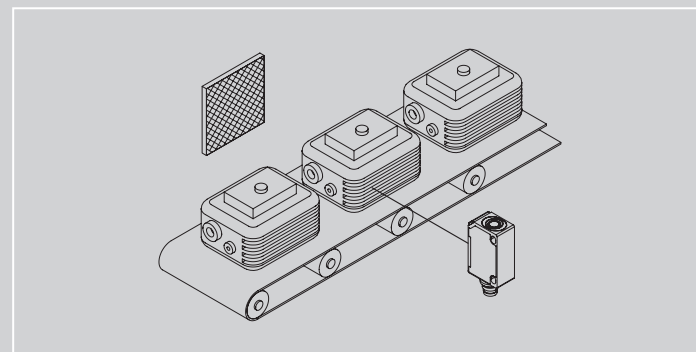
Retroreflective photoelectric sensors



The transmitter and receiver are accommodated in a single housing in retroreflective photoelectric sensors. The light emitted by the transmitter hits a reflector and is reflected. The receiver evaluates the reflected light. The advantage lies in the small size of the reflector. It is also easy to install because it is a passive element and thus requires no connections.

Like through-beam photoelectric sensors, retroreflective photoelectric sensors are often selected according to the desired range. Because the light has to travel the path from the sensor to the reflector twice one also talks of the two-way photoelectric sensor. The light from the transmitter is, explained simply, emitted in a cone shape. This means that the cross-section of the light cone increases with rising range. This is also why a larger reflector is needed at longer ranges than at shorter distances. The range is therefore quoted in the data sheet in relation to the type of reflector.

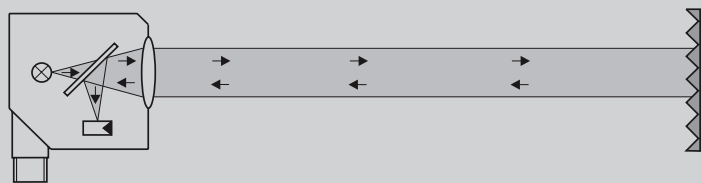
Laser sensors provide an almost parallel light beam. Whereby the light beam is extremely fine and parallel over the entire operating range. This advantage is, above all, used when the smallest of objects have to be detected along the entire operating range. Regardless of the physical principle, all retroreflective photoelectric sensors from SensoPart have a so-called polarisation filter. Polarisation filters are optical filters that can be compared with a line grid. Incidental light, which oscillates in all directions, is filtered so that only the light beams that oscillate parallel to the lattice plane are let through. Use of a polarisation filter in combination with pyramidal reflectors can also allow the reliable detection of reflective objects by retroreflective photoelectric sensors.



Checking completeness

The presence of the inserted components must be checked before further production steps.

The autocollimation principle



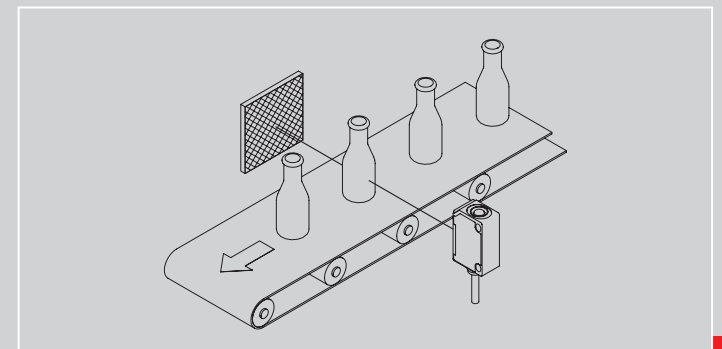
With retroreflective photoelectric sensors one speaks of the autocollimation principle when the light reflected from the reflector travels parallel to itself (i.e. within itself). The light emitted by the sensor hits a reflector and is reflected. The reflected light is then deflected to a receiver by a semi-transparent mirror and evaluated.

The autocollimation principle



Unlike the double-lens system, a retroreflective photoelectric sensor using the autocollimation principle has a very homogeneous and narrow optical path. Its switching point is largely independent of the entry direction of the target object.

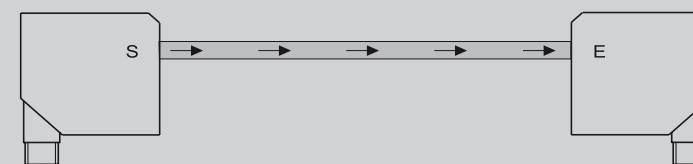
A major advantage of sensors with the autocollimation principle is detection from a range of 0 mm. There is thus, unlike the double-lens system, no blind zone.



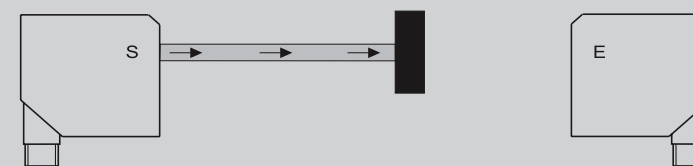
Monitoring bottles

The retroreflective photoelectric sensor specially developed for this purpose achieves reliable detection of transparent objects.

Through-beam photoelectric sensors



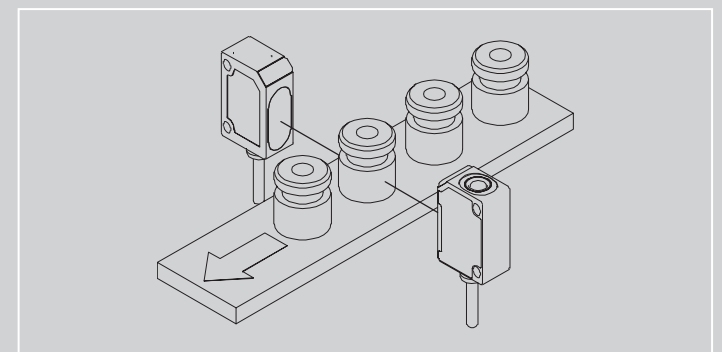
would reduce the available range. The range quoted in the data sheet should not be exceeded – in order to ensure functionality in poor operating conditions.



When using deflector mirrors, the total path to be monitored should be less than the range quoted in the data sheet.

A through-beam photoelectric sensor has a separate transmitter and receiver. This means that light only travels the path between the transmitter and the receiver once. For this reason one speaks of through-beam photoelectric sensors.

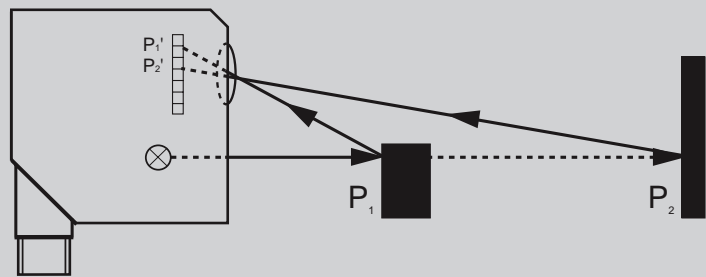
The range is of decisive importance when using through-beam photoelectric sensors. Photoelectric sensors are principally selected according to their range. In the case of very critical operating conditions, such as high dust levels or intense steam generation, care must be taken to ensure that the photoelectric sensor is not operated at its limit range. Any clouds of steam



Detecting workpieces in harsh environments

Through-beam photoelectric sensors can also provide dependable detection even under poor conditions – thanks to their high level of reliability.

Proximity sensors with background suppression



In the case of fixed background suppression, the transmitter and receiver elements are fixed-mounted. The operating range is defined by the overlapping of the transmitter and receiver angles. Objects outside this operating range cannot be detected.

In the case of adjustable background suppression, the parameters for object detection can be set mechanically via a rotary switch or electronically via teach-in. This provides much more flexible use.

Advantages

- Independent of object colour and surface
- Reflections in the background are reliably suppressed
- Robust in sunshine
- Scanning distance adjustable according to applications

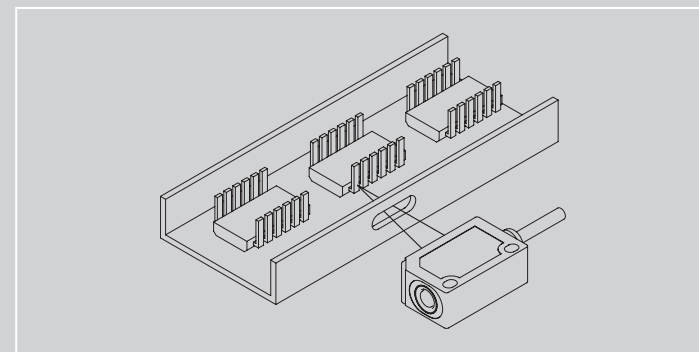
Differing object colours and surfaces can seriously affect the detection behaviour of a diffuse scanner. As a result of the purely energetic evaluation it is not possible, for example, to detect a black object against a white background. The white background reflects more light than the object itself.

The background suppression process was developed in order to be able to reliably master such tasks. Whereby both the light returning from the background as well as that reflected by the object are evaluated. The light hits two different positions (P_1' & P_2') on the receiver element.

So it is not the returning energy, but the geometrical position of the target object that is evaluated (triangulation). With this process one can, for example, reliably detect a dark object on a light conveyor belt.

There are various ways to physically achieve background suppression. Generally one differentiates between a fixed and an adjustable background suppression.

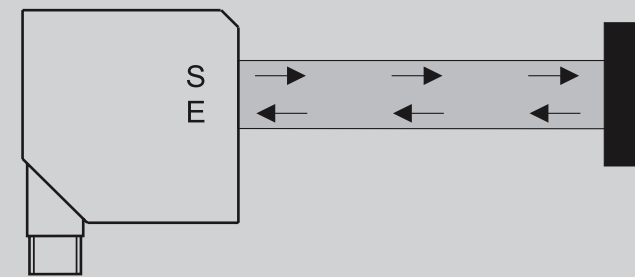
Laser devices are particularly suitable for detecting the smallest of objects. A red-light sensor should be employed for larger objects.



Monitoring pins

The fine light beam of the laser sensor permits the precise detection of even such small objects without any impairment by the background.

Proximity sensors



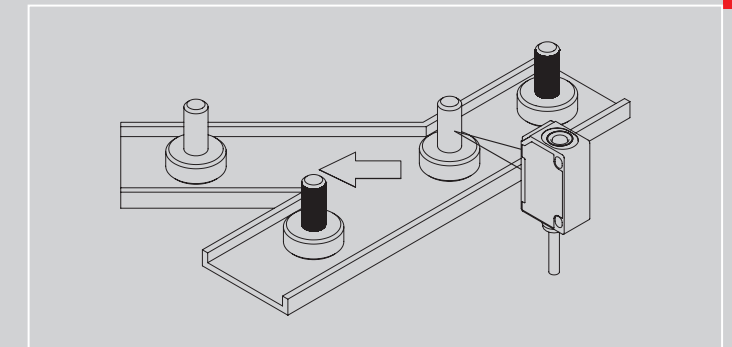
The transmitter and receiver of a proximity sensor are accommodated in a single housing. The light emitted by the transmitter hits the target object, which reflects the light. This returning light is evaluated by the receiver. The advantage of this method is that no reflector is required.

Because the scanner evaluates the reflected light and its energy, the range of conventional scanners (also called energetic or diffuse scanners) is largely dependent on the object's colour and its surface properties. Because black objects strongly absorb light, diffuse scanners can only achieve a very short range here. The surface structure is responsible for the type of reflection. Very rough, heterogeneous surfaces reflect diffusely, i.e. in all directions. Only a small percentage of the reflected light returns to the receiver. The scanning distance in this case is also low.

Proximity sensors based on energetic evaluation are therefore particularly suitable for the detection of larger objects or of objects whose material colour and surface properties remain constant.

One must also ensure that the quantity of light reflected back from the background is not greater than that reflected by the object itself. This effect occurs, for example, when a black object is in front of a white background. In this case detection with an energetic scanner is impossible. The use of a scanner with background suppression is recommended here.

The reliable detection of objects is possible if the background of the object is free, for example when an energetic scanner is mounted transversely over a conveyor belt. The setting of the sensor on the varying object surfaces and backgrounds takes place by means of a mechanical rotary switch on the sensor or via teach-in. The sensor can be set to a maximum scanning distance for a detection task without a background. A precise setting is necessary for applications with a background.



Rejection of uncoated parts

Brightness differences can be reliably detected by a diffuse scanner.

F 10 sub-miniature laser sensors

Small housings, great performance



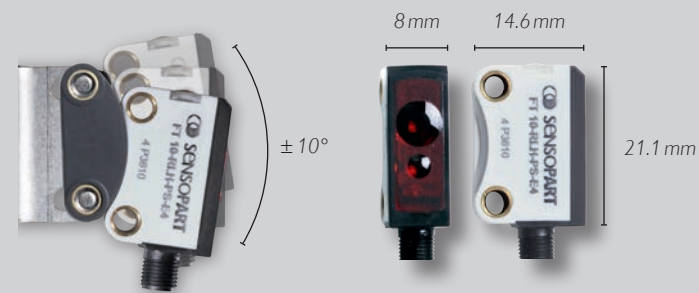
The F 10 is the only sub-miniature sensor on the market with laser light and adjustable background suppression. Its precise light spot is still so focused, even at longer distances, that small parts in the millimetre range can be reliably detected, e.g. a wire with a diameter of 0.5 mm at a distance of 60 mm. With such capabilities, the sensors of the F 10 series have nothing to fear from the considerably larger examples of their sort.

The F 10 series not only impresses through its excellent performance data, but also through its unmistakable design with special features – that are unique in this size of housing. The dovetail mounting system considerably simplifies fine adjustment, particularly in difficult installation locations, and the M5 plug allows rapid connection and exchange. A small sensor that gives users great pleasure!

Whether in handling and positioning applications, during the production of solar cells, or for the placement of semiconductor components, the sensors – just 21.1 x 14.6 x 8 mm³ in size and weighing only 3 grammes – even fit into a robot gripper without being a burden. With their great performance, the F 10 series is also an alternative to (considerably more expensive) fibre-optic systems.

made in Germany

TYPICAL F 10



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

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



Bright but harmless laser light:
The red-light laser of the F 10 generates a bright light spot that is also easily visible in daylight. Being in Laser Class 1, however, it poses no danger.

- Sub-miniature sensor for installation in the smallest of spaces and in moving machine parts
- The world's smallest laser sensor with adjustable background suppression
- Reliable suppression of sunlight and highly reflective machine parts
- Reliable detection of very dark, glossy and structured objects
- Bright, focused laser light spot for first-class small-part detection and simple alignment
- User-friendly commissioning via electronic Teach-in button or control line
- Well thought-out mounting accessories for rapid and easy integration
- Wide range of types to meet individual requirements
- Robust, detergent-proof plastic housing (IP 67, Ecolab) for use in harsh industrial environments
- Brass-reinforced mounting holes

| 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 | 202 |
| FT 10-RLHR | Laser | Teach-in | 60 mm | Broad-beam light spot | 204 |
| FT 10-B-RLF | Laser | Fixed focus | 15 mm / 30 mm | | 206 |
| Retroreflective photoelectric sensors | | | | | |
| FR 10-RL | Laser | Teach-in | 2 m | | 208 |
| Through-beam photoelectric sensors | | | | | |
| FS/FE 10-RL | Laser | Teach-in | 3 m | Sensor pair; very accurate object positioning | 210 |
| FS 10-RL/FE 10-RL | Laser | Teach-in | 3 m | Transmitter/receiver; very accurate object positioning | 212 |

FT 10-RLH

Laser photoelectric proximity sensor with background suppression



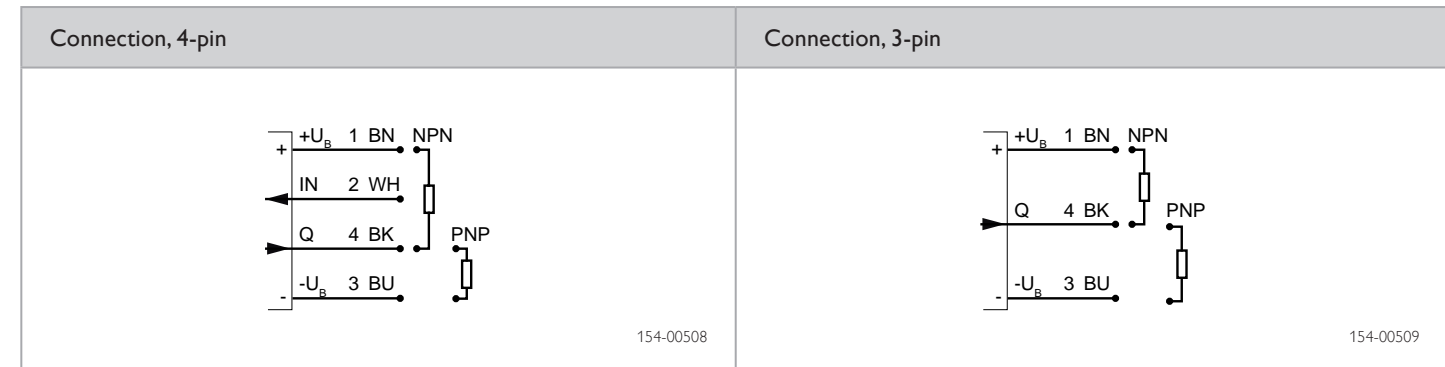
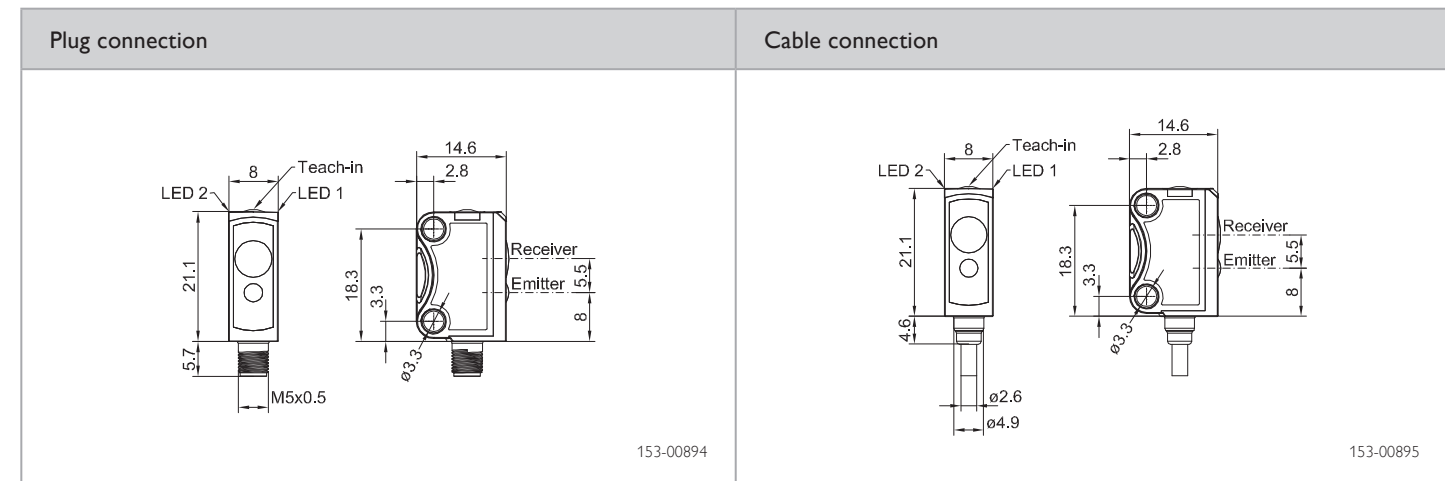
PRODUCT HIGHLIGHTS

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

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

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

| Scanning distance | Switching output | Type of connection | Part number | Article number |
|-------------------|------------------|-------------------------------------|------------------|----------------|
| 1 ... 60 mm | PNP | Plug, M5x0.5, 4-pin | FT 10-RLH-PS-E4 | 600-11130 |
| 1 ... 60 mm | NPN | Plug, M5x0.5, 4-pin | FT 10-RLH-NS-E4 | 600-11131 |
| 1 ... 60 mm | PNP | Cable, 2 m, 4-wire | FT 10-RLH-PS-K4 | 600-11132 |
| 1 ... 60 mm | NPN | Cable, 2 m, 4-wire | FT 10-RLH-NS-K4 | 600-11133 |
| 1 ... 60 mm | PNP | Pigtail, 200 mm with M8 plug, 4-pin | FT 10-RLH-PS-KM4 | 600-11134 |
| 1 ... 60 mm | NPN | Pigtail, 200 mm with M8 plug, 4-pin | FT 10-RLH-NS-KM4 | 600-11135 |
| 1 ... 60 mm | PNP | Pigtail, 200 mm with M8 plug, 3-pin | FT 10-RLH-PS-KM3 | 600-11146 |
| 1 ... 60 mm | NPN | Pigtail, 200 mm with M8 plug, 3-pin | FT 10-RLH-NS-KM3 | 600-11147 |



| Reference material | Detection range |
|--------------------|-----------------|
| White (90 %) | 1 ... 60 mm |
| Grey (18 %) | 5 ... 60 mm |
| Black (6 %) | 5 ... 60 mm |

| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



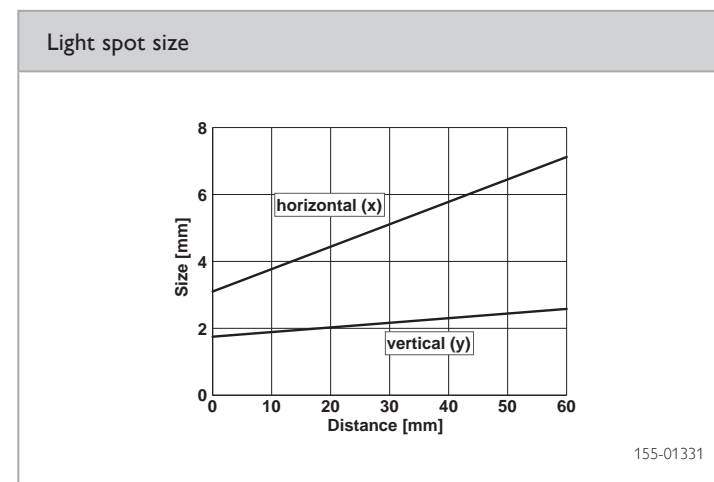
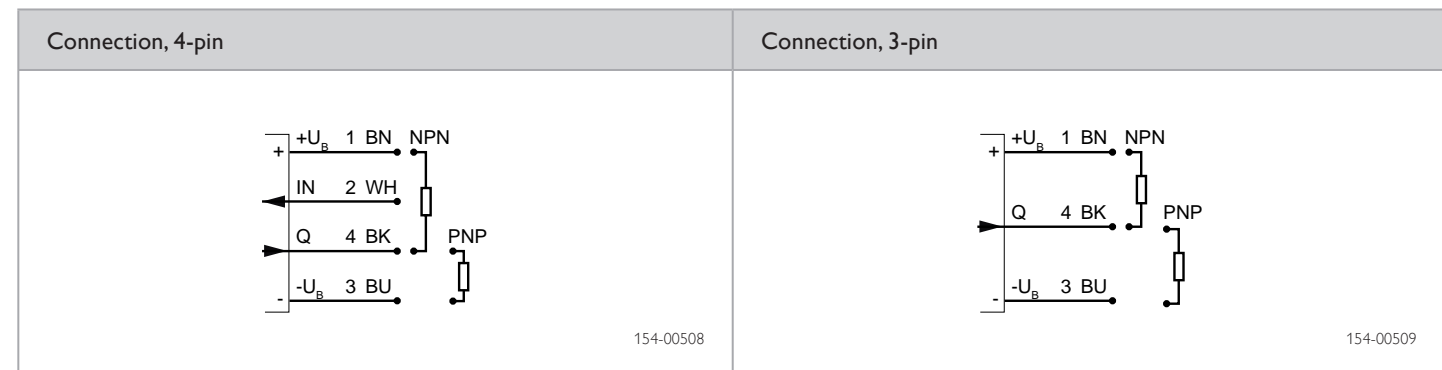
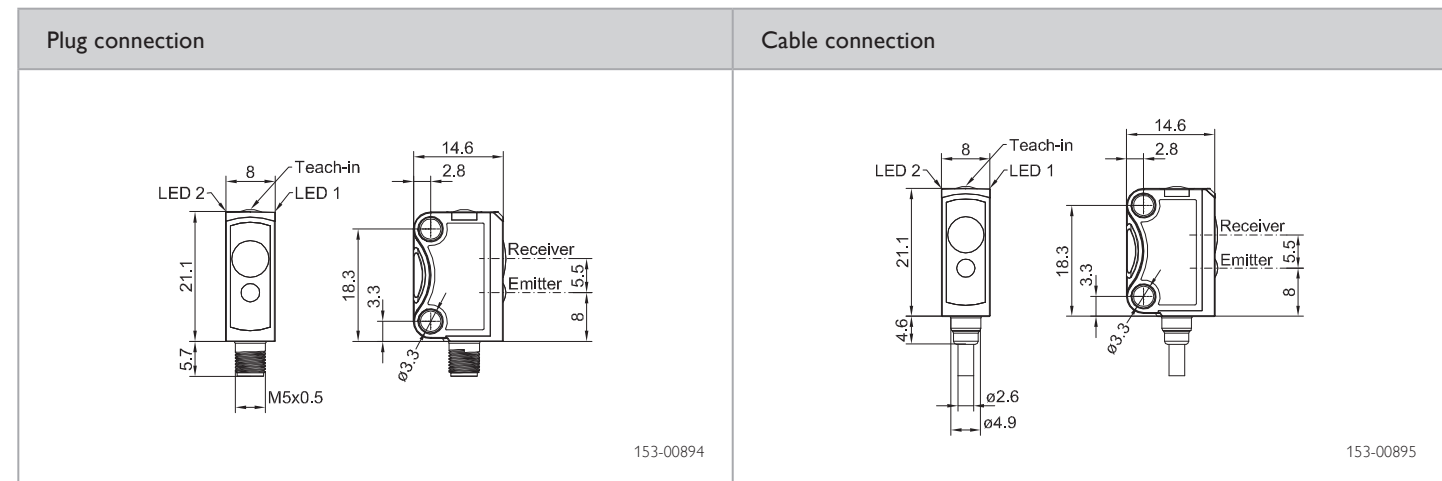
PRODUCT HIGHLIGHTS

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

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

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

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



| Reference material | Detection range |
|--------------------|-----------------|
| White (90 %) | 4 ... 60 mm |
| Grey (18 %) | 5 ... 60 mm |
| Black (6 %) | 5 ... 60 mm |

| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |

Laser photoelectric proximity sensor with background suppression, fixed focus



PRODUCT HIGHLIGHTS

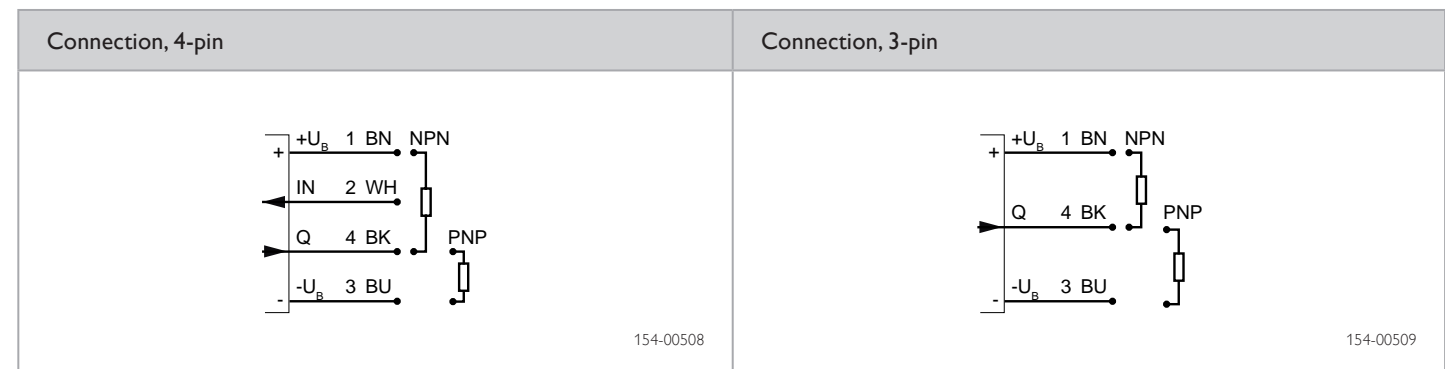
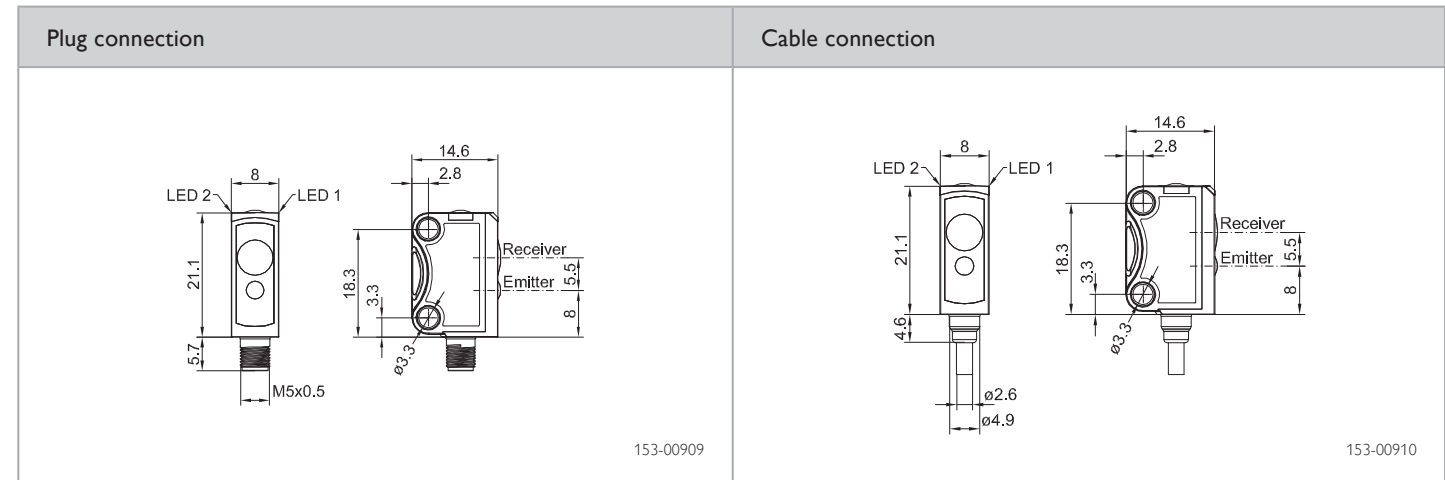
- Sub-miniature sensor with laser light and precise fixed background suppression
- Reliable switching behaviour even with varying object surfaces and colours
- Particularly suitable for detecting the smallest of parts and for installation in extremely confined spaces
- Tamper-proof sensor design – no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

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

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

| Operating range | Switching output | Type of connection | Part number | Article number |
|-----------------|------------------|-------------------------------------|---------------------|----------------|
| 1 ... 15 mm | PNP | Plug, M5x0.5, 4-pin | FT 10-B-RLF1-PS-E4 | 600-11100 |
| 1 ... 15 mm | NPN | Plug, M5x0.5, 4-pin | FT 10-B-RLF1-NS-E4 | 600-11101 |
| 1 ... 30 mm | PNP | Plug, M5x0.5, 4-pin | FT 10-B-RLF2-PS-E4 | 600-11106 |
| 1 ... 30 mm | NPN | Plug, M5x0.5, 4-pin | FT 10-B-RLF2-NS-E4 | 600-11107 |
| 1 ... 15 mm | PNP | Cable, 2 m, 4-wire | FT 10-B-RLF1-PS-K4 | 600-11102 |
| 1 ... 15 mm | NPN | Cable, 2 m, 4-wire | FT 10-B-RLF1-NS-K4 | 600-11103 |
| 1 ... 30 mm | PNP | Cable, 2 m, 4-wire | FT 10-B-RLF2-PS-K4 | 600-11108 |
| 1 ... 30 mm | NPN | Cable, 2 m, 4-wire | FT 10-B-RLF2-NS-K4 | 600-11109 |
| 1 ... 15 mm | PNP | Pigtail, 200 mm with M8 plug, 4-pin | FT 10-B-RLF1-PS-KM4 | 600-11104 |
| 1 ... 15 mm | NPN | Pigtail, 200 mm with M8 plug, 4-pin | FT 10-B-RLF1-NS-KM4 | 600-11105 |
| 1 ... 30 mm | PNP | Pigtail, 200 mm with M8 plug, 4-pin | FT 10-B-RLF2-PS-KM4 | 600-11110 |
| 1 ... 30 mm | NPN | Pigtail, 200 mm with M8 plug, 4-pin | FT 10-B-RLF2-NS-KM4 | 600-11111 |

| Operating range | Switching output | Type of connection | Part number | Article number |
|-----------------|------------------|-------------------------------------|---------------------|----------------|
| 1 ... 15 mm | PNP | Pigtail, 200 mm with M8 plug, 3-pin | FT 10-B-RLF1-PS-KM3 | 600-11142 |
| 1 ... 15 mm | NPN | Pigtail, 200 mm with M8 plug, 3-pin | FT 10-B-RLF1-NS-KM3 | 600-11143 |
| 1 ... 30 mm | PNP | Pigtail, 200 mm with M8 plug, 3-pin | FT 10-B-RLF2-PS-KM3 | 600-11144 |
| 1 ... 30 mm | NPN | Pigtail, 200 mm with M8 plug, 3-pin | FT 10-B-RLF2-NS-KM3 | 600-11145 |



| Reference material | Detection range |
|--------------------|---------------------|
| White (90 %) | 1 ... 15 mm / 30 mm |
| Grey (18 %) | 5 ... 15 mm / 30 mm |
| Black (6 %) | 5 ... 15 mm / 30 mm |

| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



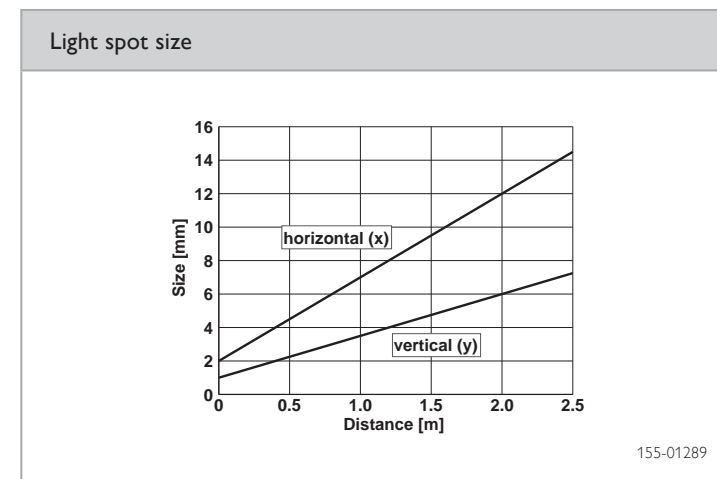
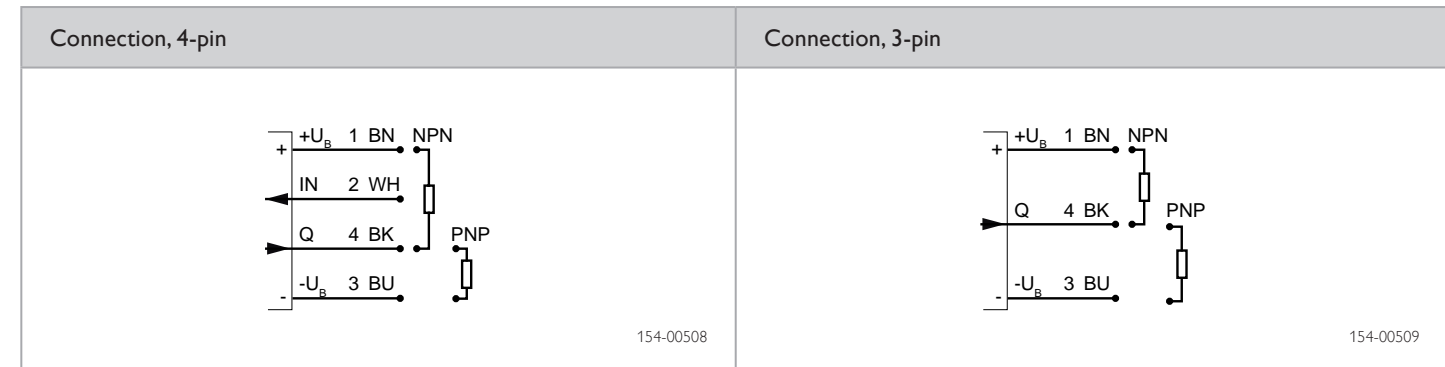
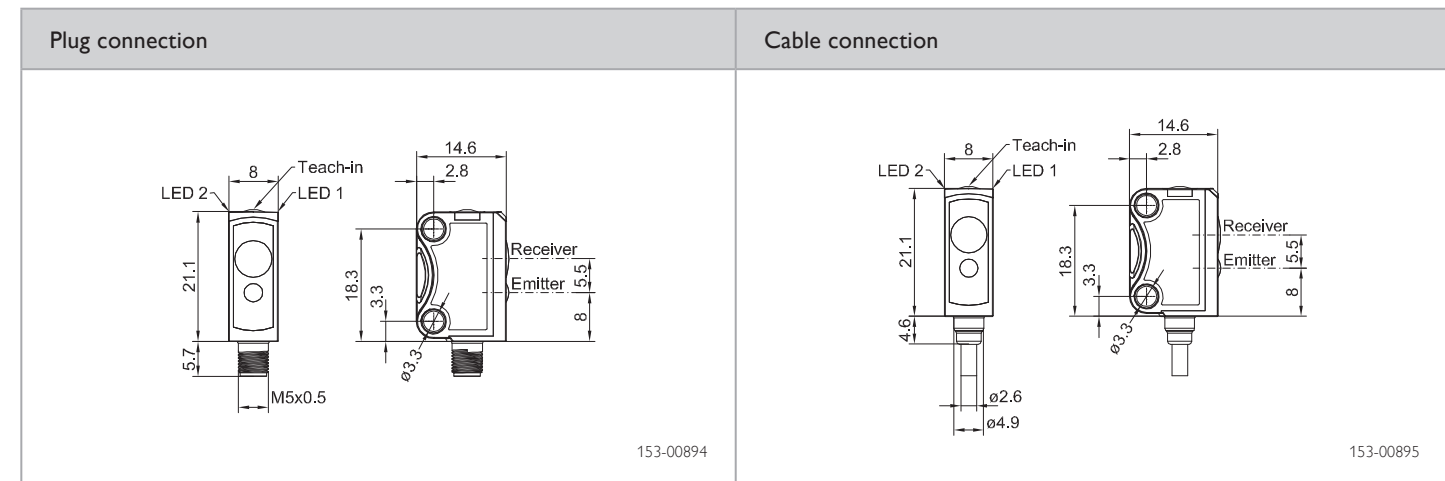
PRODUCT HIGHLIGHTS

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

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

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

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



| Reflector / reflective foil * | Operating range | Accessories | |
|-------------------------------|-----------------|-------------------|---------------|
| R5/L | 0.1 ... 2 m | Reflectors | From Page 654 |
| R2-2LB | 0.1 ... 2 m | Connection cables | From Page 670 |
| RF-50 KL* | 0.06 ... 0.75 m | Brackets | From Page 642 |
| RF-230 KL* | 0.1 ... 2 m | | |



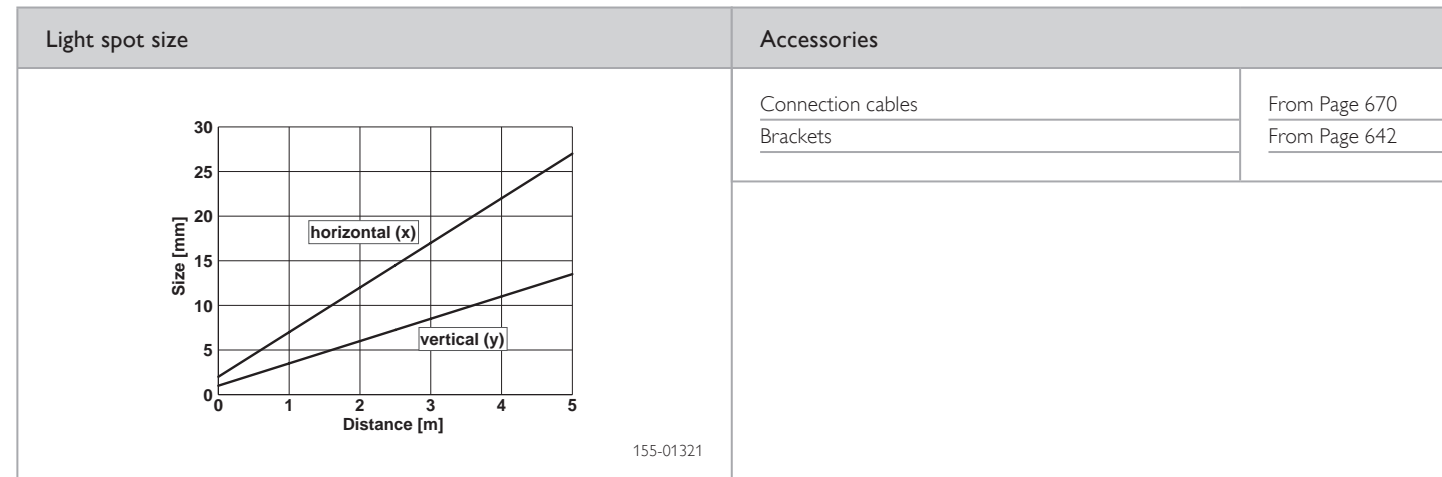
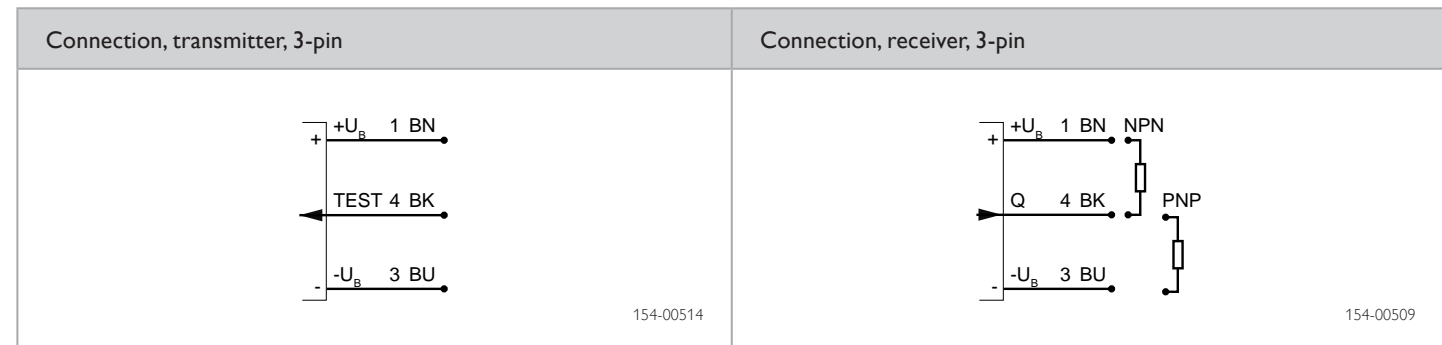
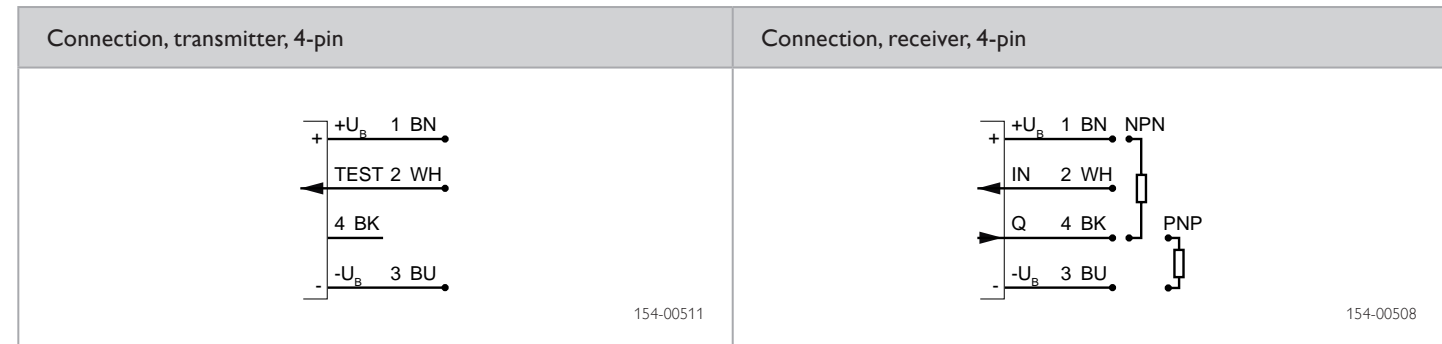
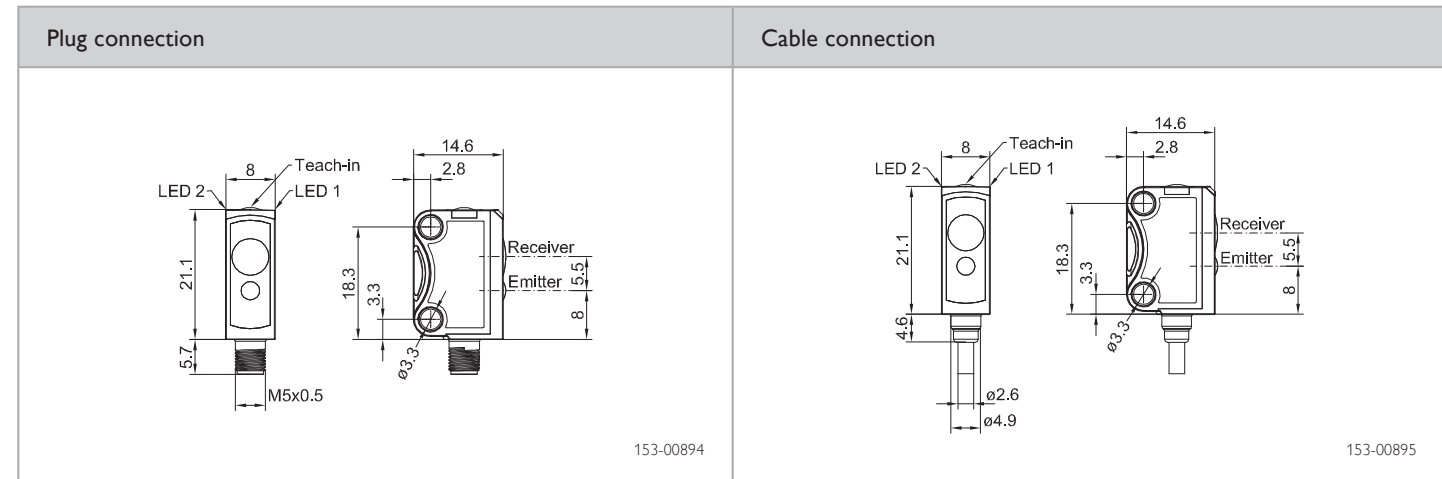
PRODUCT HIGHLIGHTS

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

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

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

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



FS 10-RL / FE 10-RL

Laser through-beam photoelectric sensor



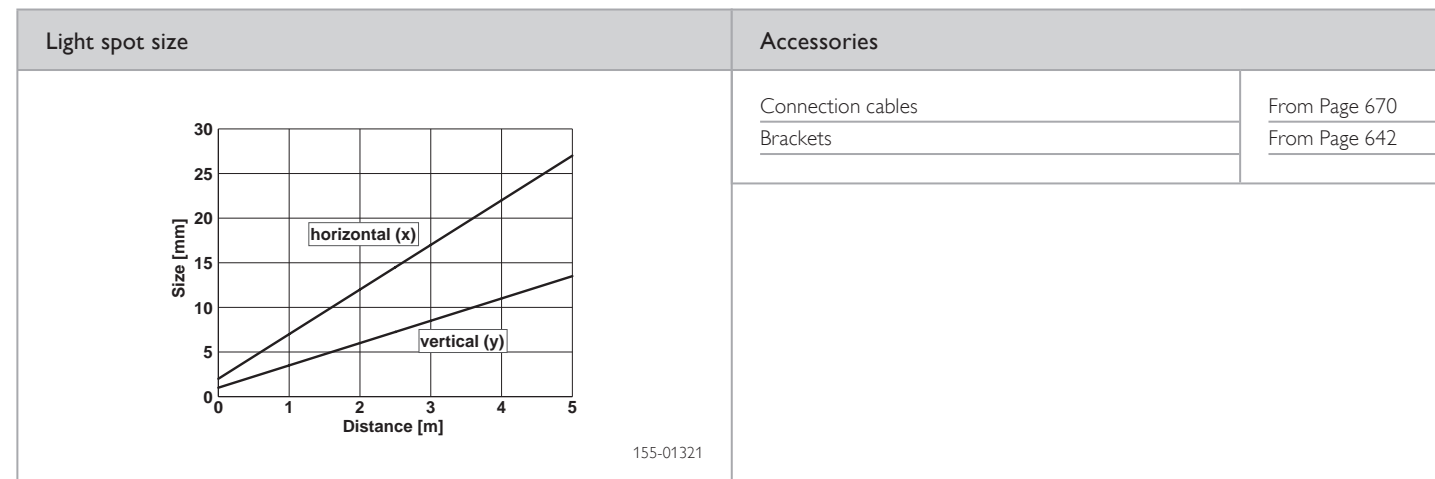
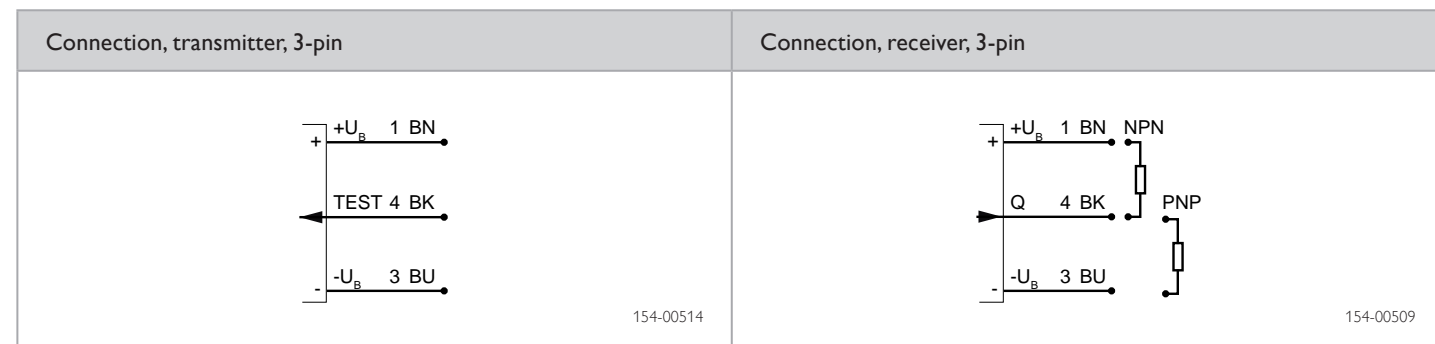
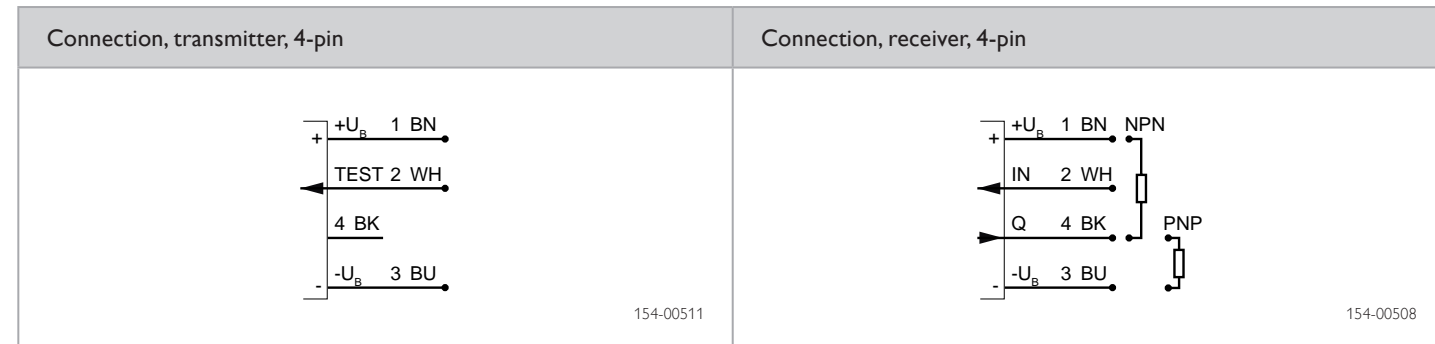
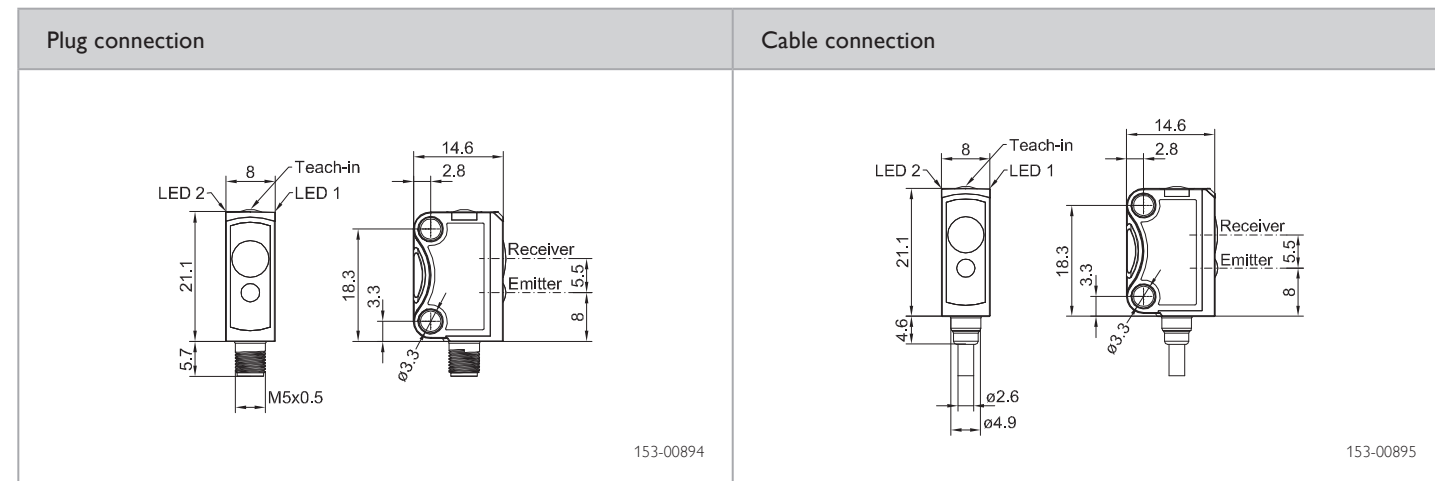
PRODUCT HIGHLIGHTS

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

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

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

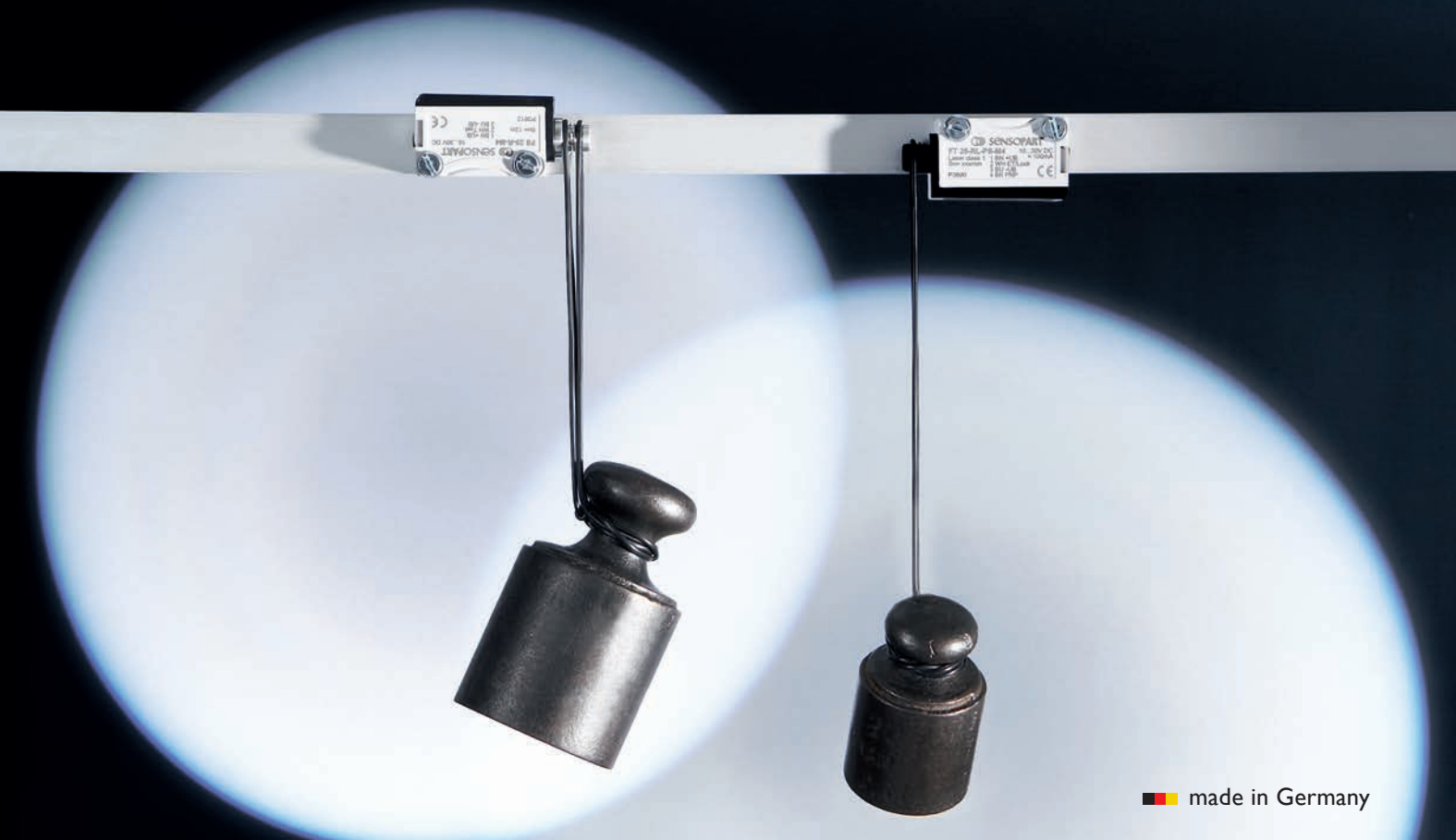
| Operating range | Switching output | Type of connection | Part number | Design | Article number |
|-----------------|------------------|-------------------------------------|-----------------|-------------|----------------|
| 1 ... 3 m | PNP | Plug, M5x0.5, 4-pin | FE 10-RL-PS-E4 | Receiver | 602-71000 |
| 1 ... 3 m | - | Plug, M5x0.5, 4-pin | FS 10-RL-E4 | Transmitter | 601-61000 |
| 1 ... 3 m | NPN | Plug, M5x0.5, 4-pin | FE 10-RL-NS-E4 | Receiver | 602-71001 |
| 1 ... 3 m | PNP | Cable, 2 m, 4-wire | FE 10-RL-PS-K4 | Receiver | 602-71002 |
| 1 ... 3 m | - | Cable, 2 m, 4-wire | FS 10-RL-K4 | Transmitter | 601-61002 |
| 1 ... 3 m | NPN | Cable, 2 m, 4-wire | FE 10-RL-NS-K4 | Receiver | 602-71003 |
| 1 ... 3 m | PNP | Pigtail, 200 mm with M8 plug, 4-pin | FE 10-RL-PS-KM4 | Receiver | 602-71004 |
| 1 ... 3 m | - | Pigtail, 200 mm with M8 plug, 4-pin | FS 10-RL-KM4 | Transmitter | 601-61004 |
| 1 ... 3 m | NPN | Pigtail, 200 mm with M8 plug, 4-pin | FE 10-RL-NS-KM4 | Receiver | 602-71005 |
| 1 ... 3 m | PNP | Pigtail, 200 mm with M8 plug, 3-pin | FE 10-RL-PS-KM3 | Receiver | 602-71006 |
| 1 ... 3 m | - | Pigtail, 200 mm with M8 plug, 3-pin | FS 10-RL-KM3 | Transmitter | 601-61005 |
| 1 ... 3 m | NPN | Pigtail, 200 mm with M8 plug, 3-pin | FE 10-RL-NS-KM3 | Receiver | 602-71008 |



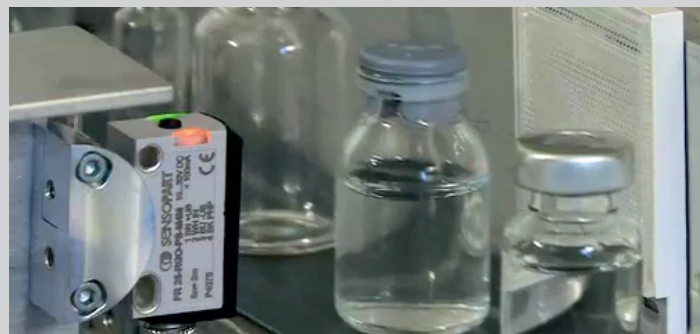
| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |

F 25 – the miniature sensor family of the new generation

The best of its type



made in Germany



The specialist for glass detection:

The FR 25-RGO retroreflective photoelectric sensor has been specially designed for detecting transparent objects. It offers absolutely precise and reproducible switching behaviour thanks to its autocollimation principle and automatic adaptation of the switching threshold (the DELTA function).



(Left) **Simple mounting, precise adjustment:** The robust aluminium dovetail mounting is particularly suitable when installation space is limited. It allows easy and accurate fine adjustment of the sensor after installation.

Precise background suppression: Thanks to extremely precise background suppression, the sensors of the F 25 series are completely immune to reflective and glossy machine parts and background effects. Together with switching that is independent of colour and object properties, F 25 sensors are the best on the market.

TYPICAL F 25

- The best black/white-shift on the market in this sensor class
- Precise background suppression thanks to the ASIC microchip
- Auto-detect: automatic adjustment of the switching output (PNP/NPN), unique on the market
- Precise detection of transparent objects of any shape (FR-25-RGO with DELTA function)
- Long ranges with compact miniature housing
- All sensors available in laser and LED designs
- Robust glass-fibre-reinforced plastic housings (IP 69K & IP 67, Ecolab)
- Robust sensor design with metal plug and mounting holes reinforced with metal inserts
- Simplest mounting thanks to dovetail, patented rod mounting and clamping jaws
- Safe operation thanks to Laser Class 1

The right sensor for every application: the new F 25 sensor family from SensoPart offers a very large range of variants – from the LED through-beam photoelectric sensor to the laser photoelectric proximity sensor with adjustable background suppression. Everything that the user could want is in the programme, including special applications: the FR 25-RGO autocollimation sensor detects transparent objects of any shape whilst automatically adapting its switching threshold to the operating conditions (the DELTA function).

Whether small-part detection or checking presence on a conveyor belt, the excellent performance of the F 25 series is always impressive. Thus the FT 25-RHD scanner not only offers very

precise background suppression, but also the best black/white-shift in its class.

The mounting and operation of the F 25 sensors are also things of joy. The robust design with tightly sealed housings (IP 69K & IP 67), the tough metal plugs and mounting holes with metal inserts, the simple dovetail mounting, the easy setup via teach-in or control input, and the many other clever details ensure uncomplicated and efficient operating processes. Not to mention the Auto-detect function that is exclusive to SensoPart: sensors equipped with it autonomously detect whether there is PNP or NPN wiring. So many things at once – truly unique!

F 25 – Product Overview

| | Type of light | Adjustment | Scanning distance / range | Special features | Page |
|--|---------------|---------------|---------------------------|---|------|
| Photoelectric proximity sensors with background suppression | | | | | |
| FT 25-RLH | Laser | Teach-in | 120 mm | Most accurate small-part detection | 216 |
| FT 25-RH | LED | Teach-in | 200 mm | | 218 |
| FT 25-RHD | LED | Teach-in | 400 mm | | 220 |
| FT 25-RF1/2 | LED | Fixed focus | 60 mm / 80 mm | | 222 |
| Photoelectric proximity sensors | | | | | |
| FT 25-RL | Laser | Teach-in | 250 mm | Detection of minimal grey value differences | 224 |
| FT 25-R | LED | Teach-in | 800 mm | | 226 |
| Retroreflective photoelectric sensors | | | | | |
| FR 25-RGO | LED | Teach-in | 2 m | Autocollimation, detection of transparent objects | 228 |
| FR 25-RO | LED | Teach-in | 2 m | Autocollimation | 230 |
| FR 25-RL | Laser | Teach-in | 15 m | Most accurate small-part detection | 232 |
| FR 25-R | LED | Teach-in | 7 m | | 234 |
| FR 25-RF | LED | Fixed setting | 5 m | | 236 |
| Through-beam photoelectric sensors | | | | | |
| FS/FE 25-RL | Laser | Teach-in | 20 m | Most accurate small-part detection | 238 |
| FS/FE 25-R | LED | Teach-in | 15 m | | 240 |
| FS/FE 25-RF | LED | Fixed setting | 6 m | | 242 |



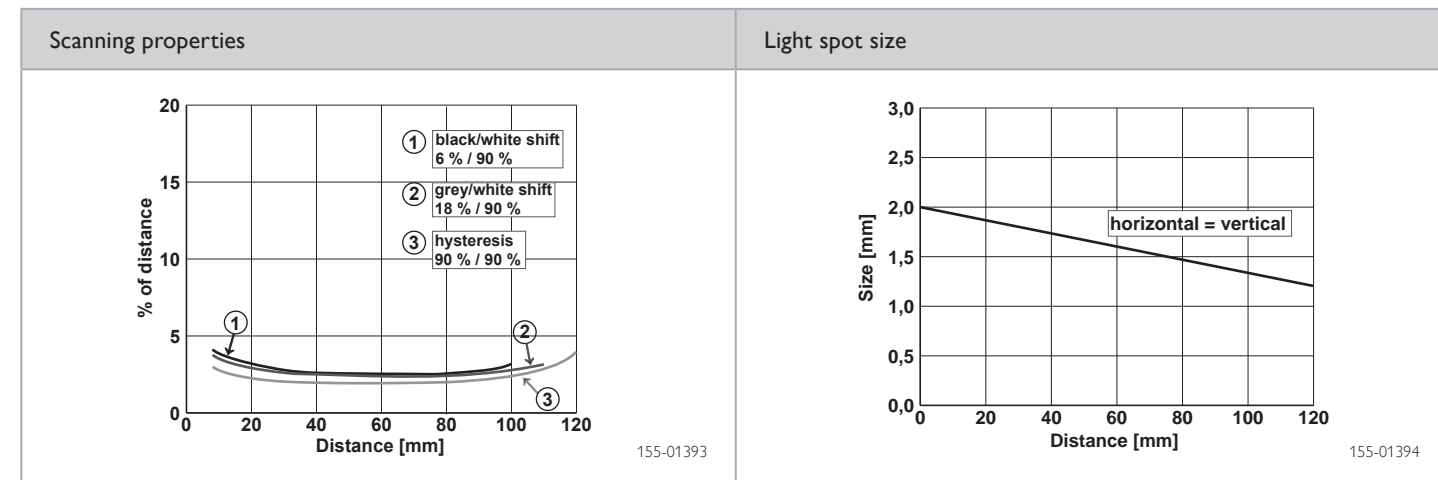
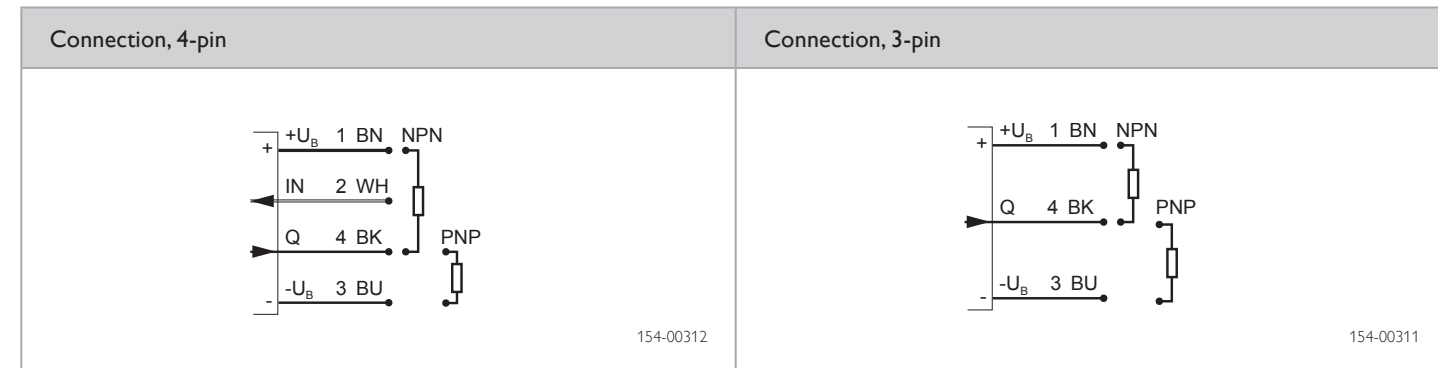
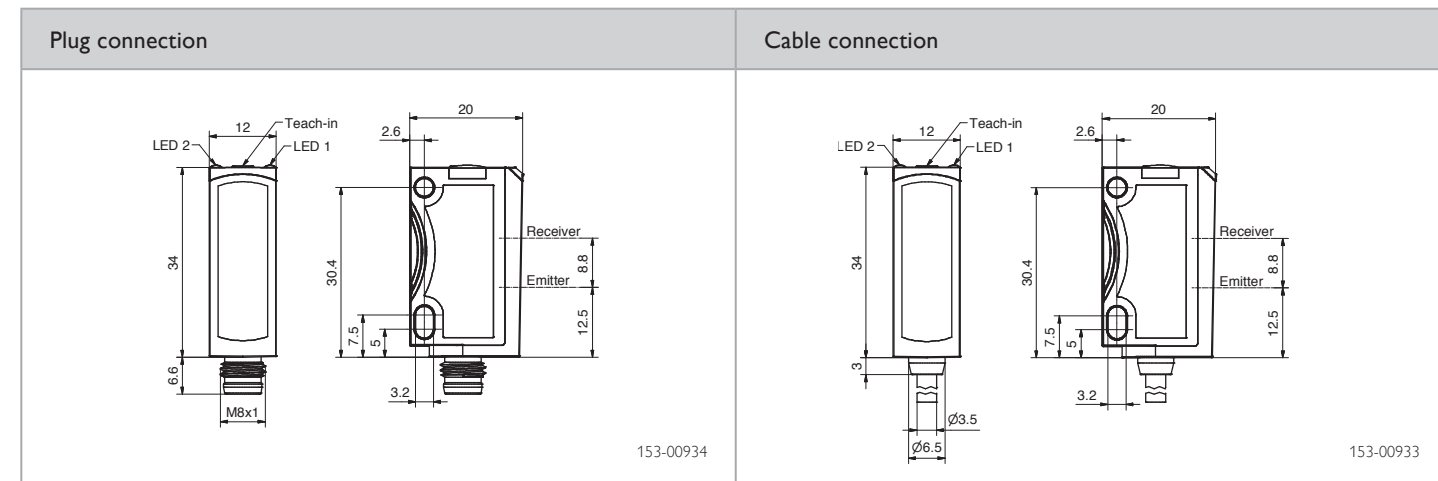
PRODUCT HIGHLIGHTS

- Precisely adjustable background suppression
- Reliable switching despite varying object colours and surfaces
- Reliable operation even with highly reflective backgrounds, thanks to SensoPart ASIC technology
- Particularly suitable for the detection of the smallest of objects
- Simple alignment thanks to easily visible light spot
- Robust glass-fibre-reinforced plastic housings

| Optical data | | Functions | |
|--|--|---------------------------------|--|
| Scanning distance | 4 ... 120 mm ¹ | Indicator LED, green | Operating voltage indicator |
| Adjustment range | 10 ... 120 mm ¹ | Indicator LED, yellow | Switching output indicator |
| Type of light | Laser, red, 650 nm | Scanning distance adjustment | Via Teach-in button and control input |
| Light spot size | See diagram | Teach-in modes | Mode 1: during running process Mode 2: during standing process |
| Laser Class (DIN EN 60825-1:2008-5) | 1 | Adjustment possibilities | N.O./N.C. via Teach-in button and control input Button lock via control input |
| | | Default settings | Max. scanning distance and N.O. |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30V DC ² | Dimensions | 34 x 20 x 12 mm ³ |
| No-load current, I ₀ | ≤ 30 mA | Enclosure rating | IP 69K & 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) |
| Standby time | < 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 | Weight (pigtail) | 20 g |
| Control input, IN ³ | +U _B = teach-in -U _B = button locked Open = normal operation | Vibration and impact resistance | EN 60947-5-2 |

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 / IP 69K plug

| Scanning distance | Switching output | Type of connection | Part number | Article number |
|-------------------|------------------|---------------------------------------|------------------|----------------|
| 4 ... 120 mm | PNP | Plug, M8x1, 3-pin | FT 25-RLH-PS-M3 | 609-11011 |
| 4 ... 120 mm | PNP | Plug, M8x1, 4-pin | FT 25-RLH-PS-M4 | 609-11005 |
| 4 ... 120 mm | NPN | Plug, M8x1, 4-pin | FT 25-RLH-NS-M4 | 609-11002 |
| 4 ... 120 mm | PNP | Metal plug, M8x1, 3-pin | FT 25-RLH-PS-M3M | 609-11007 |
| 4 ... 120 mm | NPN | Metal plug, M8x1, 3-pin | FT 25-RLH-NS-M3M | 609-11008 |
| 4 ... 120 mm | PNP | Metal plug, M8x1, 4-pin | FT 25-RLH-PS-M4M | 609-11009 |
| 4 ... 120 mm | NPN | Metal plug, M8x1, 4-pin | FT 25-RLH-NS-M4M | 609-11010 |
| 4 ... 120 mm | PNP | Cable, 2 m, 4-wire | FT 25-RLH-PS-K4 | 609-11004 |
| 4 ... 120 mm | NPN | Cable, 2 m, 4-wire | FT 25-RLH-NS-K4 | 609-11001 |
| 4 ... 120 mm | PNP | Pigtail, 150 mm with plug, M12, 4-pin | FT 25-RLH-PS-KL4 | 609-11006 |
| 4 ... 120 mm | NPN | Pigtail, 150 mm with plug, M12, 4-pin | FT 25-RLH-NS-KL4 | 609-11003 |



| Reference material | Detection range |
|--------------------|-----------------|
| White (90 %) | 4 ... 120 mm |
| Grey (18 %) | 5 ... 110 mm |
| Black (6 %) | 8 ... 100 mm |

| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



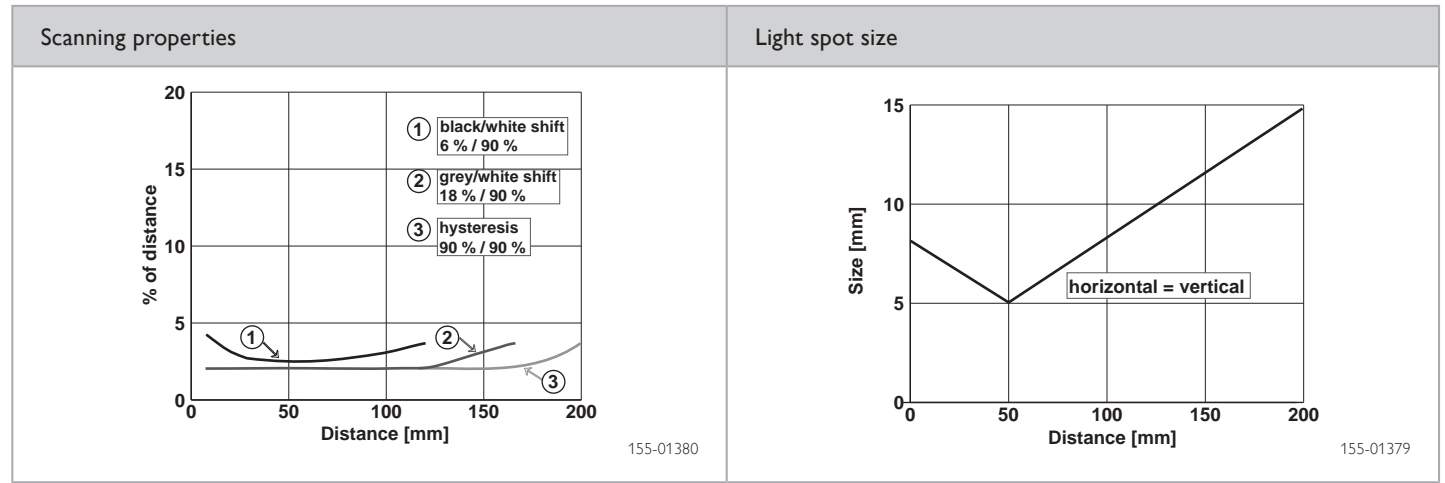
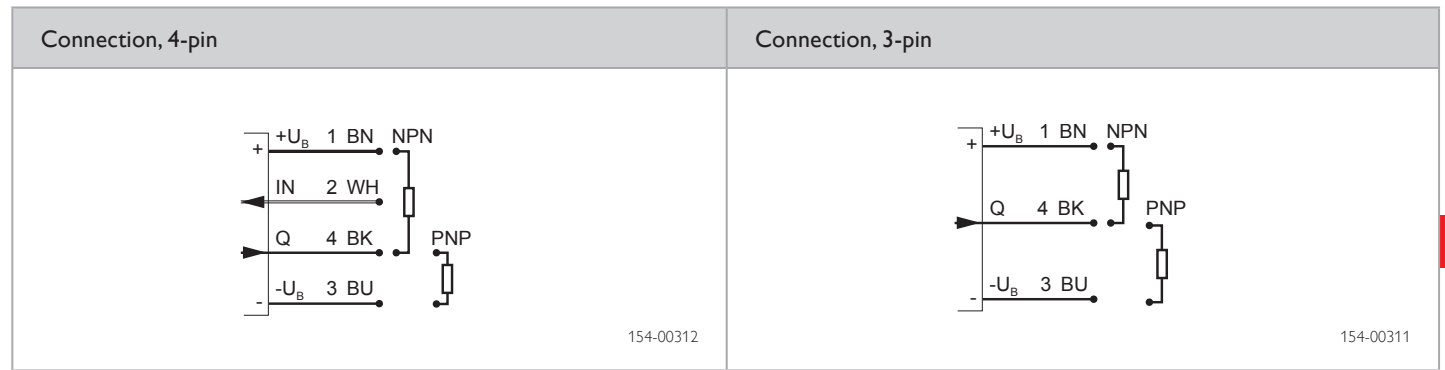
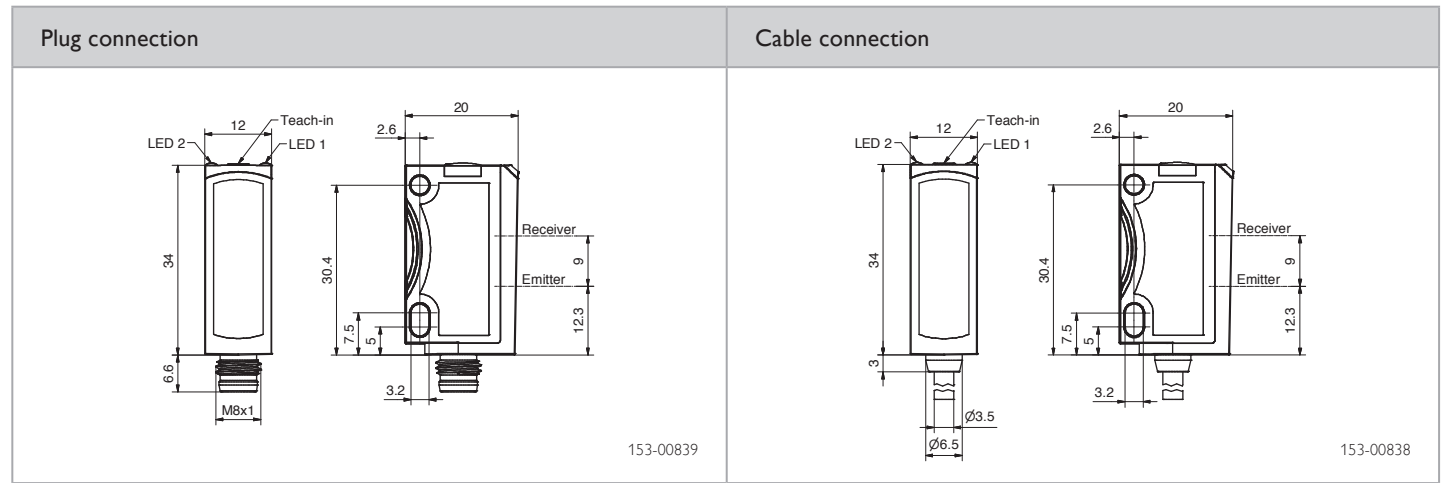
PRODUCT HIGHLIGHTS

- Precisely adjustable background suppression
- Reliable switching despite varying object colours and surfaces
- Reliable operation even with highly reflective backgrounds, thanks to SensoPart ASIC technology
- Simple alignment thanks to easily visible light spot
- Sensor setting via teach-in and control input
- Robust glass-fibre-reinforced plastic housings

| Optical data | | Functions | |
|------------------------------------|--|---------------------------------|--|
| Scanning distance | 1 ... 200 mm ¹ | Indicator LED, green | Operating voltage indicator |
| Adjustment range | 10 ... 200 mm ¹ | Indicator LED, yellow | Switching output indicator |
| Type of light | LED, red, 632 nm | Scanning distance adjustment | Via Teach-in button and control input |
| Light spot size | See diagram | Teach-in modes | Mode 1: during running process Mode 2: during standing process |
| | | 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 ... 30 V DC ² | Dimensions | 34 x 20 x 12 mm ³ |
| No-load current, I ₀ | ≤ 30 mA | Enclosure rating | IP 69K & 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) |
| Standby time | < 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 | Weight (pigtail) | 20 g |
| Control input, IN ³ | +U _B = teach-in -U _B = button locked Open = normal operation | Vibration and impact resistance | EN 60947-5-2 |

¹ Reference material: white, 90 % reflectivity ² Max. 10 % ripple, within UB, ~ 50 Hz / 100 Hz ³ Only 4-pin design ⁴ With connected IP 67 / IP 69K plug

| Scanning distance | Switching output | Type of connection | Part number | Article number |
|-------------------|------------------|---------------------------------------|-----------------|----------------|
| 1 ... 200 mm | PNP | Plug, M8x1, 4-pin | FT 25-RH-PS-M4 | 608-11004 |
| 1 ... 200 mm | NPN | Plug, M8x1, 4-pin | FT 25-RH-NS-M4 | 608-11006 |
| 1 ... 200 mm | PNP | Metal plug, M8x1, 3-pin | FT 25-RH-PS-M3M | 608-11012 |
| 1 ... 200 mm | NPN | Metal plug, M8x1, 3-pin | FT 25-RH-NS-M3M | 608-11013 |
| 1 ... 200 mm | PNP | Metal plug, M8x1, 4-pin | FT 25-RH-PS-M4M | 608-11014 |
| 1 ... 200 mm | NPN | Metal plug, M8x1, 4-pin | FT 25-RH-NS-M4M | 608-11015 |
| 1 ... 200 mm | PNP | Cable, 2 m, 4-wire | FT 25-RH-PS-K4 | 608-11005 |
| 1 ... 200 mm | NPN | Cable, 2 m, 4-wire | FT 25-RH-NS-K4 | 608-11007 |
| 1 ... 200 mm | PNP | Pigtail, 150 mm with plug, M12, 4-pin | FT 25-RH-PS-KL4 | 608-11008 |
| 1 ... 200 mm | NPN | Pigtail, 150 mm with plug, M12, 4-pin | FT 25-RH-NS-KL4 | 608-11009 |



| Reference material | Detection range |
|--------------------|-----------------|
| White (90 %) | 1 ... 200 mm |
| Grey (18 %) | 2 ... 160 mm |
| Black (6 %) | 4 ... 120 mm |

| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



PRODUCT HIGHLIGHTS

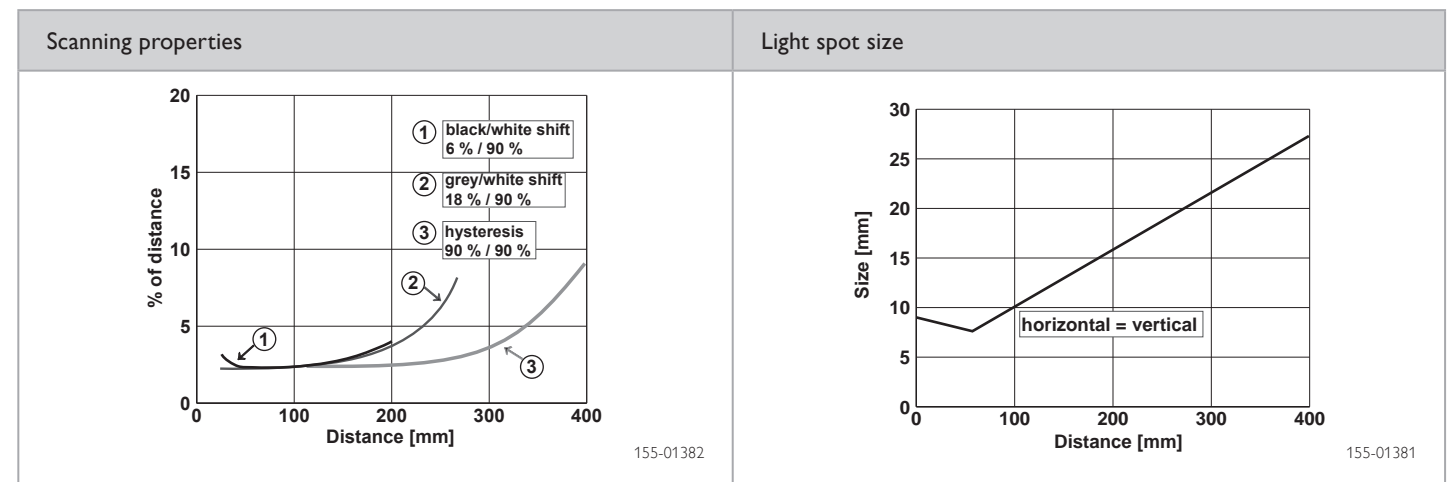
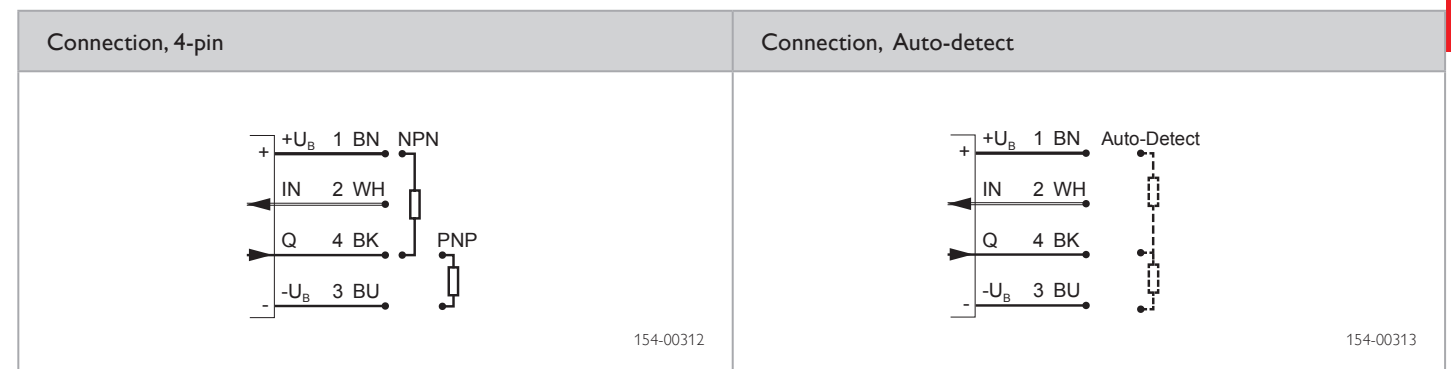
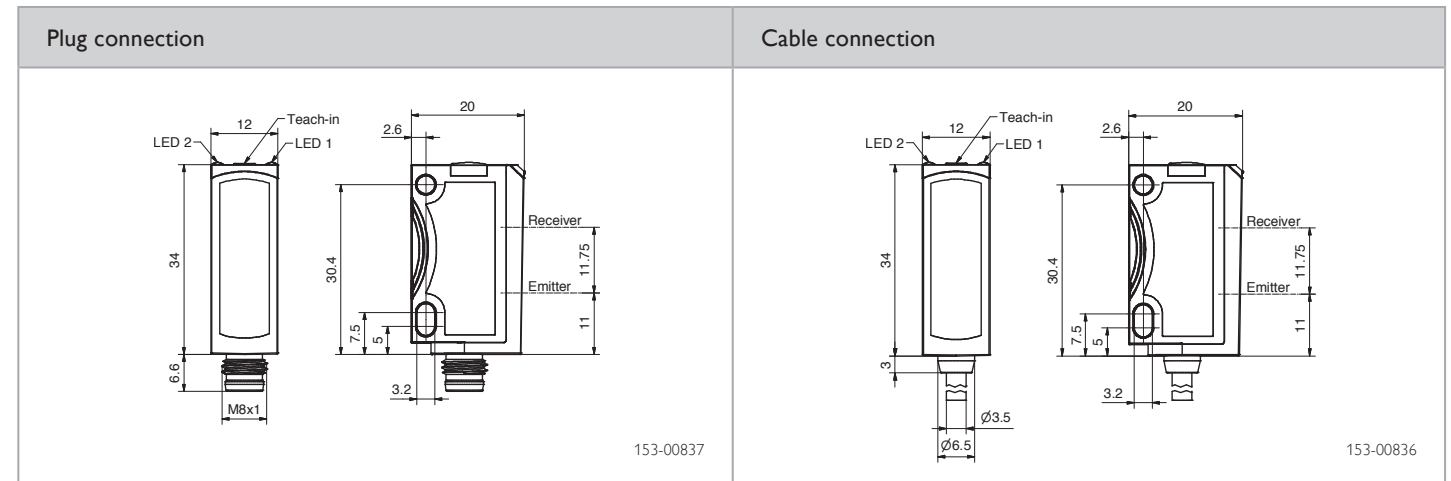
- Auto-detect photoelectric proximity sensor with real PNP and real NPN functions
- Precisely adjustable background suppression
- Long scanning distance of 400 mm with small and compact housings
- Reliable operation even with highly reflective backgrounds, thanks to SensoPart ASIC technology
- Simple alignment thanks to easily visible light spot
- Robust glass-fibre-reinforced plastic housings

| Optical data | | Functions | |
|------------------------------------|--|---------------------------------|---|
| Scanning distance | 3 ... 400 mm ¹ | Indicator LED, green | Operating voltage indicator |
| Adjustment range | 30 ... 400 mm ¹ | Indicator LED, yellow | Switching output indicator |
| Type of light | LED, red, 632 nm | Scanning distance adjustment | Via Teach-in button and control input |
| Light spot size | See diagram | Teach-in modes | Mode 1: during running process Mode 2: during standing process |
| | | Adjustment possibilities | N.O./N.C. via Teach-in button and control input Button lock via control input Auto-detect / NPN/PNP via Teach-in button and control input (only Auto-detect variants) |
| | | Default settings | Max. scanning distance and N.O. |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30V DC ² | Dimensions | 34 x 20 x 12 mm ³ |
| No-load current, I ₀ | ≤ 30 mA | Enclosure rating | IP 69K & 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) |
| Standby time | < 300 ms | Ambient temperature: operation | -20 ... +60 °C |
| Switching output, Q | PNP/NPN / Auto-detect (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 | Weight (pigtail) | 20 g |
| Control input, IN | +U _B = teach-in, -U _B = button locked Open = normal operation | Vibration and impact resistance | EN 60947-5-2 |

¹ Reference material: white, 90 % reflectivity ² Max. 10 % ripple, within U_B ~ 50 Hz / 100 Hz ³ With connected IP 67 / IP 69K plug

| Scanning distance | Switching output | Type of connection | Part number | Article number |
|-------------------|------------------|---------------------------------------|------------------|----------------|
| 3 ... 400 mm | PNP | Plug, M8x1, 4-pin | FT 25-RHD-PS-M4 | 608-11000 |
| 3 ... 400 mm | NPN | Plug, M8x1, 4-pin | FT 25-RHD-NS-M4 | 608-11002 |
| 3 ... 400 mm | PNP | Metal plug, M8x1, 4-pin | FT 25-RHD-PS-M4M | 608-11016 |
| 3 ... 400 mm | NPN | Metal plug, M8x1, 4-pin | FT 25-RHD-NS-M4M | 608-11017 |
| 3 ... 400 mm | PNP | Cable, 2 m, 4-wire | FT 25-RHD-PS-K4 | 608-11001 |
| 3 ... 400 mm | NPN | Cable, 2 m, 4-wire | FT 25-RHD-NS-K4 | 608-11003 |
| 3 ... 400 mm | PNP | Pigtail, 150 mm with plug, M12, 4-pin | FT 25-RHD-PS-KL4 | 608-11010 |

| Scanning distance | Switching output | Type of connection | Part number | Article number |
|-------------------|------------------|---------------------------------------|-------------------|----------------|
| 3 ... 400 mm | NPN | Pigtail, 150 mm with plug, M12, 4-pin | FT 25-RHD-NS-KL4 | 608-11011 |
| 3 ... 400 mm | Auto-detect | Metal plug, M8x1, 4-pin | FT 25-RHD-PNS-M4M | 608-11019 |



| Reference material | Detection range | Accessories |
|--------------------|-----------------|-------------------|
| White (90 %) | 3 ... 400 mm | Connection cables |
| Grey (18 %) | 6 ... 260 mm | Brackets |
| Black (6 %) | 12 ... 200 mm | |

Photoelectric proximity sensor with background suppression, fixed focus



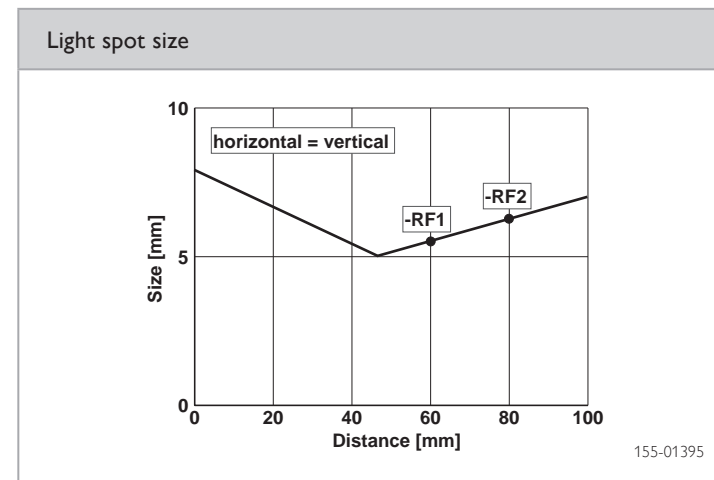
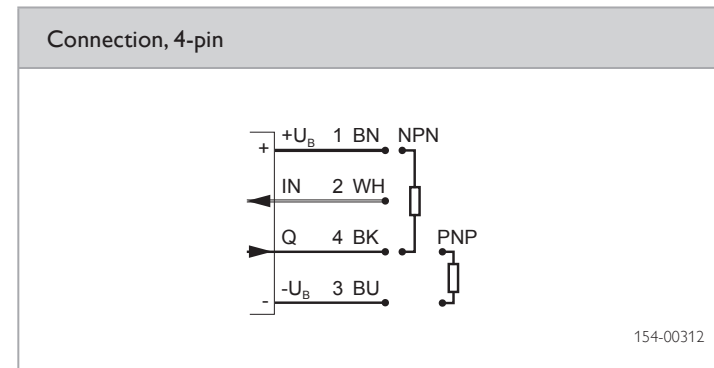
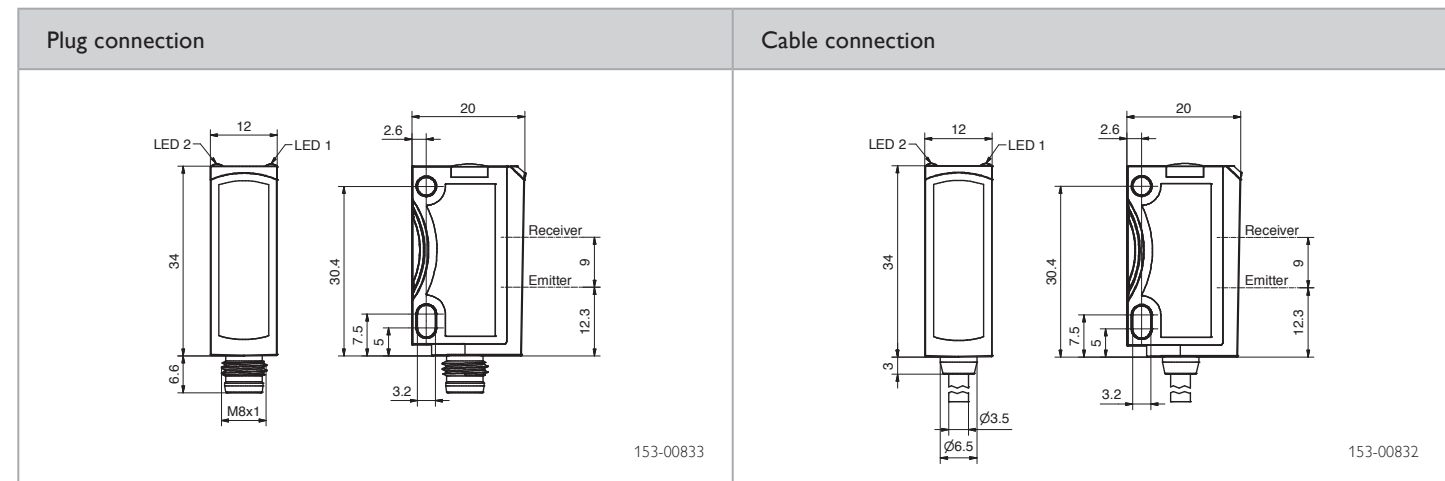
PRODUCT HIGHLIGHTS

- Precise fixed background suppression
- Economical solution for numerous applications
- Tamper-proof sensor design – no misalignment possible
- Simple alignment thanks to easily visible light spot
- Robust glass-fibre-reinforced plastic housings

| Optical data | | Functions | |
|------------------------------------|--|---------------------------------|------------------------------|
| Scanning distance | 1 ... 60 mm ¹ / 1 ... 80 mm ¹ | Indicator LED, green | Operating voltage indicator |
| Type of light | LED, red, 632 nm | Indicator LED, yellow | Switching output indicator |
| Light spot size | See diagram | Adjustment possibilities | N.O./N.C. via control input |
| Hysteresis | ~ 5% ² | | |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30 V DC ³ | Dimensions | 34 x 20 x 12 mm ³ |
| No-load current, I ₀ | ≤ 30 mA | Enclosure rating | IP 69K & 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) |
| Standby time | < 300ms | 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 | Weight (pigtail) | 20 g |
| Control input, IN | +U _B = N.C. -U _B / Open = N.O. | Vibration and impact resistance | EN 60947-5-2 |

¹ Reference material: white, 90 % reflectivity ² Based on scanning distance ³ Max. 10 % ripple, within U_B, ~ 50 Hz / 100 Hz ⁴ With connected IP 67 / IP 69K plug

| Scanning distance | Switching output | Type of connection | Part number | Article number |
|-------------------|------------------|--------------------|-----------------|----------------|
| 1 ... 60 mm | PNP | Plug, M8x1, 4-pin | FT 25-RF1-PS-M4 | 608-11020 |
| 1 ... 60 mm | PNP | Cable, 2 m, 4-wire | FT 25-RF1-PS-K4 | 608-11021 |
| 1 ... 80 mm | PNP | Plug, M8x1, 4-pin | FT 25-RF2-PS-M4 | 608-11022 |
| 1 ... 80 mm | PNP | Cable, 2 m, 4-wire | FT 25-RF2-PS-K4 | 608-11023 |
| 1 ... 80 mm | NPN | Cable, 2 m, 4-wire | FT 25-RF2-NS-K4 | 608-11024 |



| Reference material | Detection range |
|--------------------|---------------------|
| White (90 %) | 1 ... 60 mm / 80 mm |
| Grey (18 %) | 2 ... 60 mm / 80 mm |
| Black (6 %) | 4 ... 60 mm / 80 mm |

| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



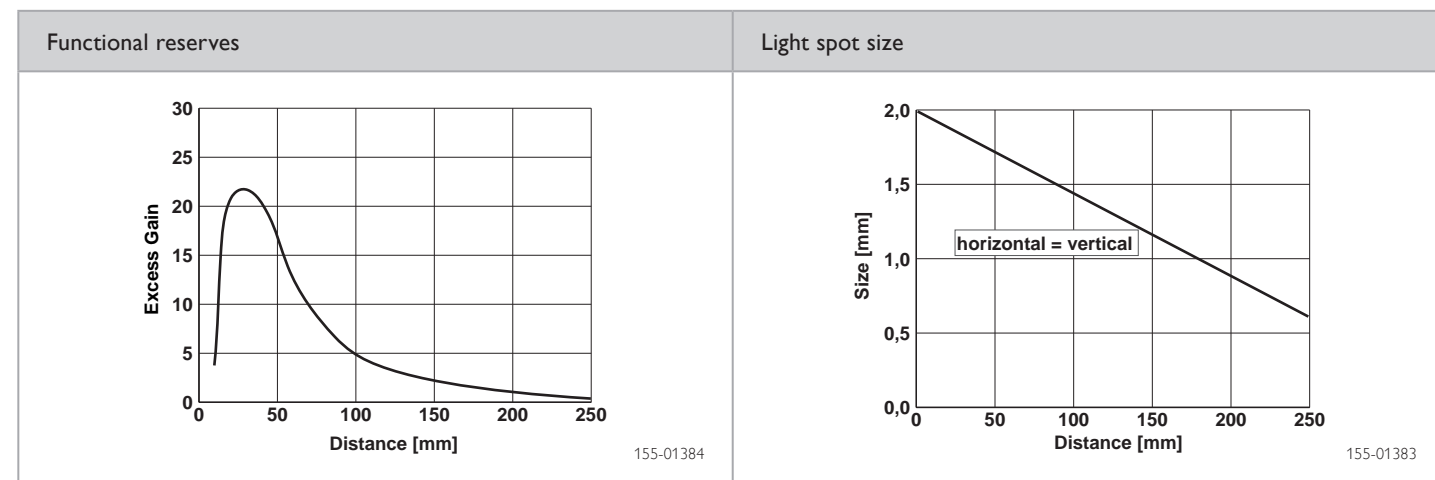
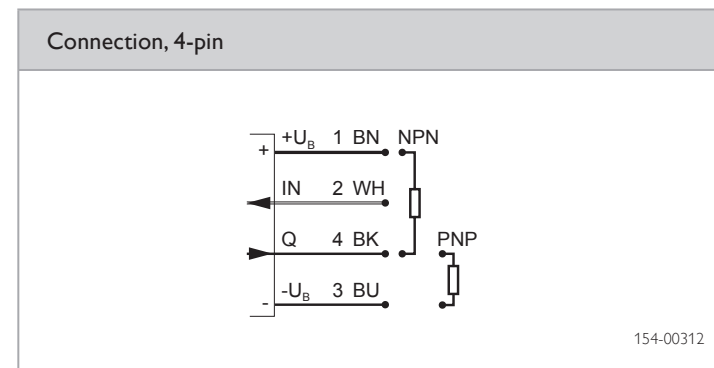
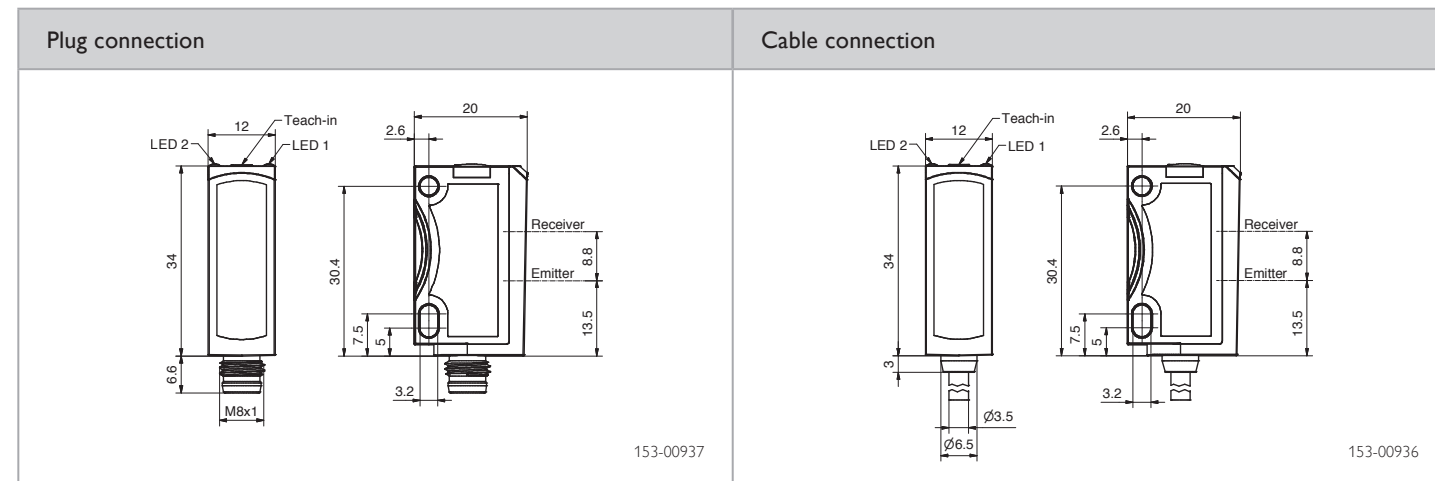
PRODUCT HIGHLIGHTS

- Differentiates between even the slightest of grey value differences
- Sensor settings via teach-in and control input
- Durable laser printing
- Very small, easily visible laser light spot
- Wide range of variants

| Optical data | | Functions | |
|--|--|---------------------------------|--|
| Scanning distance | 1 ... 250 mm ¹ | Indicator LED, green | Operating voltage indicator |
| Adjustment range | 25 ... 250 mm ¹ | Indicator LED, yellow | Switching output indicator |
| Type of light | Laser, red, 650 nm | Sensitivity adjustment | Via Teach-in button and control input |
| Light spot size | See diagram | Teach-in modes | Mode 1: during running process Mode 2: during standing process |
| Laser Class (DIN EN 60825-1:2008-5) | 1 | Adjustment possibilities | N.O./N.C. via Teach-in button and control input Button lock via control input |
| Hysteresis | ≤ 10% ² | Default settings | Max. scanning distance and N.O. |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30V DC ³ | Dimensions | 34 x 20 x 12 mm ³ |
| No-load current, I ₀ | ≤ 30 mA | Enclosure rating | IP 69K & 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) |
| Standby time | < 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) | ≤ 1500 Hz | Weight (cable device) | 40 g |
| Response time | 333 μs | Weight (pigtail) | 20 g |
| Control input, IN | +U _B = teach-in -U _B = button locked Open = normal operation | Vibration and impact resistance | EN 60947-5-2 |

¹ Reference material: white, 90 % reflectivity ² Up to scanning distance of 150 mm ³ Max. 10 % ripple, within U_B, ~ 50 Hz / 100 Hz ⁴ With connected IP 67 / IP 69K plug

| Scanning distance | Switching output | Type of connection | Part number | Article number |
|-------------------|------------------|---------------------------------------|-----------------|----------------|
| 1 ... 250 mm | PNP | Metal plug, M8x1, 4-pin | FT 25-RL-PS-M4M | 609-21013 |
| 1 ... 250 mm | NPN | Metal plug, M8x1, 4-pin | FT 25-RL-NS-M4M | 609-21014 |
| 1 ... 250 mm | PNP | Cable, 2 m, 4-wire | FT 25-RL-PS-K4 | 609-21010 |
| 1 ... 250 mm | NPN | Cable, 2 m, 4-wire | FT 25-RL-NS-K4 | 609-21008 |
| 1 ... 250 mm | PNP | Pigtail, 150 mm with plug, M12, 4-pin | FT 25-RL-PS-KL4 | 609-21012 |
| 1 ... 250 mm | NPN | Pigtail, 150 mm with plug, M12, 4-pin | FT 25-RL-NS-KL4 | 609-21009 |



| Reference material | Detection range |
|--------------------|-----------------|
| White (90 %) | 1 ... 250 mm |
| Grey (18 %) | 6 ... 100 mm |
| Black (6 %) | 20 ... 60 mm |

| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



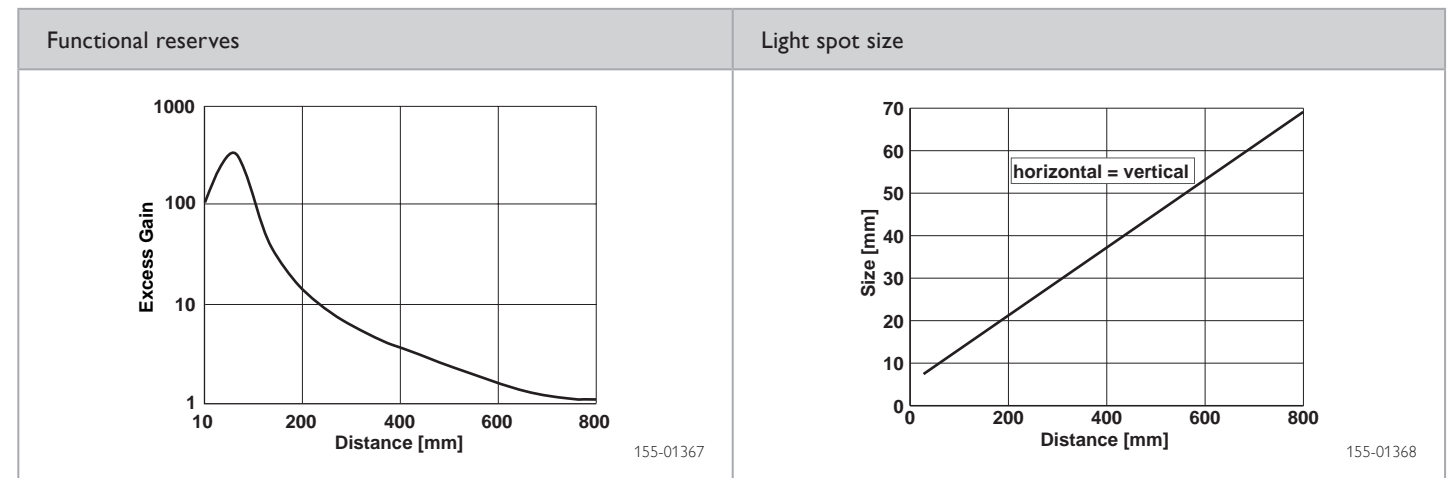
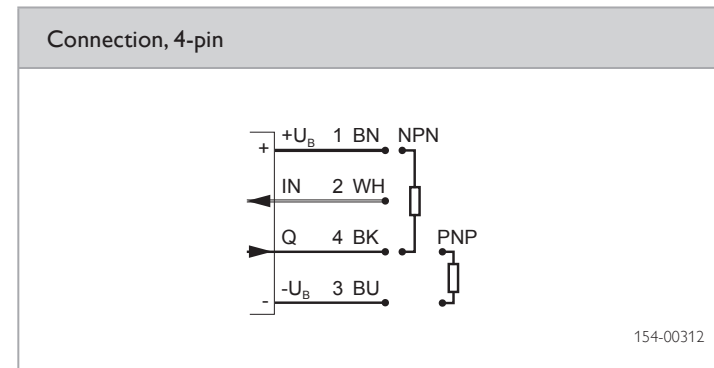
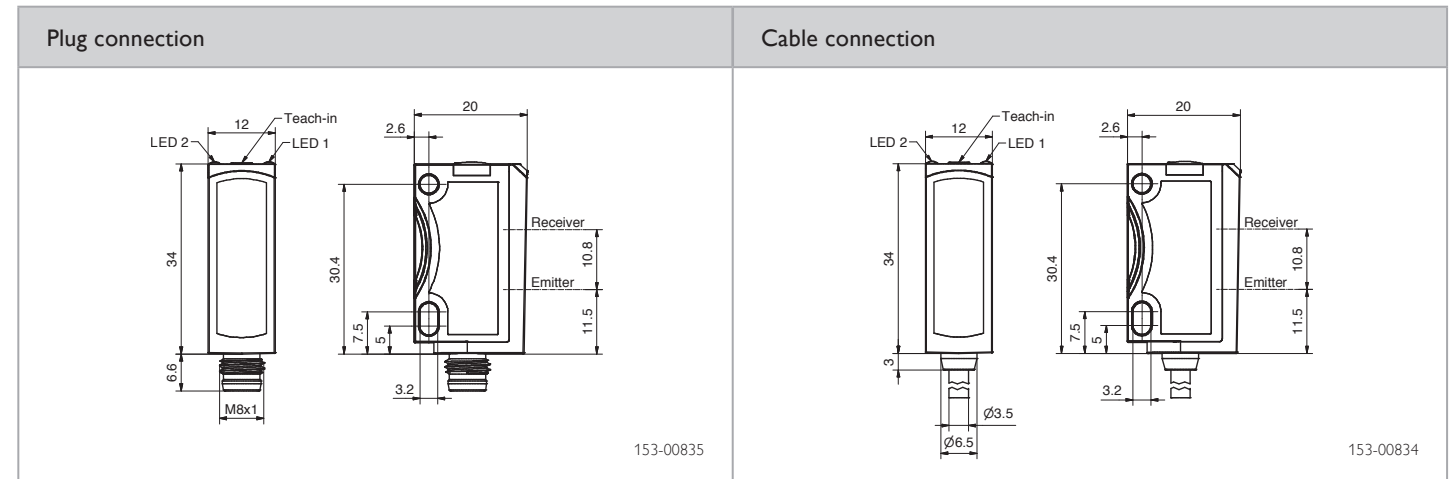
PRODUCT HIGHLIGHTS

- Differentiates between even the slightest of grey value differences
- Sensor settings via teach-in and control input
- Simple alignment thanks to easily visible light spot
- Robust glass-fibre-reinforced plastic housings
- Durable laser printing

| Optical data | | Functions | |
|------------------------------------|--|---------------------------------|--|
| Scanning distance | 0 ... 800 mm ¹ | Indicator LED, green | Operating voltage indicator |
| Adjustment range | 20 ... 800 mm ¹ | Indicator LED, yellow | Switching output indicator |
| Type of light | LED, red, 632 nm | Sensitivity adjustment | Via Teach-in button and control input |
| Light spot size | See diagram | Teach-in modes | Mode 1: during running process Mode 2: during standing process |
| | | 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 ² | Dimensions | 34 x 20 x 12 mm ³ |
| No-load current, I ₀ | ≤ 30 mA | Enclosure rating | IP 69K & 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) |
| Standby time | < 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 | Weight (pigtail) | 20 g |
| Control input, IN | + U _B = teach-in - U _B = button locked Open = normal operation | Vibration and impact resistance | EN 60947-5-2 |

¹ Reference material: white, 90 % reflectivity ² Max. 10 % ripple, within U_B ~ 50 Hz / 100 Hz ³ With connected IP 67 / IP 69K plug

| Scanning distance | Switching output | Type of connection | Part number | Article number |
|-------------------|------------------|---------------------------------------|----------------|----------------|
| 800 mm | PNP | Plug, M8x1, 4-pin | FT 25-R-PS-M4 | 607-21000 |
| 800 mm | NPN | Plug, M8x1, 4-pin | FT 25-R-NS-M4 | 607-21002 |
| 800 mm | PNP | Metal plug, M8x1, 4-pin | FT 25-R-PS-M4M | 607-21006 |
| 800 mm | NPN | Metal plug, M8x1, 4-pin | FT 25-R-NS-M4M | 607-21007 |
| 800 mm | PNP | Cable, 2 m, 4-wire | FT 25-R-PS-K4 | 607-21001 |
| 800 mm | NPN | Cable, 2 m, 4-wire | FT 25-R-NS-K4 | 607-21003 |
| 800 mm | PNP | Pigtail, 150 mm with plug, M12, 4-pin | FT 25-R-PS-KL4 | 607-21004 |
| 800 mm | NPN | Pigtail, 150 mm with plug, M12, 4-pin | FT 25-R-NS-KL4 | 607-21005 |



| Reference material | Detection range |
|--------------------|-----------------|
| White (90 %) | 0 ... 800 mm |
| Grey (18 %) | 1 ... 450 mm |
| Black (6 %) | 3 ... 250 mm |

| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |

Retroreflective photoelectric sensor for detection of transparent objects



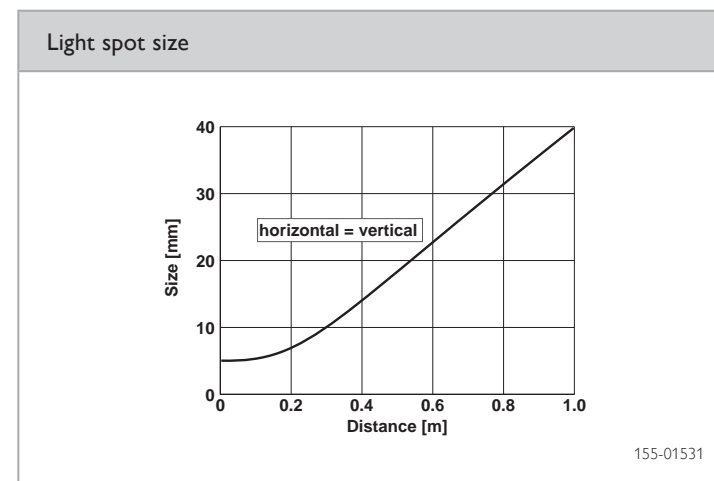
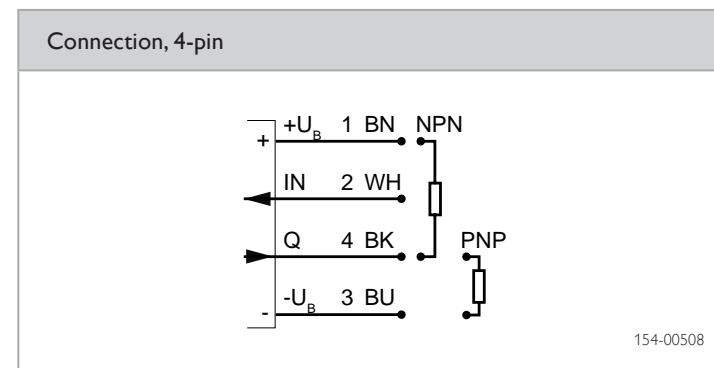
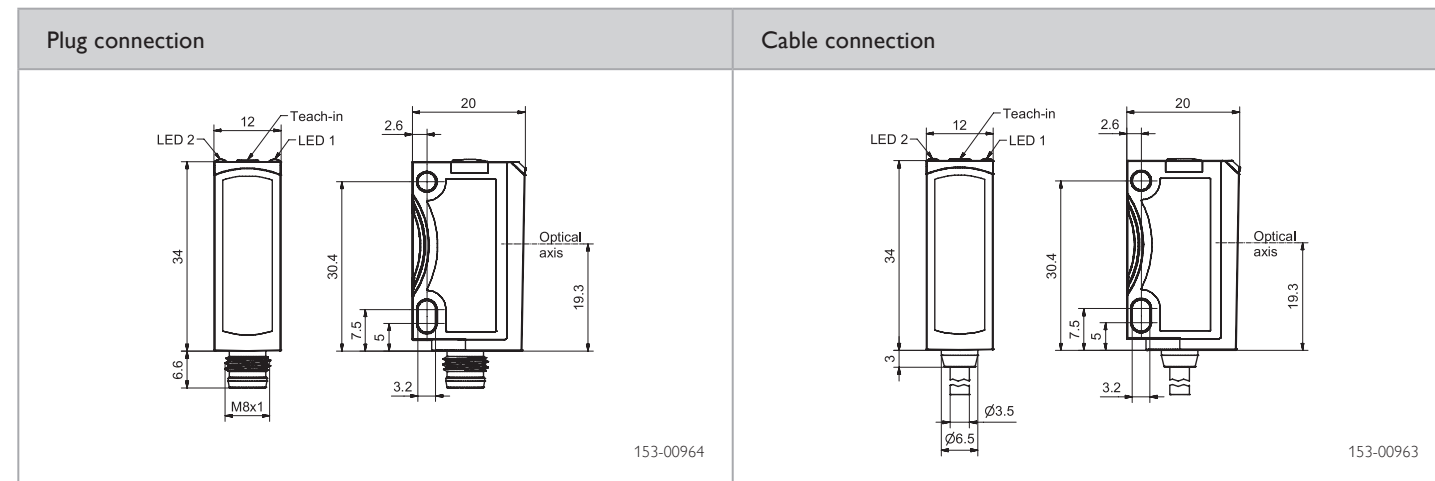
PRODUCT HIGHLIGHTS

- Reliable detection of transparent objects regardless of shape
- Autocollimation principle: reliable and precise detection from a range of 0 mm
- DELTA function (Dynamic Evaluation of Light for Threshold Adaption): dynamic sensor adaptation to changing environmental conditions – dust and dirt have no effect
- Precise and easily visible light spot with sharp contour for easy alignment of the sensor

| Optical data | | Functions | |
|------------------------------------|--|---------------------------------|--|
| Operating range | 0 ... 2 m ¹ | Indicator LED, green | Operating voltage indicator |
| Type of light | LED, red, 632 nm | Indicator LED, yellow | Switching output indicator |
| Polarising filter | Yes | 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 | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30V DC ² | Dimensions | 34 x 20 x 12 mm ³ |
| No-load current, I ₀ | ≤ 30 mA | Enclosure rating | IP 69K & 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) |
| Standby time | < 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 Max. 10 % ripple, within U_B ~ 50 Hz / 100 Hz ³ With connected IP 67 / IP 69K plug

| Scanning distance | Switching output | Type of connection | Part number | Article number |
|-------------------|------------------|-------------------------|------------------|----------------|
| 0 ... 2 m | PNP | Plug, M8x1, 4-pin | FR 25-RGO-PS-M4 | 606-11020 |
| 0 ... 2 m | NPN | Plug, M8x1, 4-pin | FR 25-RGO-NS-M4 | 606-11021 |
| 0 ... 2 m | PNP | Metal plug, M8x1, 4-pin | FR 25-RGO-PS-M4M | 606-11016 |
| 0 ... 2 m | NPN | Metal plug, M8x1, 4-pin | FR 25-RGO-NS-M4M | 606-11017 |
| 0 ... 2 m | PNP | Cable, 2 m, 4-wire | FR 25-RGO-PS-K4 | 606-11018 |
| 0 ... 2 m | NPN | Cable, 2 m, 4-wire | FR 25-RGO-NS-K4 | 606-11019 |



| Reflector / reflective tape | Recommended operating range with transparent cylindrical objects | Recommended operating range with transparent flat objects |
|-----------------------------|--|---|
| R5/L (904-51543) | 0 ... 500 mm | 0 ... 800 mm |
| RF-230 KL (904-51593) | 0 ... 300 mm | 0 ... 800 mm |

| Accessories | |
|-------------------|---------------|
| Reflectors | From Page 654 |
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



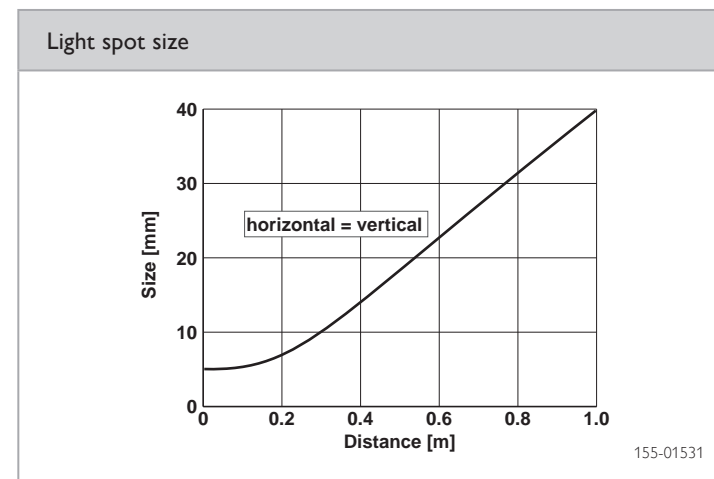
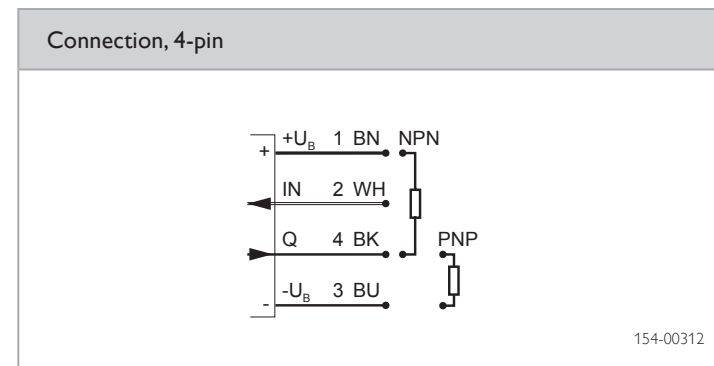
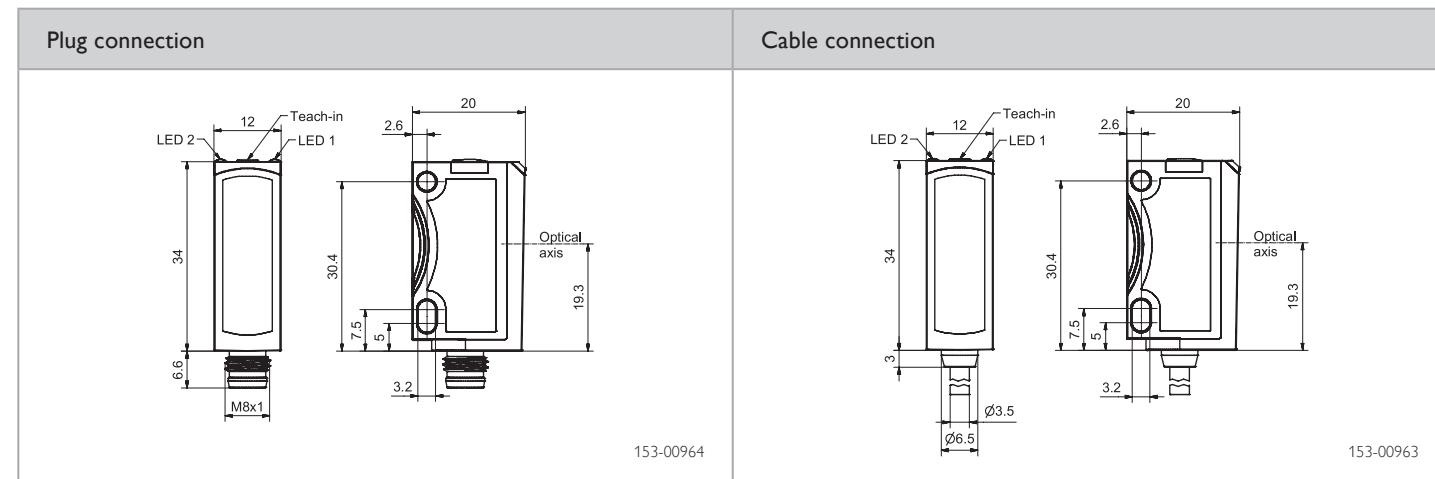
PRODUCT HIGHLIGHTS

- Autocollimation principle: reliable and precise detection from a range of 0 mm
- Precise detection, even through narrow openings and drilled holes
- Compact miniature housings for installation in the smallest of spaces
- Simple operation via electronic Teach-in button or control input
- Robust glass-fibre-reinforced plastic housings

| Optical data | | Functions | |
|------------------------------------|--|---------------------------------|--|
| Operating range | 0 ... 2 m ¹ | Indicator LED, green | Operating voltage indicator |
| Type of light | LED, red, 632 nm | Indicator LED, yellow | Switching output indicator |
| Polarising filter | Yes | 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 | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30V DC ² | Dimensions | 34 x 20 x 12 mm ³ |
| No-load current, I ₀ | ≤ 30 mA | Enclosure rating | IP 69K & 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) |
| Standby time | < 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 | 10 g |
| Switching frequency, f (ti/tp 1:1) | ≤ 1000 Hz | Vibration and impact resistance | EN 60947-5-2 |
| Response time | 500 μs | | |
| Control input, IN | +U _B = teach-in -U _B = button locked Open = normal operation | | |

¹ Reference material: R5/L reflector ² Max. 10 % ripple, within U_B, ~ 50 Hz / 100 Hz ³ With connected IP 67 / IP 69K plug

| Operating range | Switching output | Type of connection | Part number | Article number |
|-----------------|------------------|--------------------|------------------|----------------|
| 0 ... 2 m | PNP | Plug, M8x1, 4-pin | FR 25-RGO2-PS-M4 | 606-11022 |
| 0 ... 2 m | NPN | Plug, M8x1, 4-pin | FR 25-RGO2-NS-M4 | 606-11023 |



| Accessories | |
|-------------------|---------------|
| Reflectors | From Page 654 |
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



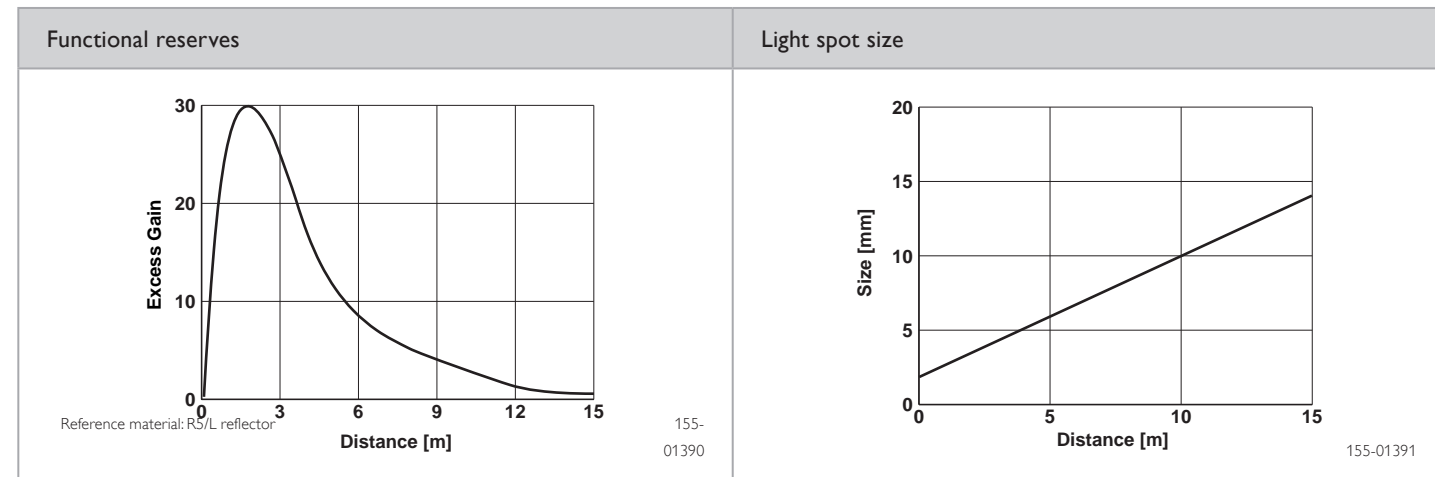
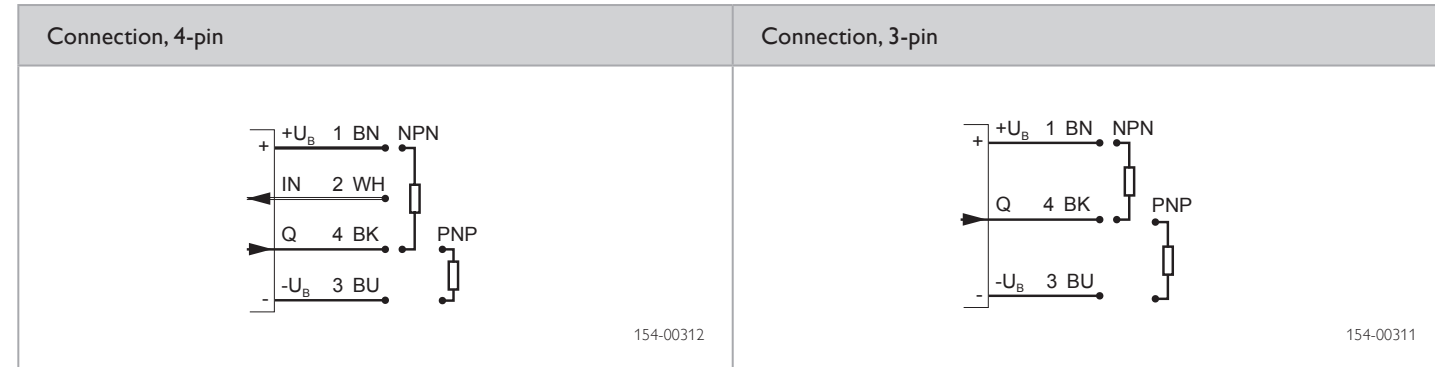
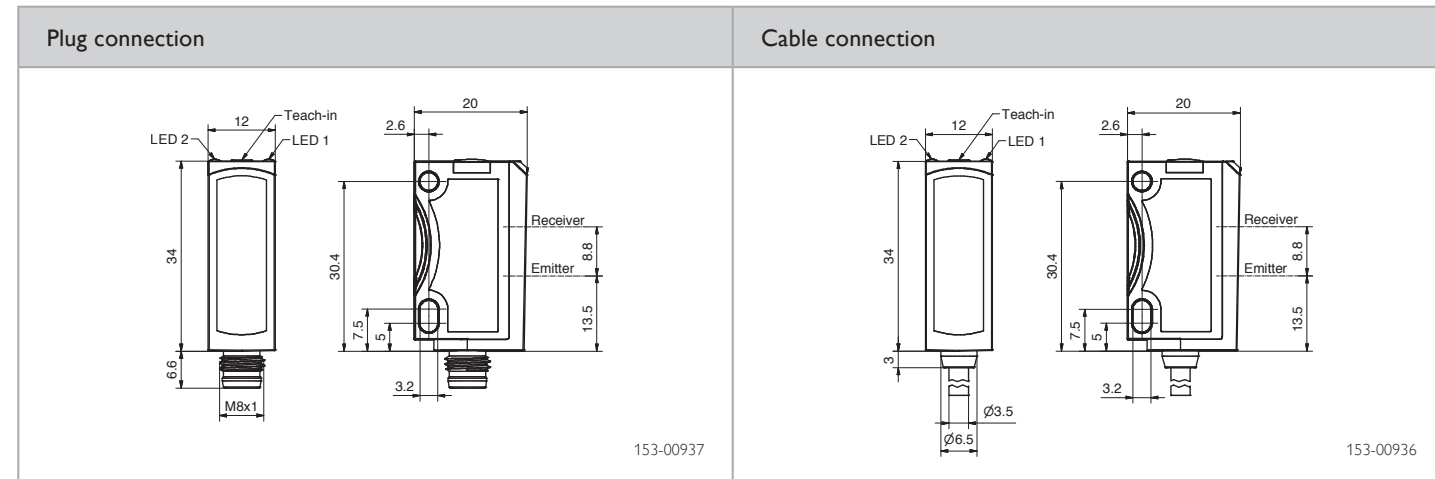
PRODUCT HIGHLIGHTS

- Particularly suitable for short-range applications
- Suitable for a wide variety of different reflectors
- Very small, easily visible laser light spot
- Sensor settings via teach-in and control input
- Robust glass-fibre-reinforced plastic housings

| Optical data | | Functions | |
|--|--|---------------------------------|---|
| Limit range | 1 ... 15 m ¹ | Indicator LED, green | Operating voltage indicator |
| Operating range | 1 ... 13 m ¹ | Indicator LED, yellow | Switching output indicator |
| Type of light | Laser, red, 650 nm | Sensitivity adjustment | Via Teach-in button and control input |
| Light spot size | See diagram | Teach-in modes | Mode 1: during running process Mode 2: during standing process |
| Laser Class (DIN EN 60825-1:2008-5) | 1 | Adjustment possibilities | N.O./N.C. via Teach-in button and control input Button lock via control input |
| Polarising filter | Yes | Default settings | Max. range and N.O. |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30V DC ² | Dimensions | 34 x 20 x 12 mm ³ |
| No-load current, I ₀ | ≤ 30 mA | Enclosure rating | IP 69K & 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) |
| Standby time | < 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) | ≤ 2000 Hz | Weight (cable device) | 40 g |
| Response time | 250 μs | Weight (pigtail) | 20 g |
| Control input, IN ³ | + U _B = teach-in - U _B = button locked Open = normal operation | Vibration and impact resistance | EN 60947-5-2 |

¹ Reference material: R5/L reflector ² Max. 10 % ripple, within U_B, ~ 50 Hz / 100 Hz ³ Only 4-pin design ⁴ With connected IP 67 / IP 69K plug

| Operating range | Switching output | Type of connection | Part number | Article number |
|-----------------|------------------|---------------------------------------|-----------------|----------------|
| 1 ... 13 m | PNP | Metal plug, M8x1, 3-pin | FR 25-RL-PS-M3M | 609-31000 |
| 1 ... 13 m | PNP | Metal plug, M8x1, 4-pin | FR 25-RL-PS-M4M | 609-31001 |
| 1 ... 13 m | NPN | Metal plug, M8x1, 4-pin | FR 25-RL-NS-M4M | 609-31002 |
| 1 ... 13 m | PNP | Cable, 2 m, 4-wire | FR 25-RL-PS-K4 | 609-21004 |
| 1 ... 13 m | NPN | Cable, 2 m, 4-wire | FR 25-RL-NS-K4 | 609-21001 |
| 1 ... 13 m | PNP | Pigtail, 150 mm with plug, M12, 4-pin | FR 25-RL-PS-KL4 | 609-21006 |
| 1 ... 13 m | NPN | Pigtail, 150 mm with plug, M12, 4-pin | FR 25-RL-NS-KL4 | 609-21003 |



| Reflector (especially for short range) | Operating range |
|--|-----------------|
| RD-25 KL | 0.15 ... 1 m |

| Accessories | |
|-------------------|---------------|
| Reflectors | From Page 654 |
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



PRODUCT HIGHLIGHTS

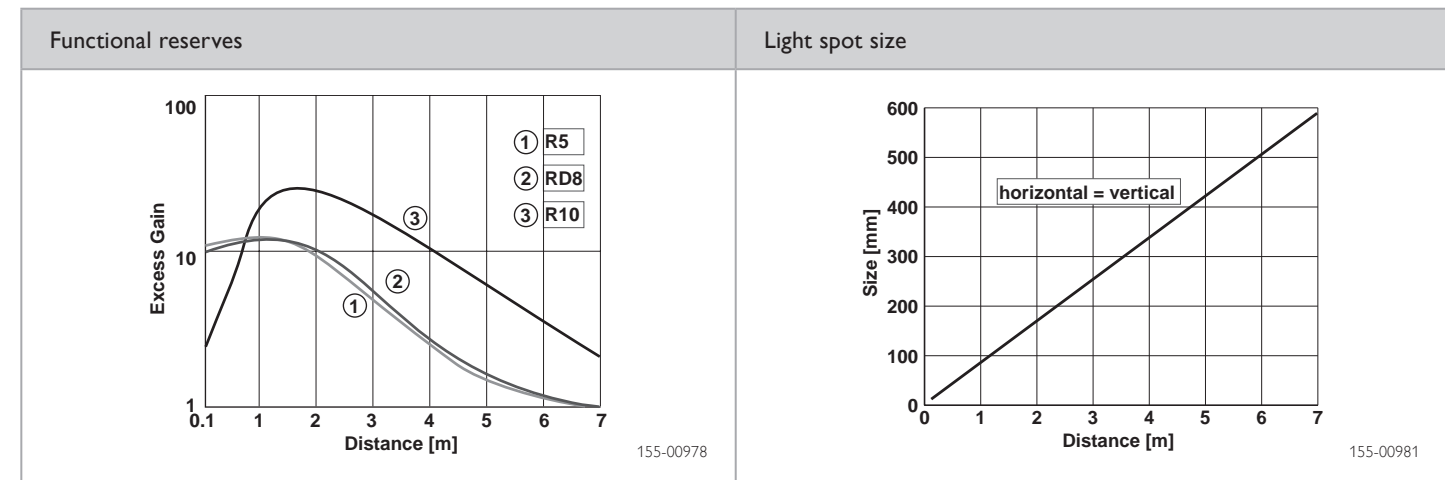
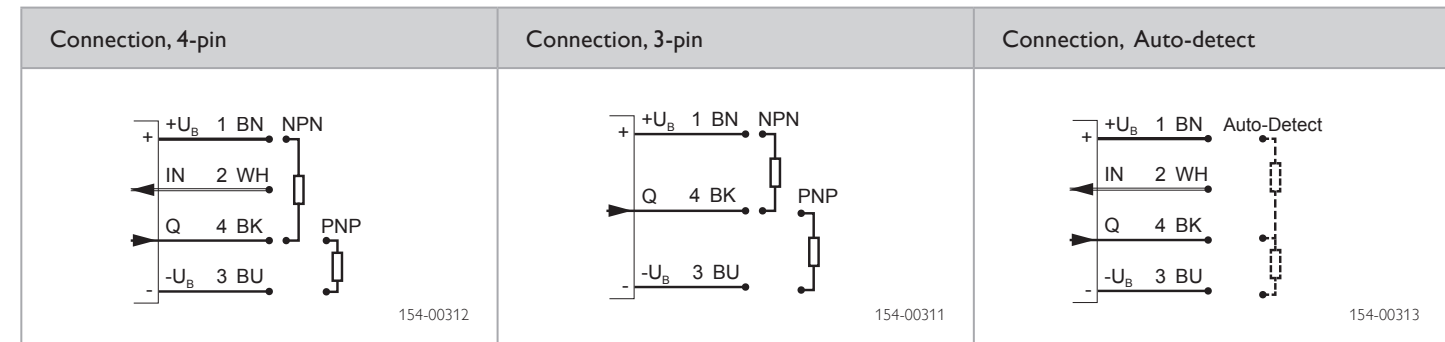
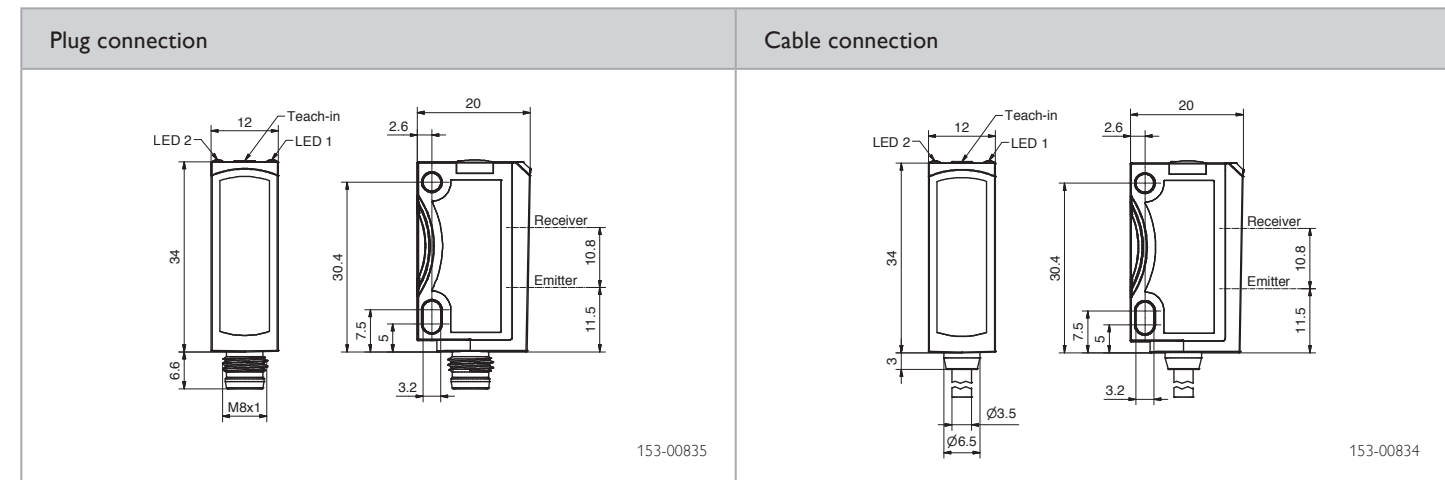
- Auto-detect retroreflective photoelectric sensor with real PNP and real NPN functions
- Particularly suitable for short-range applications
- Simple alignment thanks to easily visible light spot
- Robust glass-fibre-reinforced plastic housings
- Durable laser printing
- Wide range of variants

| Optical data | | Functions | |
|------------------------------------|--|---------------------------------|---|
| Limit range | 0.1 ... 7 m ¹ | Indicator LED, green | Operating voltage indicator |
| Operating range | 0.1 ... 6 m ¹ | Indicator LED, yellow | Switching output indicator |
| Type of light | LED, red, 632 nm | Sensitivity adjustment | Via Teach-in button and control input |
| Light spot size | See diagram | Teach-in modes | Mode 1: during running process Mode 2: during standing process |
| Polarising filter | Yes | Adjustment possibilities | N.O./N.C. via Teach-in button and control input Button lock via control input Auto-detect / NPN / PNP via Teach-in button and control input (only Auto-detect variants) |
| | | Default settings | Max. range and N.O. |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30V DC ² | Dimensions | 34 x 20 x 12 mm ³ |
| No-load current, I ₀ | ≤ 30 mA | Enclosure rating | IP 69K & 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) |
| Standby time | < 300 ms | Ambient temperature: operation | -20 ... +60 °C |
| Switching output, Q | PNP/NPN/Auto-detect (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 | Weight (pigtail) | 20 g |
| Control input, IN ³ | +U _B = teach-in -U _B = button locked Open = normal operation | Vibration and impact resistance | EN 60947-5-2 |

¹ Reference material: R10 reflector ² Max. 10 % ripple, within U_B, ~ 50 Hz / 100 Hz ³ Only 4-pin design ⁴ With connected IP 67 / IP 69K plug

| Operating range | Switching output | Type of connection | Part number | Article number |
|-----------------|------------------|-------------------------|----------------|----------------|
| 0.1 ... 6 m | PNP | Plug, M8x1, 4-pin | FR 25-R-PS-M4 | 606-11000 |
| 0.1 ... 6 m | NPN | Plug, M8x1, 4-pin | FR 25-R-NS-M4 | 606-11002 |
| 0.1 ... 6 m | PNP | Metal plug, M8x1, 3-pin | FR 25-R-PS-M3M | 606-11006 |
| 0.1 ... 6 m | NPN | Metal plug, M8x1, 3-pin | FR 25-R-NS-M3M | 606-11007 |
| 0.1 ... 6 m | PNP | Metal plug, M8x1, 4-pin | FR 25-R-PS-M4M | 606-11008 |
| 0.1 ... 6 m | NPN | Metal plug, M8x1, 4-pin | FR 25-R-NS-M4M | 606-11009 |
| 0.1 ... 6 m | PNP | Cable, 2 m, 4-wire | FR 25-R-PS-K4 | 606-11001 |
| 0.1 ... 6 m | NPN | Cable, 2 m, 4-wire | FR 25-R-NS-K4 | 606-11003 |

| Operating range | Switching output | Type of connection | Part number | Article number |
|-----------------|------------------|---------------------------------------|-----------------|----------------|
| 0.1 ... 6 m | PNP | Pigtail, 150 mm with plug, M12, 4-pin | FR 25-R-PS-KL4 | 606-11004 |
| 0.1 ... 6 m | NPN | Pigtail, 150 mm with plug, M12, 4-pin | FR 25-R-NS-KL4 | 606-11005 |
| 0.1 ... 6 m | Auto-detect | Metal plug, M8x1, 4-pin | FR 25-R-PNS-M4M | 606-11011 |



| Reflector | Operating range | Accessories |
|-----------|-----------------|-------------------|
| R10 | 0.1 ... 6 m | Reflectors |
| RD8 | 0.1 ... 4 m | Connection cables |
| R5 | 0.1 ... 4 m | Brackets |



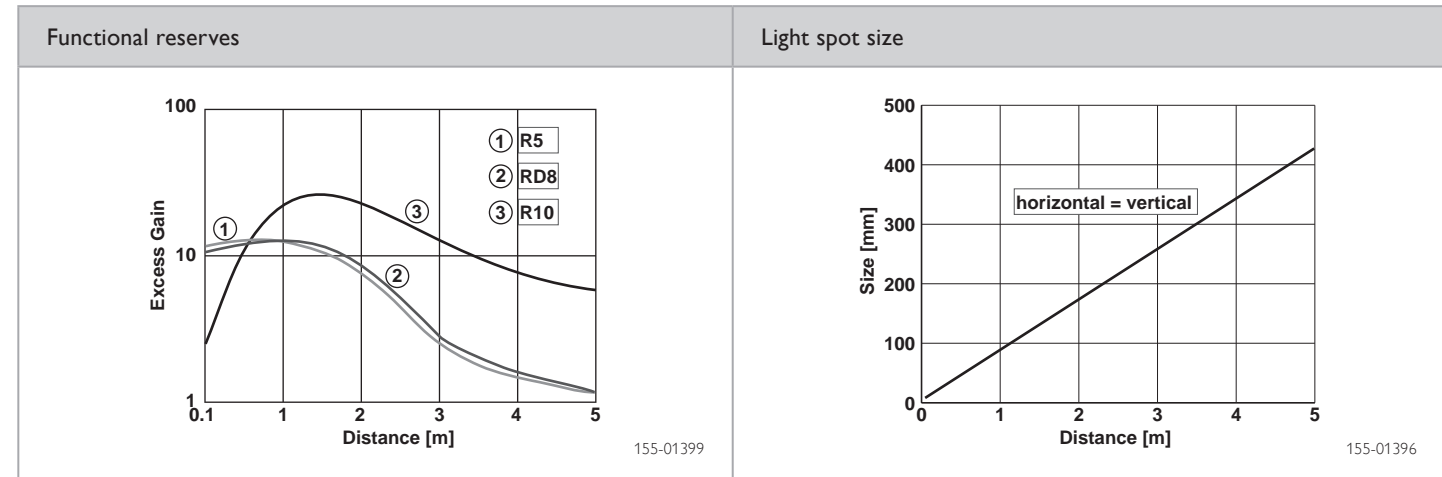
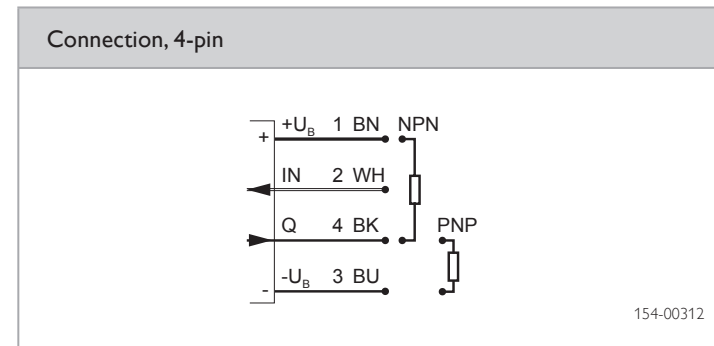
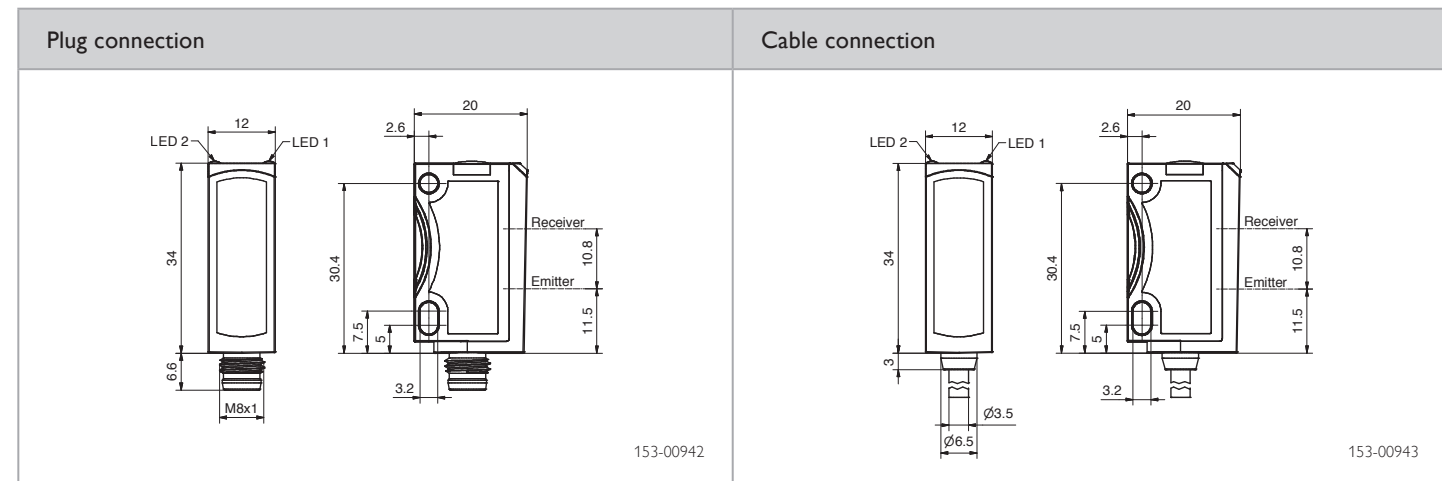
PRODUCT HIGHLIGHTS

- Economical solution for numerous applications
- Tamper-proof sensor design – no misalignment possible
- Suitable for a wide variety of different reflectors
- Simple alignment thanks to easily visible light spot
- Robust glass-fibre-reinforced plastic housings

| Optical data | | Functions | |
|------------------------------------|--|---------------------------------|------------------------------|
| Limit range | 0.1 ... 5 m ¹ | Indicator LED, green | Operating voltage indicator |
| Operating range | 0.1 ... 3 m ¹ | Indicator LED, yellow | Switching output indicator |
| Type of light | LED, red, 632 nm | Adjustment possibilities | N.O./N.C. via control input |
| Light spot size | See diagram | | |
| Polarising filter | Yes | | |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30V DC ² | Dimensions | 34 x 20 x 12 mm ³ |
| No-load current, I ₀ | ≤ 30 mA | Enclosure rating | IP 69K & 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) |
| Standby time | < 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 | Weight (pigtail) | 20 g |
| Control input, IN | +U _B = N.C. -U _B / Open = N.O. | Vibration and impact resistance | EN 60947-5-2 |

¹ Reference material: R10 reflector ² Max. 10 % ripple, within U_B, ~ 50 Hz / 100 Hz ³ With connected IP 67 / IP 69K plug

| Operating range | Switching output | Type of connection | Part number | Article number |
|-----------------|------------------|--------------------|----------------|----------------|
| 0.1 ... 3 m | PNP | Plug, M8x1, 4-pin | FR 25-RF-PS-M4 | 606-11012 |
| 0.1 ... 3 m | NPN | Plug, M8x1, 4-pin | FR 25-RF-NS-M4 | 606-11013 |
| 0.1 ... 3 m | PNP | Cable, 2 m, 4-wire | FR 25-RF-PS-K4 | 606-11014 |
| 0.1 ... 3 m | NPN | Cable, 2 m, 4-wire | FR 25-RF-NS-K4 | 606-11015 |



| Reflector | Operating range |
|-----------|-----------------|
| R10 | 0.1 ... 3 m |
| RD8 | 0.1 ... 3 m |
| R5 | 0.1 ... 3 m |

| Accessories | |
|-------------------|---------------|
| Reflectors | From Page 654 |
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



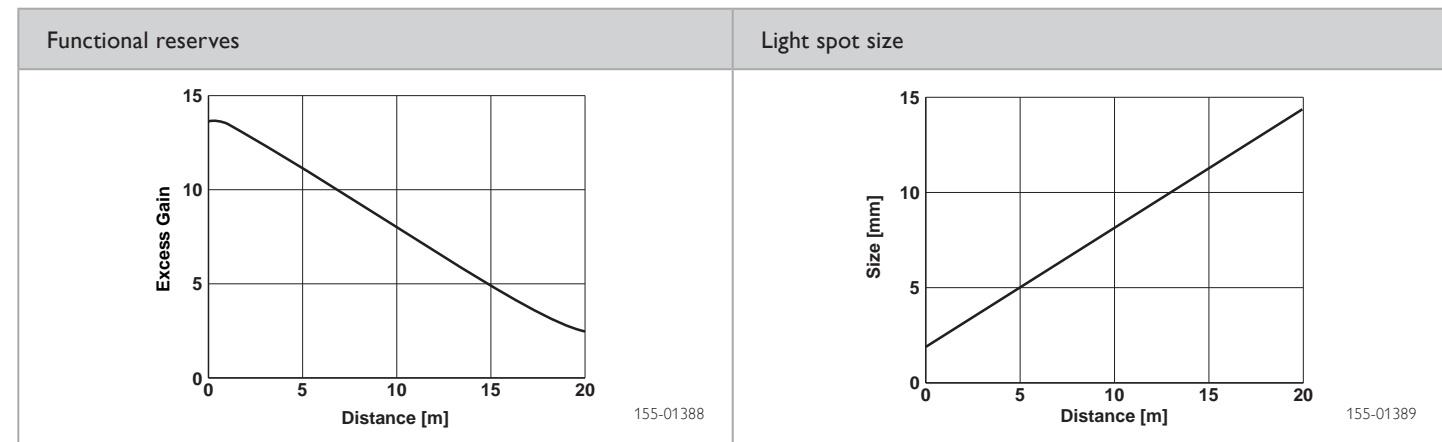
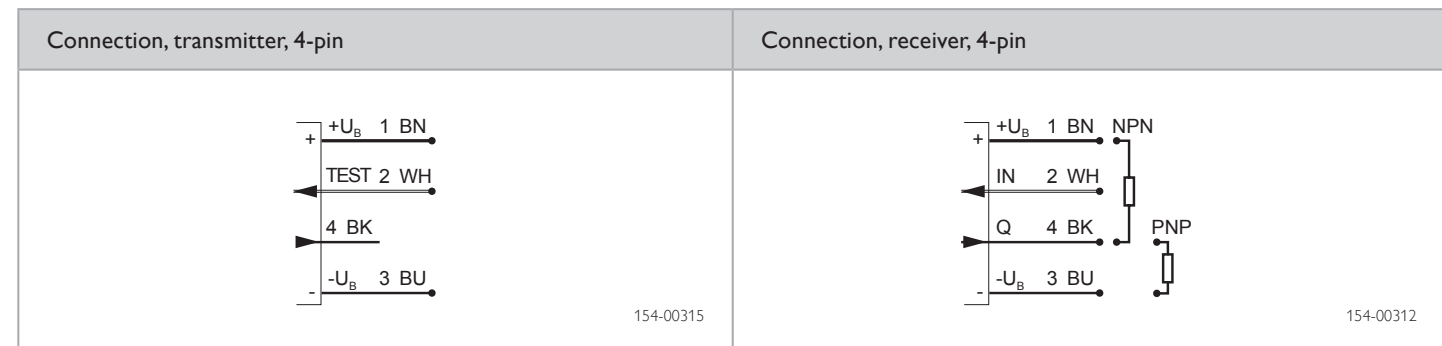
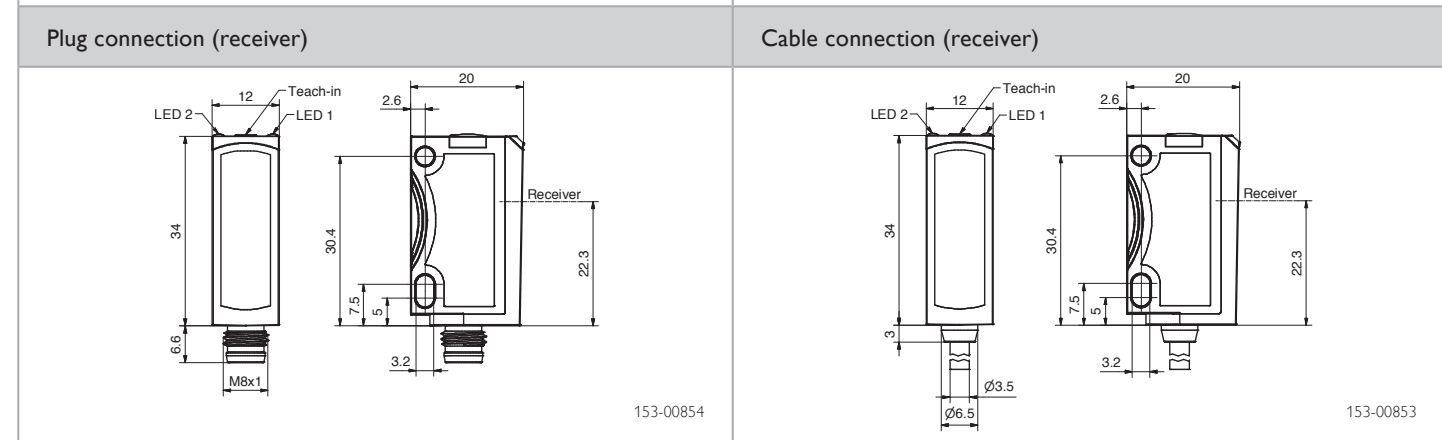
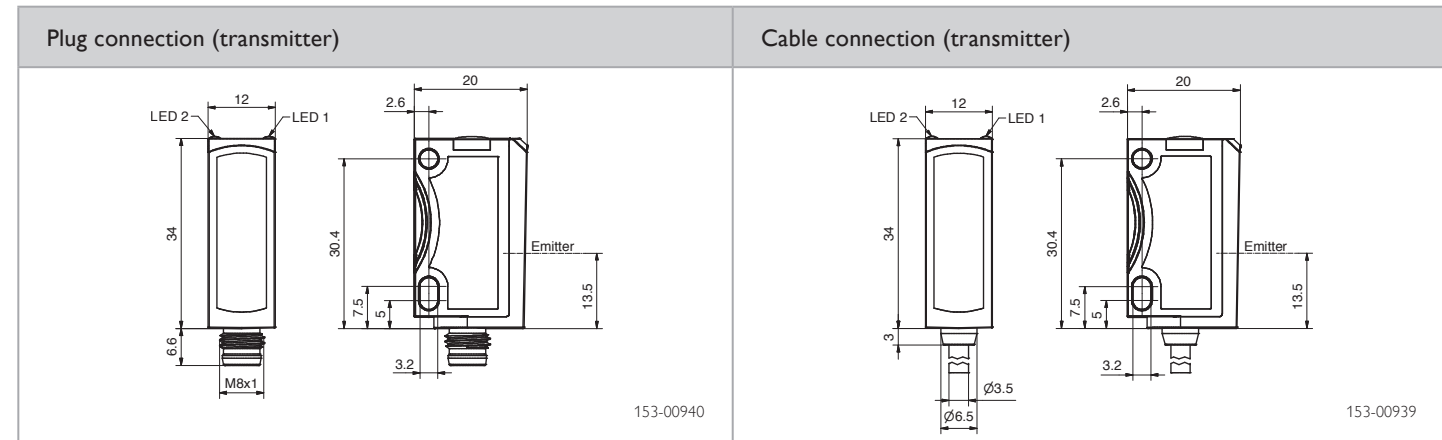
PRODUCT HIGHLIGHTS

- Long range with small and compact housings
- Test input for checking sensor pair function
- Very small, easily visible laser light spot
- Sensor settings via teach-in and control input
- Robust glass-fibre-reinforced plastic housings

| Optical data | | Functions | |
|-------------------------------------|--|-------------------------------------|--|
| Limit range | 0 ... 20 m | Indicator LED, green | Operating voltage indicator |
| Operating range | 0 ... 18 m | Indicator LED, yellow | Switching output indicator |
| Type of light | Laser, red, 650 nm | Sensitivity adjustment (receiver) | Via Teach-in button and control input |
| Light spot size | See diagram | Teach-in modes | Mode 1: during running process Mode 2: during standing process |
| Laser Class (DIN EN 60825-1:2008-5) | 1 | Adjustment possibilities (receiver) | N.O./N.C. via Teach-in button and control input Button lock via control input |
| | | Default settings | Max. range and N.O. |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30 V DC ¹ | Dimensions | 34 x 20 x 12 mm ³ |
| No-load current, I ₀ | ≤ 30 mA | Enclosure rating | IP 69K & IP 67 ² |
| 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) |
| Standby time | < 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) | ≤ 2000 Hz | Weight (cable device) | 40 g |
| Response time | 250 μs | Weight (pigtail) | 20 g |
| Control input, IN (receiver) | +U _B = teach-in -U _B = button locked Open = normal operation | Vibration and impact resistance | EN 60947-5-2 |
| Control input, Test (transmitter) | +U _B = Test (transmitter off) -U _B / Open = normal operation | | |

¹ Max. 10 % ripple, within U_B, ~ 50 Hz / 100 Hz ² With connected IP 67 / IP 69K plug

| Operating range | Switching output | Type of connection | Part number | Article number |
|-----------------|------------------|-------------------------|-----------------|----------------|
| 0 ... 18 m | PNP | Metal plug, M8x1, 4-pin | FE 25-RL-PS-M4M | 605-21014 |
| 0 ... 18 m | NPN | Metal plug, M8x1, 4-pin | FE 25-RL-NS-M4M | 605-21015 |
| 0 ... 18 m | - | Metal plug, M8x1, 4-pin | FS 25-RL-M4M | 605-11007 |
| 0 ... 18 m | PNP | Cable, 2 m, 4-wire | FE 25-RL-PS-K4 | 605-21004 |
| 0 ... 18 m | NPN | Cable, 2 m, 4-wire | FE 25-RL-NS-K4 | 605-21007 |
| 0 ... 18 m | - | Cable, 2 m, 4-wire | FS 25-RL-K4 | 605-11002 |



| Accessories | | | |
|-------------------|---------------|----------|---------------|
| Connection cables | From Page 670 | Brackets | From Page 642 |



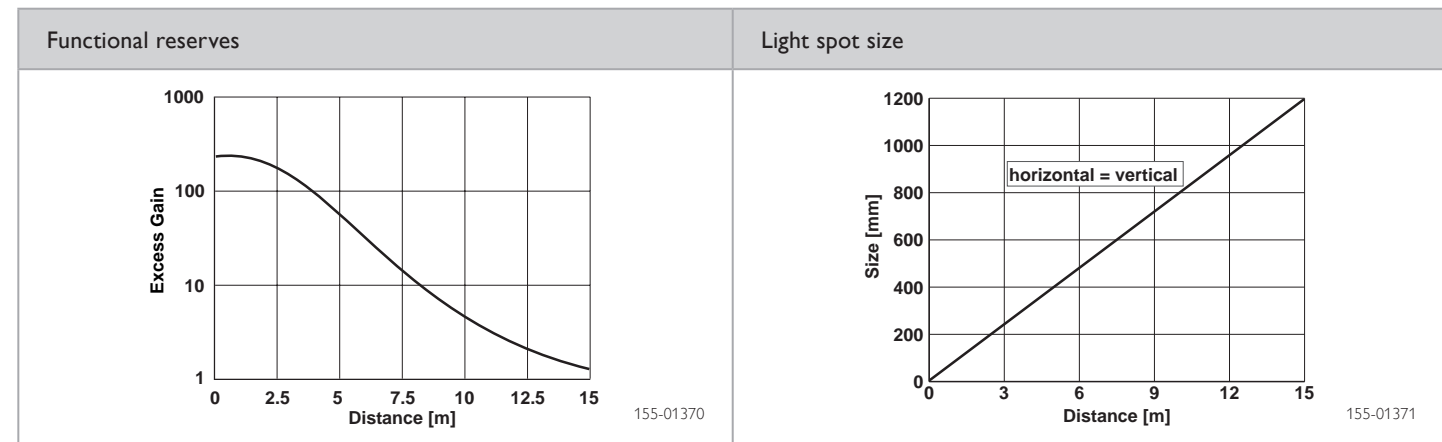
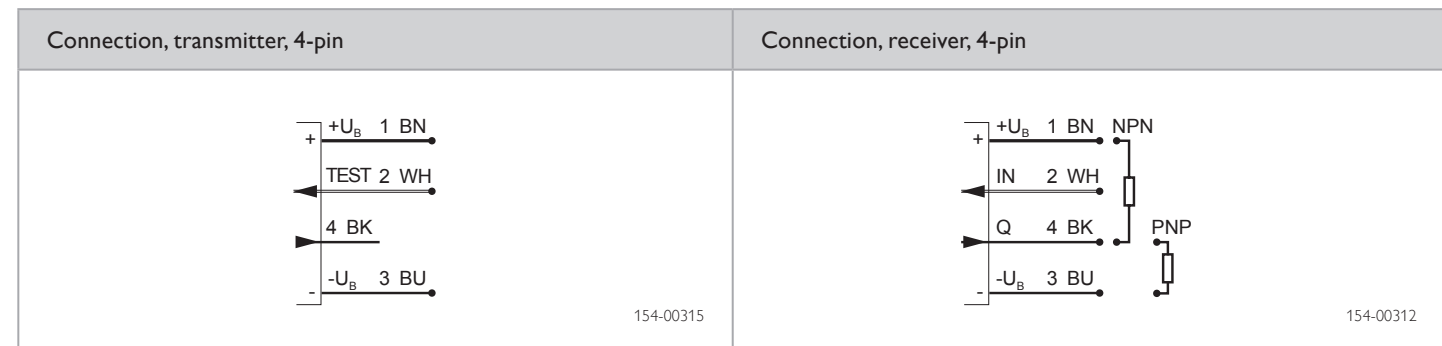
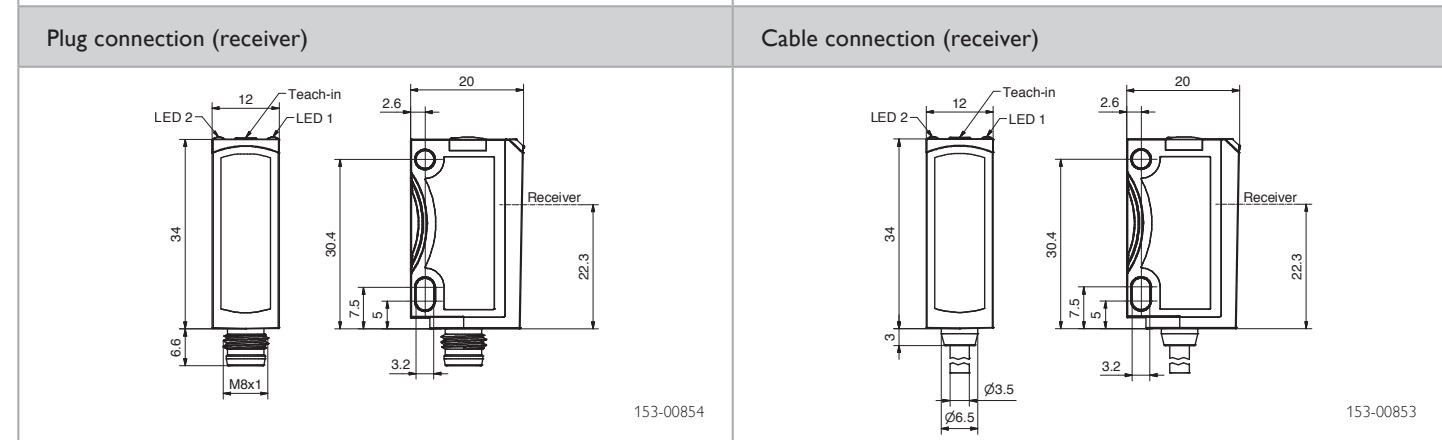
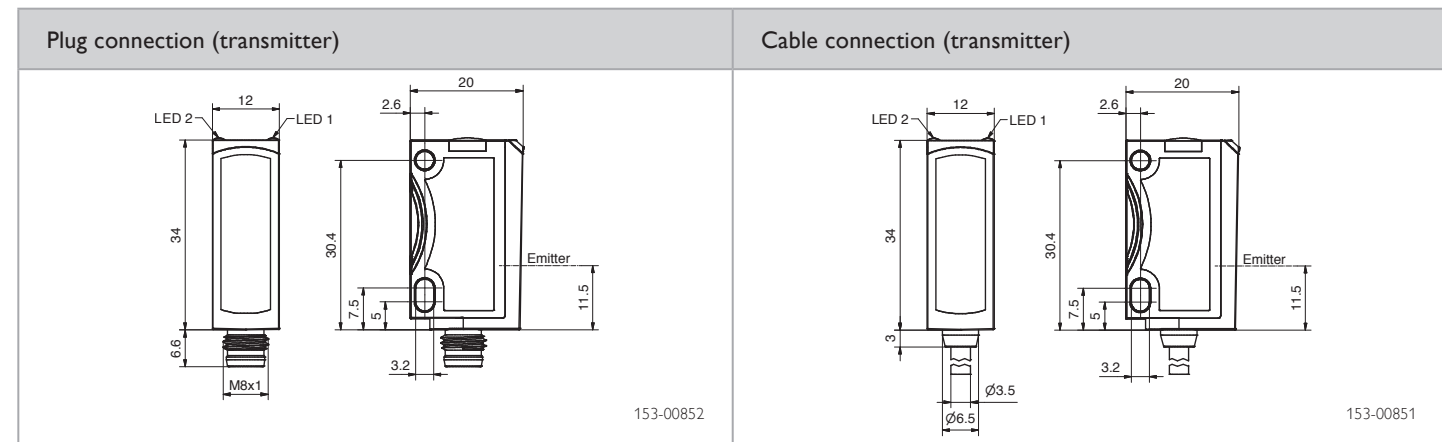
PRODUCT HIGHLIGHTS

- Test input for checking sensor pair function
- Sensor settings via teach-in and control input
- Simple alignment thanks to easily visible light spot
- Robust glass-fibre-reinforced plastic housings
- Durable laser printing

| Optical data | | Functions | |
|------------------------------------|--|-------------------------------------|--|
| Limit range | 0 ... 15 m | Indicator LED, green | Operating voltage indicator |
| Operating range | 0 ... 13 m | Indicator LED, yellow | Switching output indicator |
| Type of light | LED, red, 632 nm | Sensitivity adjustment (receiver) | Via Teach-in button and control input |
| Light spot size | See diagram | Teach-in modes | Mode 1: during running process Mode 2: during standing process |
| | | 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 ... 30 V DC ¹ | Dimensions | 34 x 20 x 12 mm ³ |
| No-load current, I ₀ | ≤ 30 mA | Enclosure rating | IP 69K & IP 67 ² |
| 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) |
| Standby time | < 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 | Weight (pigtail) | 20 g |
| Control input, IN (receiver) | +U _B = teach-in -U _B = button locked Open = normal operation | Vibration and impact resistance | EN 60947-5-2 |
| Control input, Test (transmitter) | +U _B = Test (transmitter off) -U _B / Open = normal operation | | |

¹ Max 10 % ripple, within U_B ~ 50 Hz / 100 Hz ²With connected IP 67 / IP 69K plug

| Operating range | Switching output | Type of connection | Part number | Article number |
|-----------------|------------------|-------------------------|----------------|----------------|
| 0 ... 13 m | PNP | Metal plug, M8x1, 4-pin | FE 25-R-PS-M4M | 605-21012 |
| 0 ... 13 m | NPN | Metal plug, M8x1, 4-pin | FE 25-R-NS-M4M | 605-21013 |
| 0 ... 13 m | - | Metal plug, M8x1, 4-pin | FS 25-R-M4M | 605-11006 |
| 0 ... 13 m | PNP | Cable, 2 m, 4-wire | FE 25-R-PS-K4 | 605-21001 |
| 0 ... 13 m | NPN | Cable, 2 m, 4-wire | FE 25-R-NS-K4 | 605-21003 |
| 0 ... 13 m | - | Cable, 2 m, 4-wire | FS 25-R-K4 | 605-11001 |



| Accessories | | | |
|-------------------|---------------|----------|---------------|
| Connection cables | From Page 670 | Brackets | From Page 642 |

Through-beam photoelectric sensor, fixed setting



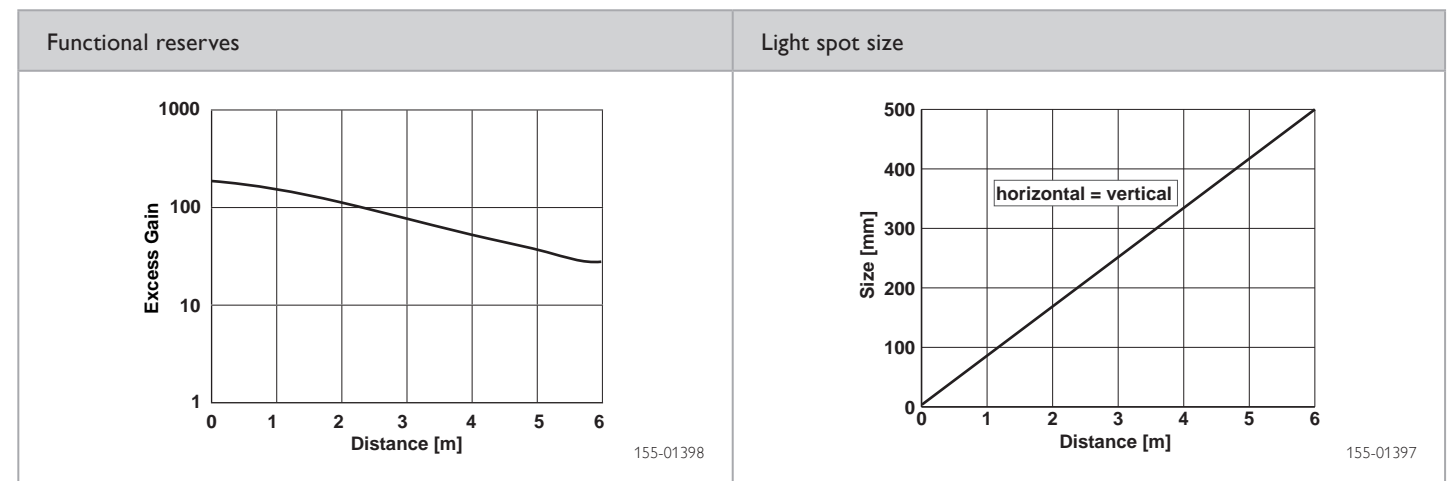
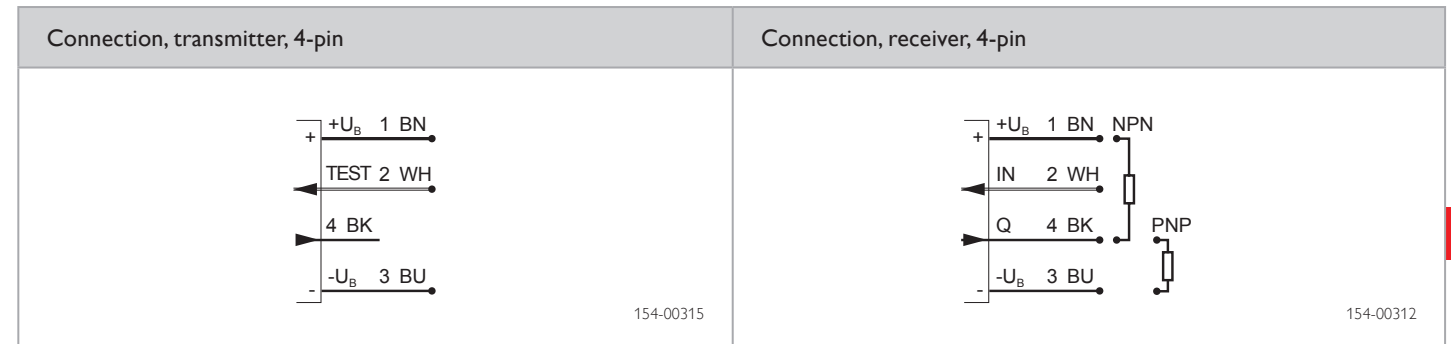
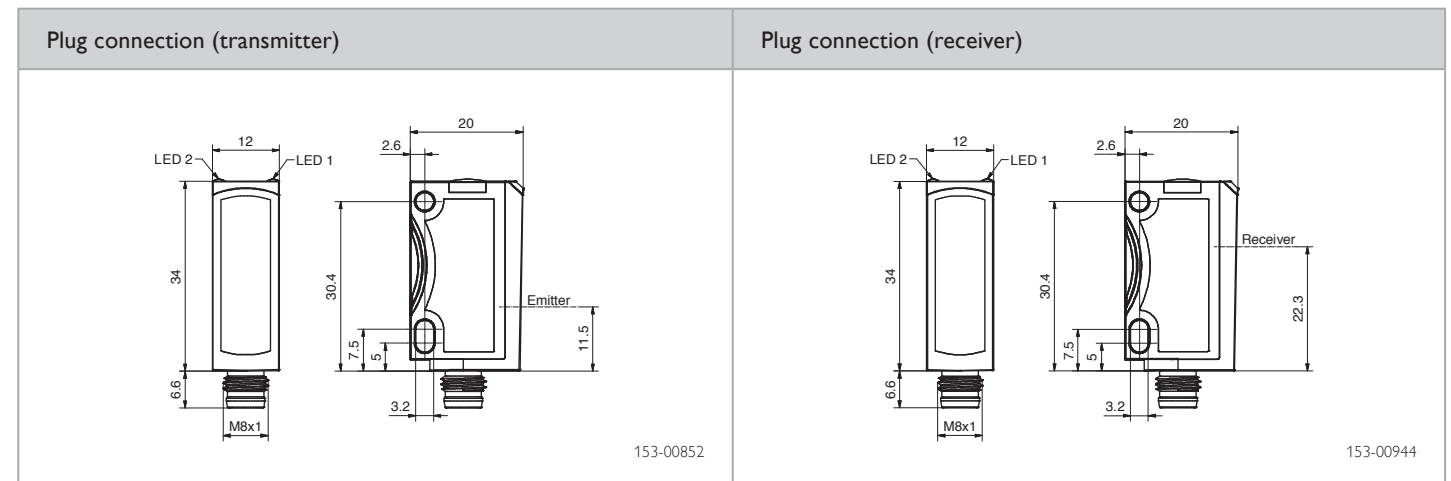
PRODUCT HIGHLIGHTS

- Economical solution for numerous applications
- Tamper-proof sensor design – no misalignment possible
- Simple alignment thanks to easily visible light spot
- Robust glass-fibre-reinforced plastic housings
- Durable laser printing

| Optical data | | Functions | |
|------------------------------------|---|-------------------------------------|------------------------------|
| Limit range | 0 ... 6 m | Indicator LED, green | Operating voltage indicator |
| Operating range | 0 ... 4 m | Indicator LED, yellow | Switching output indicator |
| Type of light | LED, red, 632 nm | Adjustment possibilities (receiver) | N.O./N.C. via control input |
| Light spot size | See diagram | | |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30V DC ¹ | Dimensions | 34 x 20 x 12 mm ³ |
| No-load current, I ₀ | ≤ 30 mA | Enclosure rating | IP 69K & IP 67 ² |
| 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) |
| Standby time | < 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 | Weight (pigtail) | 20 g |
| Control input, IN (receiver) | +U _B = N.C. -U _B / Open = N.O. | Vibration and impact resistance | EN 60947-5-2 |
| Control input, Test (transmitter) | +U _B = Test (transmitter off) -U _B / Open = normal operation | | |

¹ Max. 10 % ripple, within U_B, ~ 50 Hz / 100 Hz ² With connected IP 67 / IP 69K plug

| Operating range | Switching output | Type of connection | Part number | Article number |
|-----------------|------------------|--------------------|----------------|----------------|
| 0 ... 4 m | PNP | Plug, M8x1, 4-pin | FE 25-RF-PS-M4 | 605-21016 |
| 0 ... 4 m | NPN | Plug, M8x1, 4-pin | FE 25-RF-NS-M4 | 605-21017 |
| 0 ... 4 m | – | Plug, M8x1, 4-pin | FS 25-RF-M4 | 605-11008 |



| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |

F 55 – family of photoelectric sensors with high-quality housings

The compact class with long ranges



Always sparkling clean

Neither bubble baths with aggressive chemicals nor high-pressure rinsing processes with jets of water or steam can damage the tightly sealed stainless steel housings of the F 55 series. No deposits can adhere during the cleaning process due to the completely smooth housing surface with flush inset operating elements.



TYPICAL F 55

- Glass-fibre-reinforced plastic or stainless steel housings (IP 69K / IP 67, Ecolab)
- Bright, easily visible, light spot with sharp contour even in daylight
- Precise background suppression and minimal black/white-shift
- User-friendly operation of all diffuse variants via electronic Teach-in button or control line
- 18-step potentiometer for precise adjustment of background suppression
- Laser or LED options
- Safe operation due to Laser Class 1
- Two dovetail guides for simple sensor alignment
- Well thought-out mounting accessories

SensoPart sets new standards in the compact class with its F 55 family of photoelectric sensors. The products in this series combine excellent performance data with a robust housing design and many user-friendly details. They guarantee reliable detection by means of focused laser light or red-light LED with precise background suppression.

The sensors of the F 55 series have a very high light intensity: the photoelectric proximity sensor with background suppression, for example, reaches a scanning distance of up to 1200 mm. The bright, sharply contoured light spot is still easily visible even at long distances and in intense daylight, considerably simplifying commissioning.

The F 55 sensors generally impress through their clever design details: there is, for example, no trouble at all mounting them when space is limited, thanks to the device plug that can be continuously rotated through 270° and the supplementary dovetail guides. Adjustment via potentiometer with an indicator scale or by teach-in is also easy and user-friendly. The F 55 series covers all standard applications in industrial automation: whether for part detection in the automotive industry or for sorting tasks in machine construction – the sensors excel everywhere with their excellent performance. The food industry-enabled tightly sealed stainless steel variants (IP 69K) with Ecolab certification – rounding out the comprehensive sensor programme – shine in all regards.

| F 55 – Product Overview | | | | | |
|--|---------------|---------------|---------------------------|---|------|
| | Type of light | Adjustment | Scanning distance / range | Special features | Page |
| Photoelectric proximity sensors with background suppression | | | | | |
| FT 55- RLH | Laser | Potentiometer | 800 mm | | 246 |
| FT 55-RL2H | Laser | Potentiometer | 1000 mm | Precise small-part detection at long scanning distances | 248 |
| FT 55B-RH | LED | Potentiometer | 800 mm | | 250 |
| FT 55-RH | LED | Potentiometer | 1200 mm | | 252 |
| FT 55-RHM | LED | Teach-in | 550 mm | Stainless steel housing | 254 |
| Photoelectric proximity sensors | | | | | |
| FT 55-RL2 | Laser | Teach-in | 1200 mm | Detection of slightest grey value differences | 256 |
| FT 55-R | LED | Teach-in | 2000 mm | | 258 |
| FT 55-RM | LED | Teach-in | 1750 mm | Stainless steel housing | 260 |
| Retroreflective photoelectric sensors | | | | | |
| FR 55-RL | Laser | Teach-in | 14 m | | 262 |
| FR 55-R | LED | Teach-in | 14 m | | 264 |
| FR 55-RM | LED | Teach-in | 13 m | Stainless steel housing | 266 |
| Through-beam photoelectric sensors | | | | | |
| FS/FE 55-RL | Laser | Teach-in | 30 m | | 268 |
| FS/FE 55-R | LED | Teach-in | 25 m | | 270 |
| FS/FE 55-RM | LED | Teach-in | 20 m | Stainless steel housing | 272 |



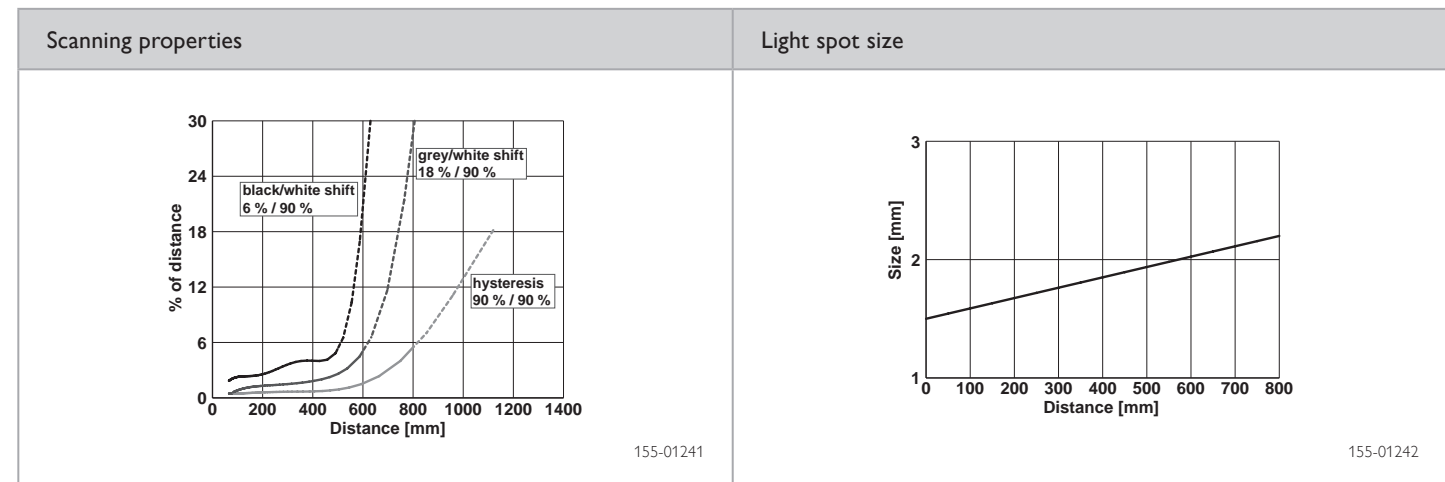
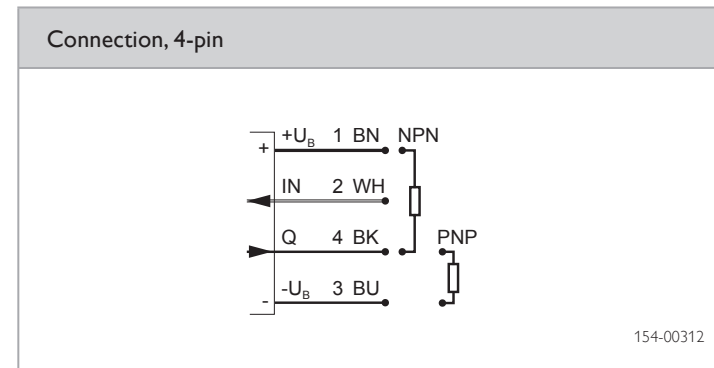
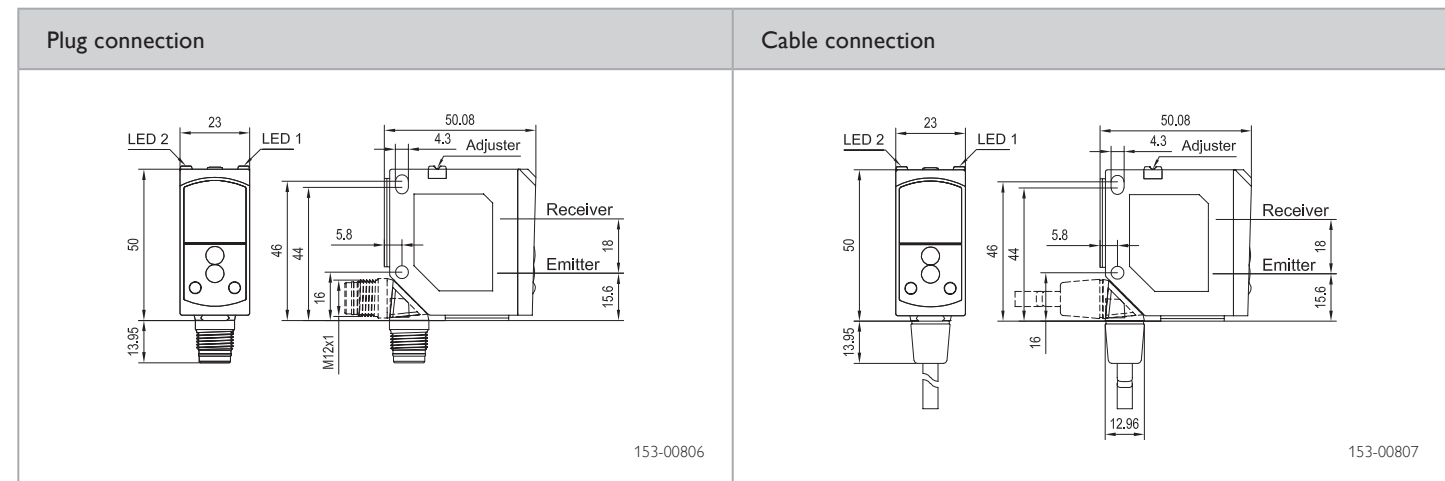
PRODUCT HIGHLIGHTS

- Precisely adjustable background suppression – reliable operation even with highly reflective and glossy backgrounds
- Particularly suitable for the detection of the smallest of objects
- Very small, easily visible laser light spot
- Precise scanning distance adjustment by means of potentiometer
- Plug and cable connection rotatable

| Optical data | | Functions | |
|--------------------------------------|--|---------------------------------|--|
| Scanning distance | 5 ... 800 mm ¹ | Indicator LED, green | Operating voltage indicator |
| Type of light | Laser, red, 655 nm | Indicator LED, yellow | Switching output indicator / contamination indicator |
| Light spot size | See diagram | Scanning distance adjustment | Via potentiometer |
| Laser Class (DIN EN 60825-1:2008-05) | 1 | Adjustment possibilities | N.O./N.C. via control input |
| | | Default settings | Max. scanning distance (6 %) |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 12 ... 30V DC ² | Dimensions | 50 x 50.08 x 23 mm ³ |
| No-load current, I ₀ | ≤ 30 mA | Enclosure rating | IP 69K & IP 67 ³ |
| Output current, I _e | ≤ 100 mA | Material, housing | PC-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) |
| Standby time | < 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) | 35 g |
| Switching frequency, f (ti/tp 1:1) | ≤ 1000 Hz | Weight (cable device) | 125 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 Max. 10 % ripple, within U_B, ~ 50 Hz / 100 Hz ³ With connected IP 67 / IP 69K plug

| Scanning distance | Switching output | Type of connection | Part number | Article number |
|-------------------|------------------|--------------------|-----------------|----------------|
| 5 ... 800 mm | PNP | Plug, M12x1, 4-pin | FT 55-RLH-PS-L4 | 623-11018 |
| 5 ... 800 mm | NPN | Plug, M12x1, 4-pin | FT 55-RLH-NS-L4 | 623-11019 |
| 5 ... 800 mm | PNP | Cable, 3 m, 4-wire | FT 55-RLH-PS-K4 | 623-11021 |
| 5 ... 800 mm | NPN | Cable, 3 m, 4-wire | FT 55-RLH-NS-K4 | 623-11022 |



| Reference material | Detection range |
|--------------------|-----------------|
| White (90 %) | 5 ... 800 mm |
| Grey (18 %) | 10 ... 600 mm |
| Black (6 %) | 30 ... 500 mm |

| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |

Laser photoelectric proximity sensor with background suppression



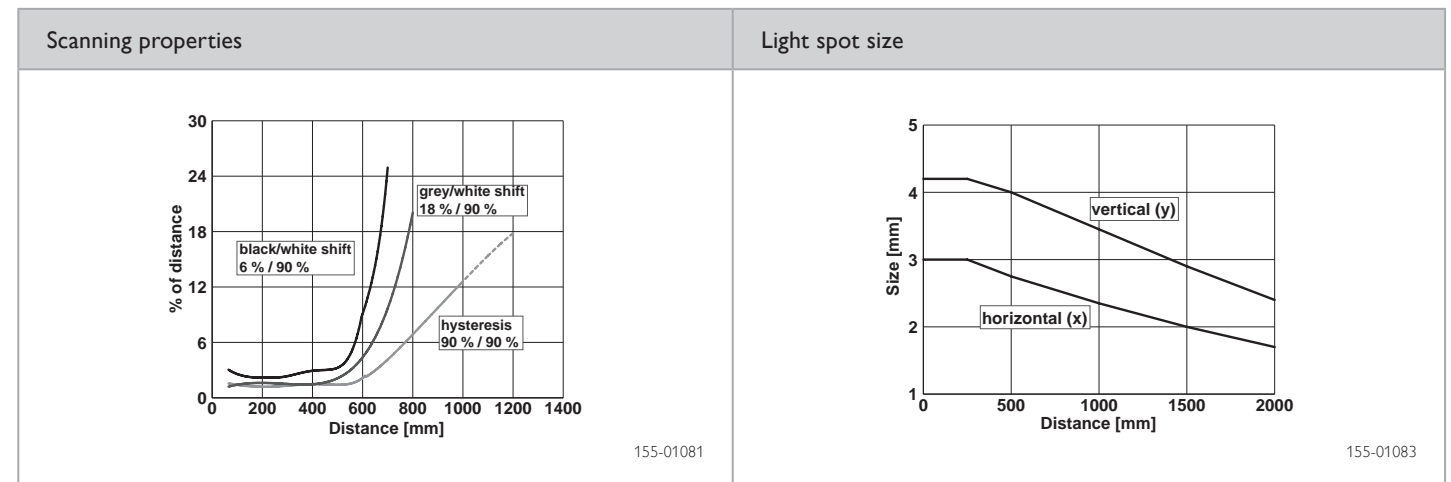
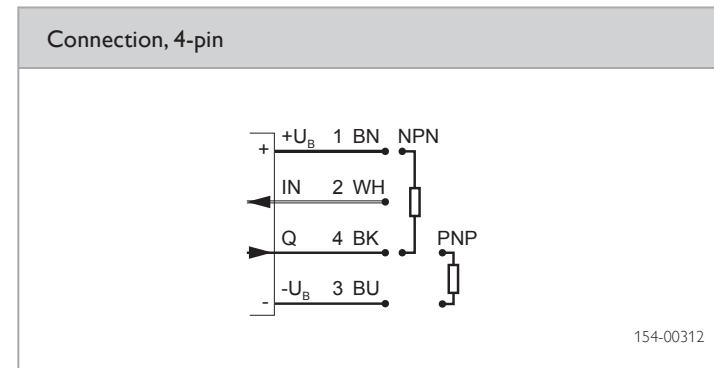
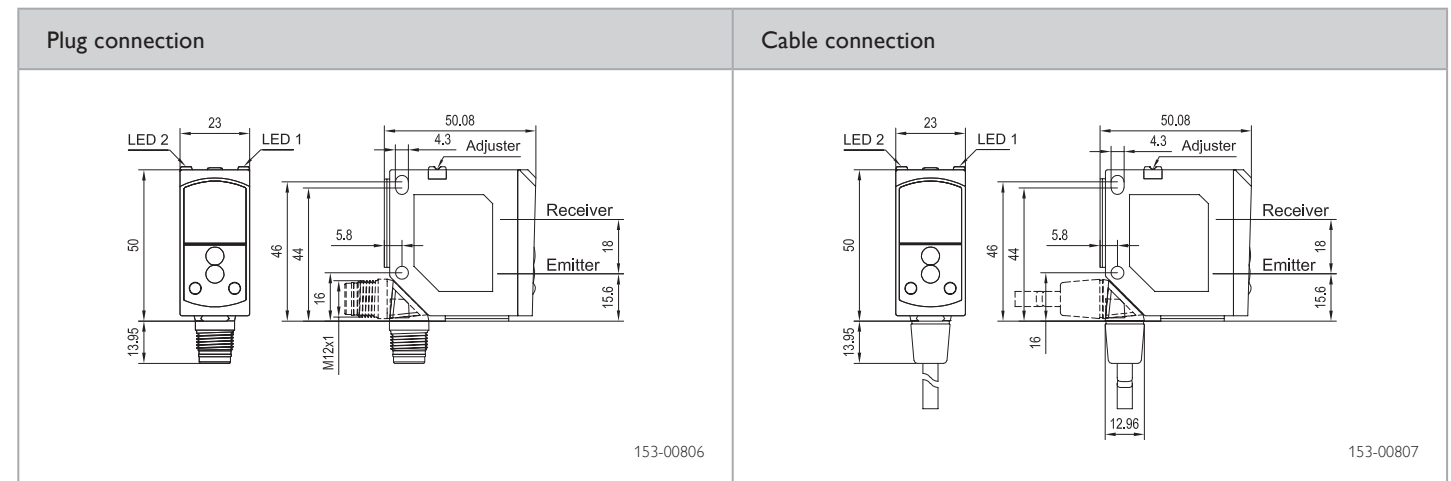
PRODUCT HIGHLIGHTS

- Long scanning distance of 1 m combined with extremely accurate small-part detection
- Precisely adjustable background suppression – reliable operation even with highly reflective and glossy backgrounds
- Very small, easily visible laser light spot
- Precise scanning distance adjustment by means of potentiometer
- Integrated display window for scanning distance adjustment

| Optical data | | Functions | |
|-------------------------------------|--|---------------------------------|--|
| Scanning distance | 5 ... 1000 mm ¹ | Indicator LED, green | Operating voltage indicator |
| Type of light | Laser, red, 655 nm | Indicator LED, yellow | Switching output indicator / contamination indicator |
| Light spot size | See diagram | Scanning distance adjustment | Via potentiometer |
| Laser Class (DIN EN 60825-1:2008-5) | 2 | Adjustment possibilities | N.O./N.C. via control input |
| | | Default settings | S _n = 500 mm (6 %) |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 12 ... 30V DC ² | Dimensions | 50 x 50.08 x 23 mm ³ |
| No-load current, I ₀ | ≤ 30 mA | Enclosure rating | IP 69K & IP 67 ³ |
| Output current, I _e | ≤ 100 mA | Material, housing | PC-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) |
| Standby time | < 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) | 35 g |
| Switching frequency, f (ti/tp 1:1) | ≤ 1000 Hz | Weight (cable device) | 125 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 Max. 10 % ripple, within U_B ~ 50 Hz / 100 Hz ³ With connected IP 67 / IP 69K plug

| Scanning distance | Switching output | Type of connection | Part number | Article number |
|-------------------|------------------|--------------------|------------------|----------------|
| 5 ... 1000 mm | PNP | Plug, M12x1, 4-pin | FT 55-RL2H-PS-L4 | 623-11006 |
| 5 ... 1000 mm | NPN | Plug, M12x1, 4-pin | FT 55-RL2H-NS-L4 | 623-11007 |
| 5 ... 1000 mm | PNP | Cable, 3 m, 4-wire | FT 55-RL2H-PS-K4 | 623-11009 |
| 5 ... 1000 mm | NPN | Cable, 3 m, 4-wire | FT 55-RL2H-NS-K4 | 623-11010 |



| Reference material | Detection range |
|--------------------|-----------------|
| White (90 %) | 5 ... 1000 mm |
| Grey (18 %) | 10 ... 800 mm |
| Black (6 %) | 15 ... 700 mm |

| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



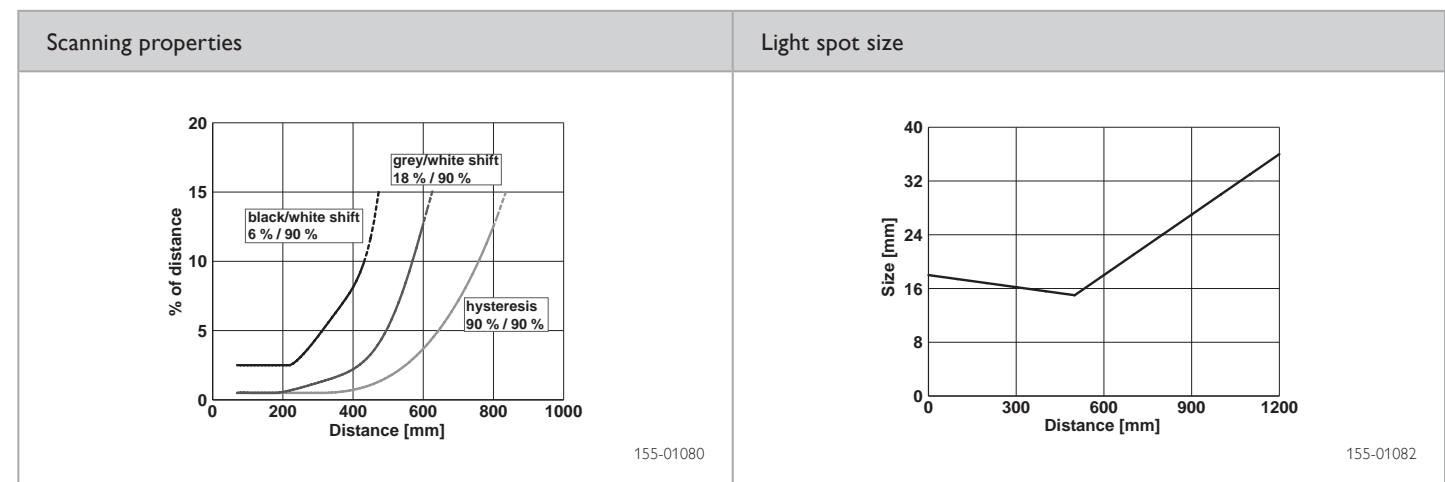
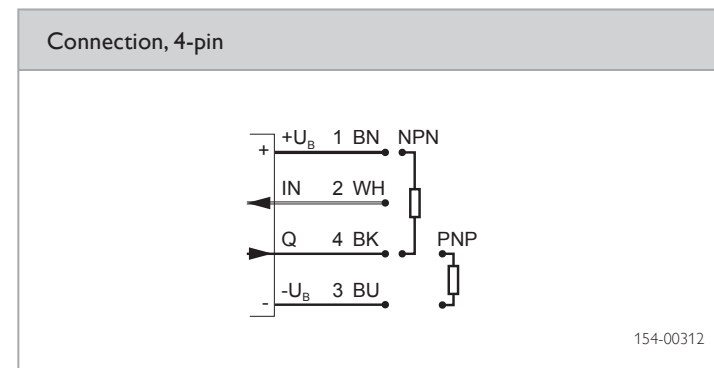
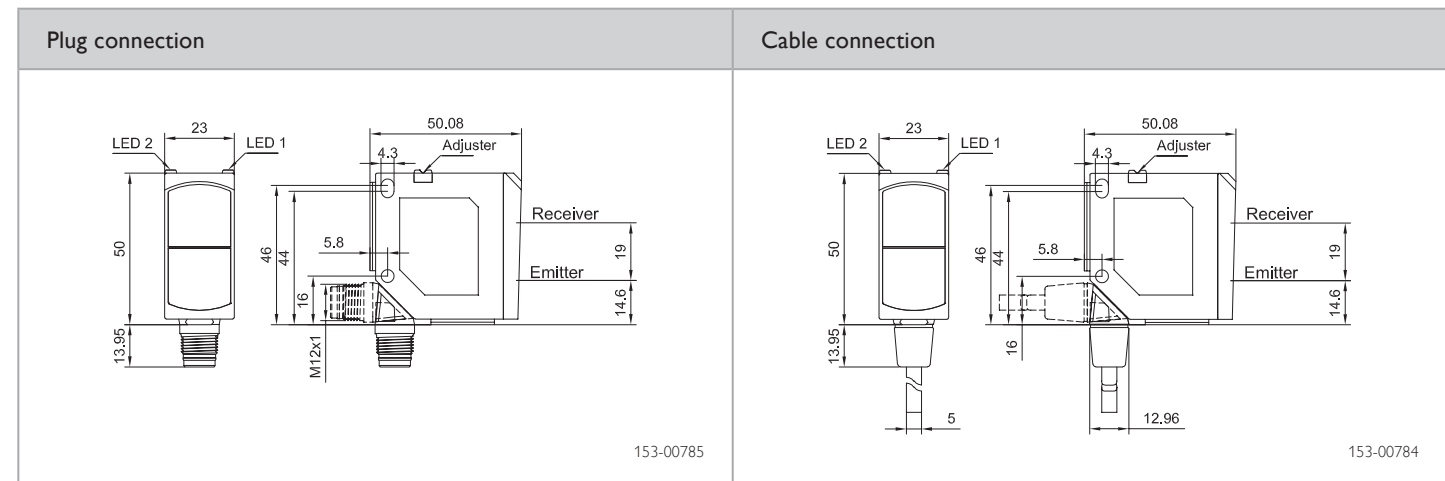
PRODUCT HIGHLIGHTS

- Precisely adjustable background suppression
- Reliable switching despite differing object colours and surfaces
- Simple alignment thanks to easily visible light spot
- Plug and cable connection rotatable

| Optical data | | Functions | |
|------------------------------------|--|---------------------------------|--|
| Scanning distance | 3 ... 800 mm ¹ | Indicator LED, green | Operating voltage indicator |
| Type of light | LED, red, 640 nm | Indicator LED, yellow | Switching output indicator / contamination indicator |
| Light spot size | See diagram | Scanning distance adjustment | Via potentiometer |
| | | Adjustment possibilities | N.O./N.C. via control input |
| | | Default settings | Max. scanning distance (6 %) |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30V DC ² | Dimensions | 50 x 50.08 x 23 mm ³ |
| No-load current, I ₀ | ≤ 30 mA | Enclosure rating | IP 69K & IP 67 ³ |
| Output current, I _e | ≤ 100 mA | Material, housing | PC-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) |
| Standby time | < 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) | 35 g |
| Switching frequency, f (ti/tp 1:1) | ≤ 600 Hz | Weight (cable) | 125 g |
| Response time | 830 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 Max. 10 % ripple, within U_B ~ 50 Hz / 100 Hz ³ With connected IP 67 / IP 69K plug

| Scanning distance | Switching output | Type of connection | Part number | Article number |
|-------------------|------------------|--------------------|-----------------|----------------|
| 3 ... 800 mm | PNP | Plug, M12x1, 4-pin | FT 55B-RH-PS-L4 | 623-11012 |
| 3 ... 800 mm | NPN | Plug, M12x1, 4-pin | FT 55B-RH-NS-L4 | 623-11013 |
| 3 ... 800 mm | PNP | Cable 3 m, 4-wire | FT 55B-RH-PS-K4 | 623-11014 |
| 3 ... 800 mm | NPN | Cable 3 m, 4-wire | FT 55B-RH-NS-K4 | 623-11015 |



| Reference material | Detection range |
|--------------------|-----------------|
| White (90 %) | 3 ... 800 mm |
| Grey (18 %) | 5 ... 600 mm |
| Black (6 %) | 15 ... 450 mm |

| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



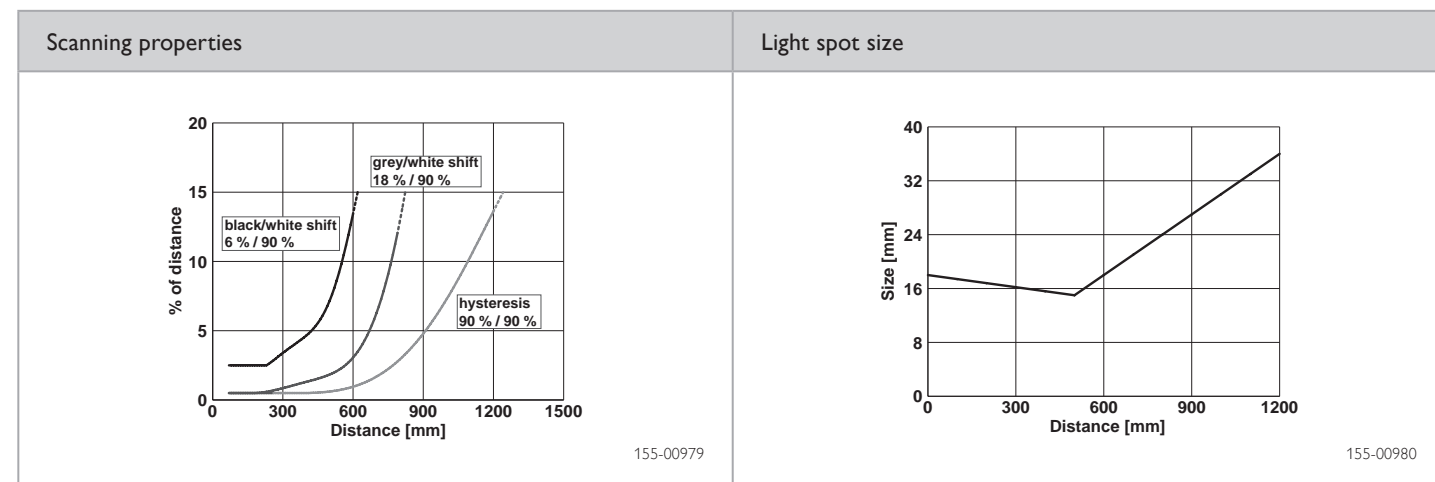
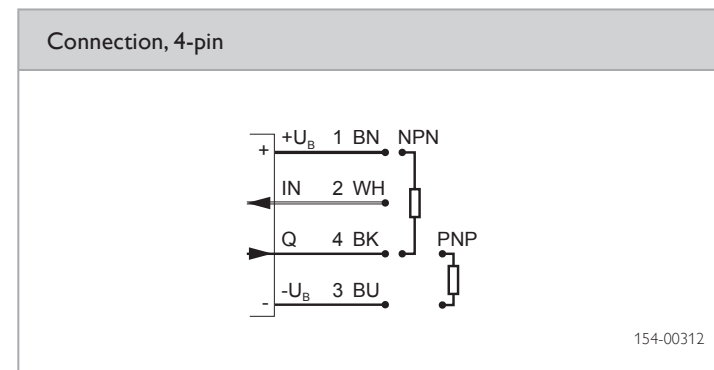
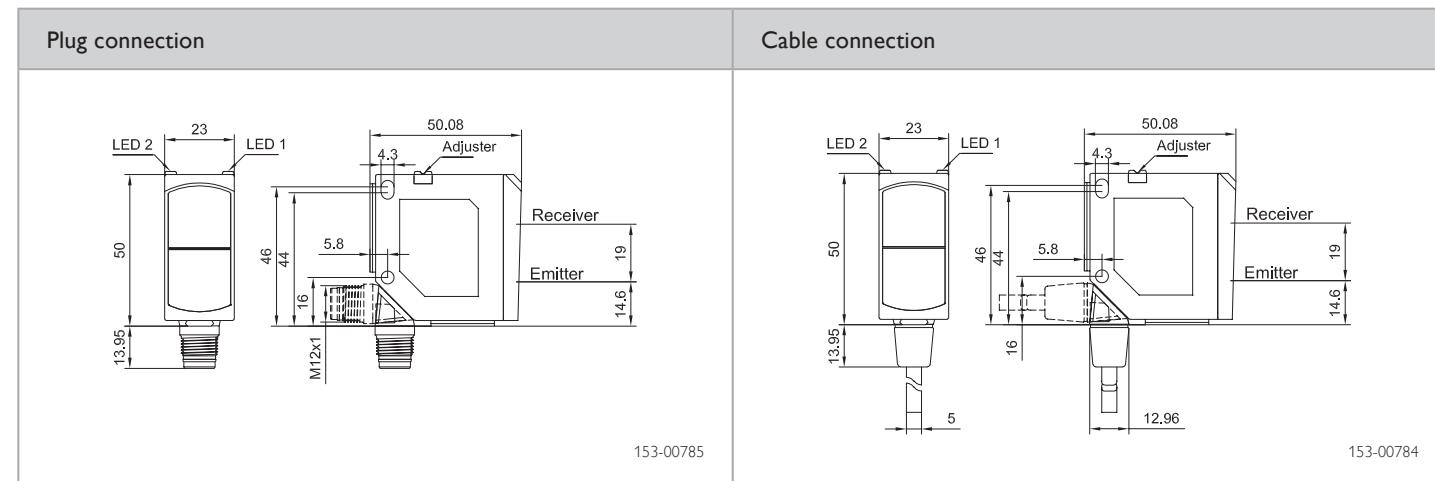
PRODUCT HIGHLIGHTS

- Long scanning distance of 1.20 m
- Precisely adjustable background suppression – reliable operation even with highly reflective and glossy backgrounds
- Reliable suppression of ambient light, such as sunlight and halogen lamps
- Precise scanning distance adjustment by means of potentiometer

| Optical data | | Functions | |
|------------------------------------|--|---------------------------------|--|
| Scanning distance | 3 ... 1200 mm ¹ | Indicator LED, green | Operating voltage indicator |
| Type of light | LED, red, 640 nm | Indicator LED, yellow | Switching output indicator / contamination indicator |
| Light spot size | See diagram | Scanning distance adjustment | Via potentiometer |
| | | Adjustment possibilities | N.O./N.C. via control input |
| | | Default settings | S _n = 500 mm (6 %) |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30V DC ² | Dimensions | 50 x 50.08 x 23 mm ³ |
| No-load current, I ₀ | ≤ 30 mA | Enclosure rating | IP 69K & IP 67 ³ |
| Output current, I _e | ≤ 100 mA | Material, housing | PC-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) |
| Standby time | < 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) | 35 g |
| Switching frequency, f (ti/tp 1:1) | ≤ 600 Hz | Weight (cable device) | 125 g |
| Response time | 830 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 Max. 10 % ripple, within U_B ~ 50 Hz / 100 Hz ³ With connected IP 67 / IP 69K plug

| Scanning distance | Switching output | Type of connection | Part number | Article number |
|-------------------|------------------|--------------------|----------------|----------------|
| 3 ... 1200 mm | PNP | Plug, M12x1, 4-pin | FT 55-RH-PS-L4 | 623-11000 |
| 3 ... 1200 mm | NPN | Plug, M12x1, 4-pin | FT 55-RH-NS-L4 | 623-11001 |
| 3 ... 1200 mm | PNP | Cable, 3 m, 4-wire | FT 55-RH-PS-K4 | 623-11003 |
| 3 ... 1200 mm | NPN | Cable, 3 m, 4-wire | FT 55-RH-NS-K4 | 623-11004 |



| Reference material | Detection range |
|--------------------|-----------------|
| White (90 %) | 3 ... 1200 mm |
| Grey (18 %) | 5 ... 800 mm |
| Black (6 %) | 10 ... 600 mm |

| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |

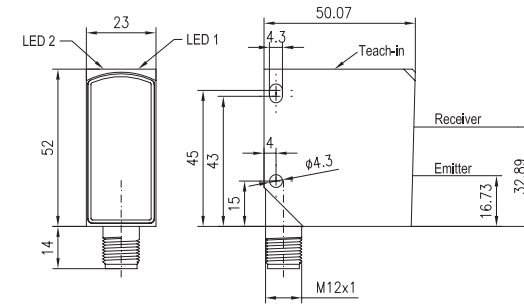
Photoelectric proximity sensor with background suppression – stainless steel housing



PRODUCT HIGHLIGHTS

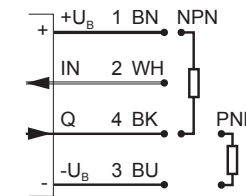
- Minimum black / white-shift for reliable switching regardless of object colour and surface
- Stable stainless steel housing – ideal for use in hygiene zones
- Housing concept designed for intensive cleaning processes in the food industry
- Sensor adjustment via teach-in and control input

Plug connection



153-00800

Connection, 4-pin



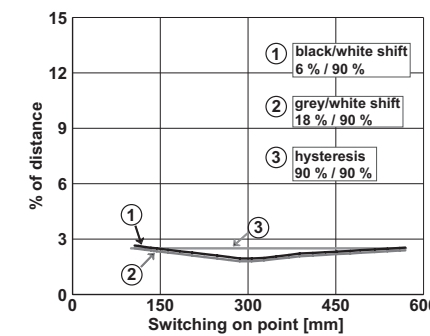
154-00312

| Optical data | | Functions | |
|------------------------------------|--|---------------------------------|--|
| Scanning distance | 3 ... 550 mm ¹ | Indicator LED, green | Operating voltage indicator |
| Adjustment range | 100 ... 550 mm ¹ | Indicator LED, yellow | Switching output indicator / functional reserve indicator |
| Type of light | LED, red, 640 nm | Scanning distance adjustment | Via Teach-in button and control input |
| Light spot size | See diagram | Teach-in modes | Mode 1: during running process Mode 2: during standing process |
| | | 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 ... 30 V DC ² | Dimensions | 52 x 50.07 x 23 mm ³ |
| No-load current, I ₀ | ≤ 30 mA | Enclosure rating | IP 69K & IP 67 ³ |
| Output current, I _e | ≤ 100 mA | Material, housing | Stainless steel, 316L |
| Protective circuits | Reverse-polarity protection, U _B / short-circuit protection (Q) | Material, front screen | PMMA |
| Standby time | < 300 ms | Type of connection | (See Selection Table) |
| Switching output, Q | PNP/NPN (see Selection Table) | Ambient temperature: operation | -20 ... +60 °C |
| Output function | N.O./N.C. | Ambient temperature: storage | -20 ... +80 °C |
| Switching frequency, f (ti/tp 1:1) | ≤ 400 Hz | Weight (plug device) | 145 g |
| Response time | 1.25 ms | 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: white, 90 % reflectivity ² Max. 10 % ripple, within U_B ~ 50 Hz / 100 Hz ³ With connected IP 67 / IP 69K plug

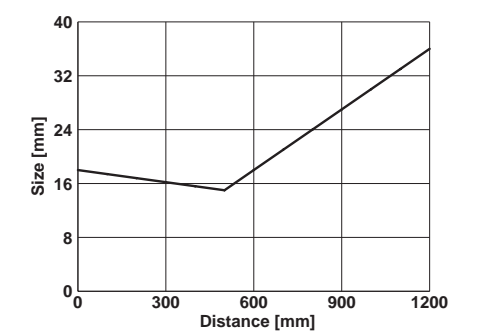
| Scanning distance | Switching output | Type of connection | Part number | Article number |
|-------------------|------------------|--------------------|-----------------|----------------|
| 3 ... 550 mm | PNP | Plug, M12x1, 4-pin | FT 55-RHM-PS-L4 | 623-11025 |
| 3 ... 550 mm | NPN | Plug, M12x1, 4-pin | FT 55-RHM-NS-L4 | 623-11026 |

Scanning properties



155-01286

Light spot size



155-00980

| Reference material | Detection range |
|--------------------|-----------------|
| White (90 %) | 3 ... 550 mm |
| Grey (18 %) | 12 ... 550 mm |
| Black (6 %) | 20 ... 550 mm |

Accessories

| | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



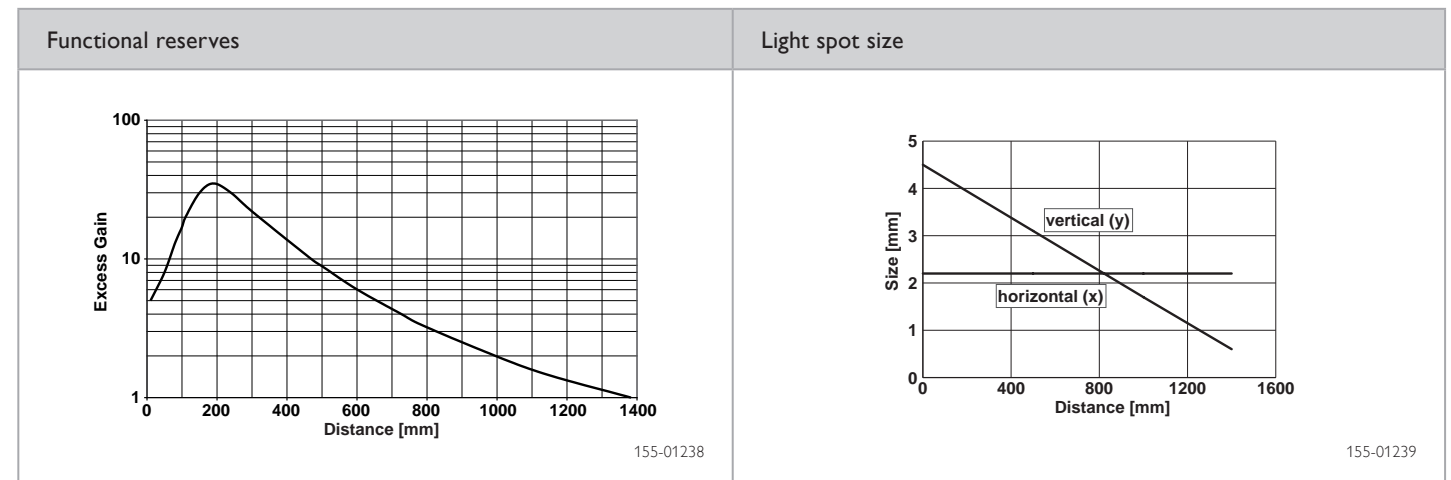
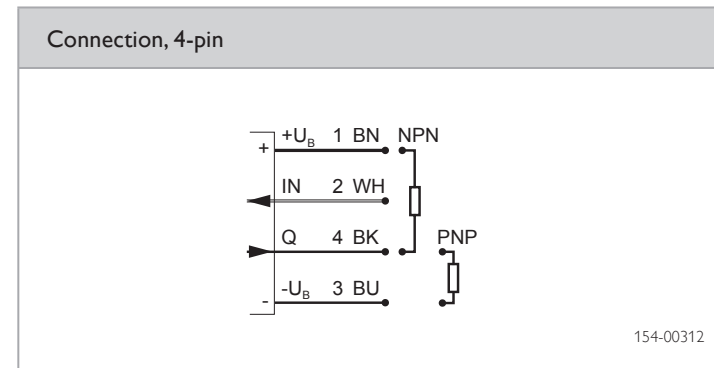
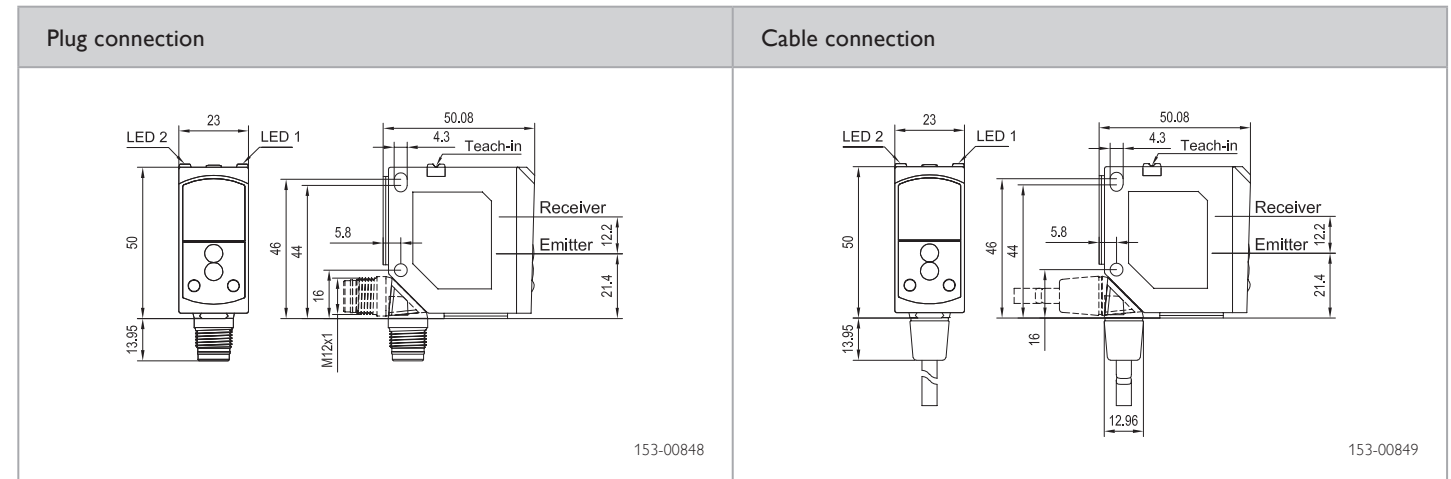
PRODUCT HIGHLIGHTS

- Differentiation of even the slightest of grey value differences
- Sensor adjustment via teach-in and control input
- Very small, easily visible laser light spot
- Plug and cable connection rotatable

| Optical data | | Functions | |
|-------------------------------------|--|---------------------------------|--|
| Scanning distance | 5 ... 1200 mm ¹ | Indicator LED, green | Operating voltage indicator |
| Type of light | Laser, red, 655 nm | Indicator LED, yellow | Switching output indicator / contamination indicator |
| Light spot size | See diagram | 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 process Mode 2: during standing process |
| Hysteresis | ≤ 15 % | 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 ... 30 V DC ² | Dimensions | 50 x 50.08 x 23 mm ³ |
| No-load current, I ₀ | ≤ 30 mA | Enclosure rating | IP 69K & IP 67 ³ |
| Output current, I _e | ≤ 100 mA | Material, housing | PC-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) |
| Standby time | < 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) | 35 g |
| Switching frequency, f (ti/tp 1:1) | ≤ 600 Hz | Weight (cable device) | 125 g |
| Response time | 830 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: white, 90 % reflectivity ² Max. 10 % ripple, within U_B ~ 50 Hz / 100 Hz ³With connected IP 67 / IP 69K plug

| Scanning distance | Switching output | Type of connection | Part number | Article number |
|-------------------|------------------|--------------------|-----------------|----------------|
| 5 ... 1200 mm | PNP | Plug, M12x1, 4-pin | FT 55-RL2-PS-L4 | 622-21006 |
| 5 ... 1200 mm | NPN | Plug, M12x1, 4-pin | FT 55-RL2-NS-L4 | 622-21007 |
| 5 ... 1200 mm | PNP | Cable, 3 m, 4-wire | FT 55-RL2-PS-K4 | 622-21009 |
| 5 ... 1200 mm | NPN | Cable, 3 m, 4-wire | FT 55-RL2-NS-K4 | 622-21010 |



| Reference material | Detection range |
|--------------------|-----------------|
| White (90 %) | 5 ... 1200 mm |
| Grey (18 %) | 10 ... 700 mm |
| Black (6 %) | 100 ... 400 mm |

| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



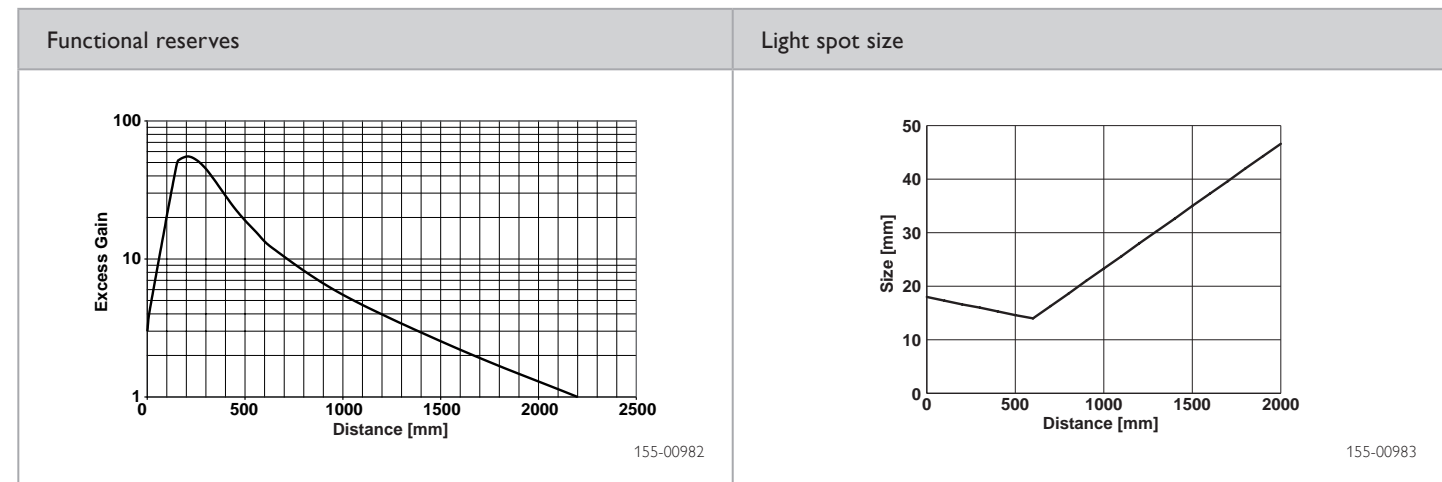
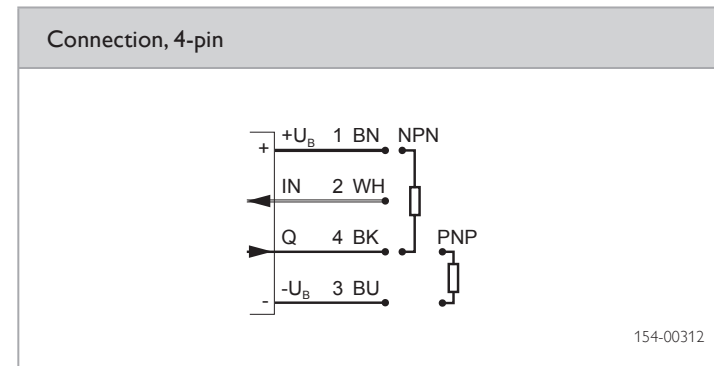
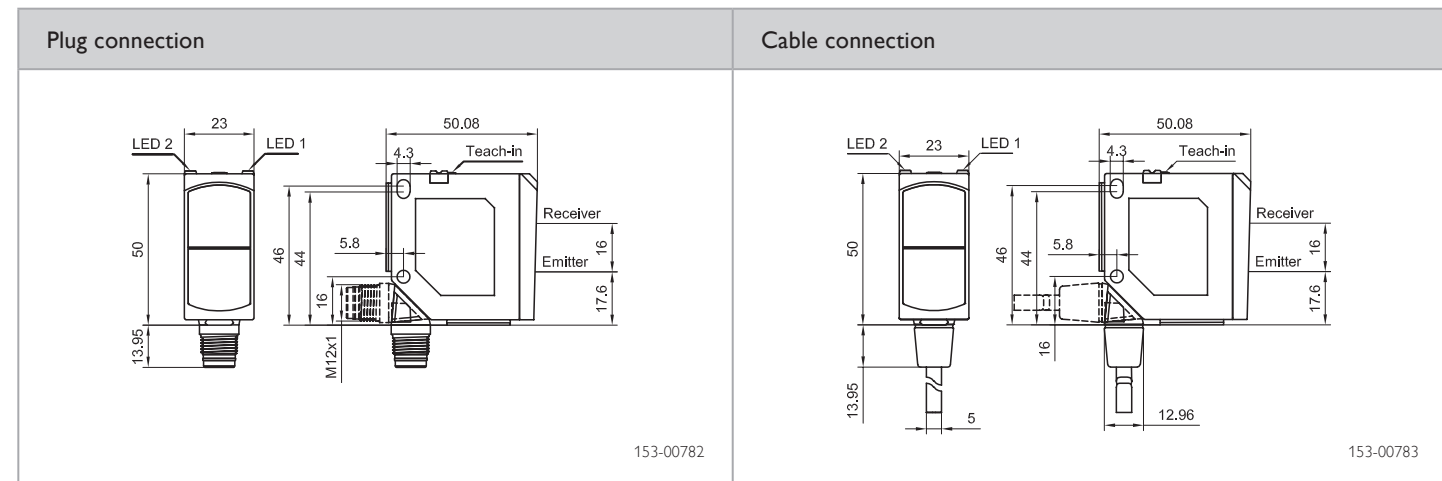
PRODUCT HIGHLIGHTS

- Differentiation of even the slightest of grey value differences
- Sensor adjustment via teach-in and control input
- Simple alignment thanks to easily visible light spot
- Plug and cable connection rotatable

| Optical data | | Functions | |
|------------------------------------|--|---------------------------------|--|
| Scanning distance | 5 ... 2000 mm ¹ | Indicator LED, green | Operating voltage indicator |
| Type of light | LED, red, 640 nm | Indicator LED, yellow | Switching output indicator / contamination indicator |
| Light spot size | See diagram | 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. scanning distance and N.O. |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30 V DC ² | Dimensions | 50 x 50.08 x 23 mm ³ |
| No-load current, I ₀ | ≤ 30 mA | Enclosure rating | IP 69K & IP 67 ³ |
| Output current, I _e | ≤ 100 mA | Material, housing | PC-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) |
| Standby time | < 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) | 35 g |
| Switching frequency, f (ti/tp 1:1) | ≤ 600 Hz | Weight (cable device) | 125 g |
| Response time | 830 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: white, 90 % reflectivity ² Max. 10 % ripple, within U_B ~ 50 Hz / 100 Hz ³With connected IP 67 / IP 69K plug

| Scanning distance | Switching output | Type of connection | Part number | Article number |
|-------------------|------------------|--------------------|---------------|----------------|
| 5 ... 2000 mm | PNP | Plug, M12x1, 4-pin | FT 55-R-PS-L4 | 622-21000 |
| 5 ... 2000 mm | NPN | Plug, M12x1, 4-pin | FT 55-R-NS-L4 | 622-21001 |
| 5 ... 2000 mm | PNP | Cable, 3 m, 4-wire | FT 55-R-PS-K4 | 622-21003 |
| 5 ... 2000 mm | NPN | Cable, 3 m, 4-wire | FT 55-R-NS-K4 | 622-21004 |



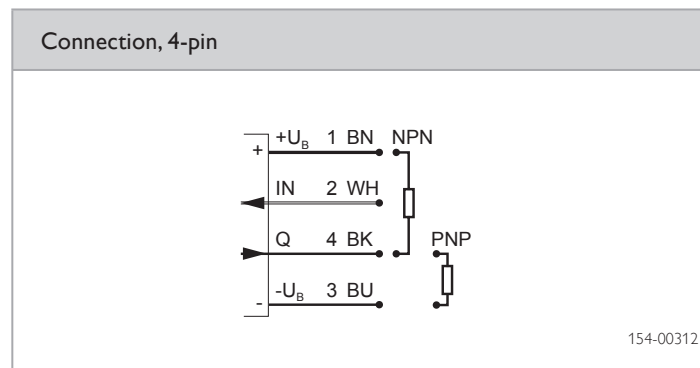
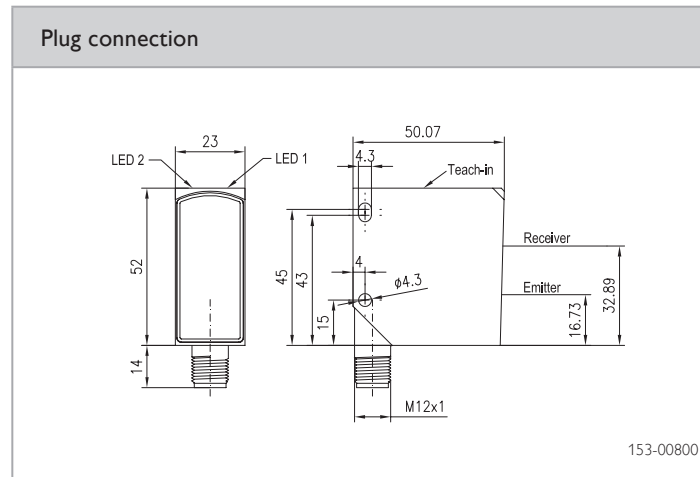
| Reference material | Detection range |
|--------------------|-----------------|
| White (90 %) | 5 ... 2000 mm |
| Grey (18 %) | 10 ... 1200 mm |
| Black (6 %) | 90 ... 600 mm |

| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |

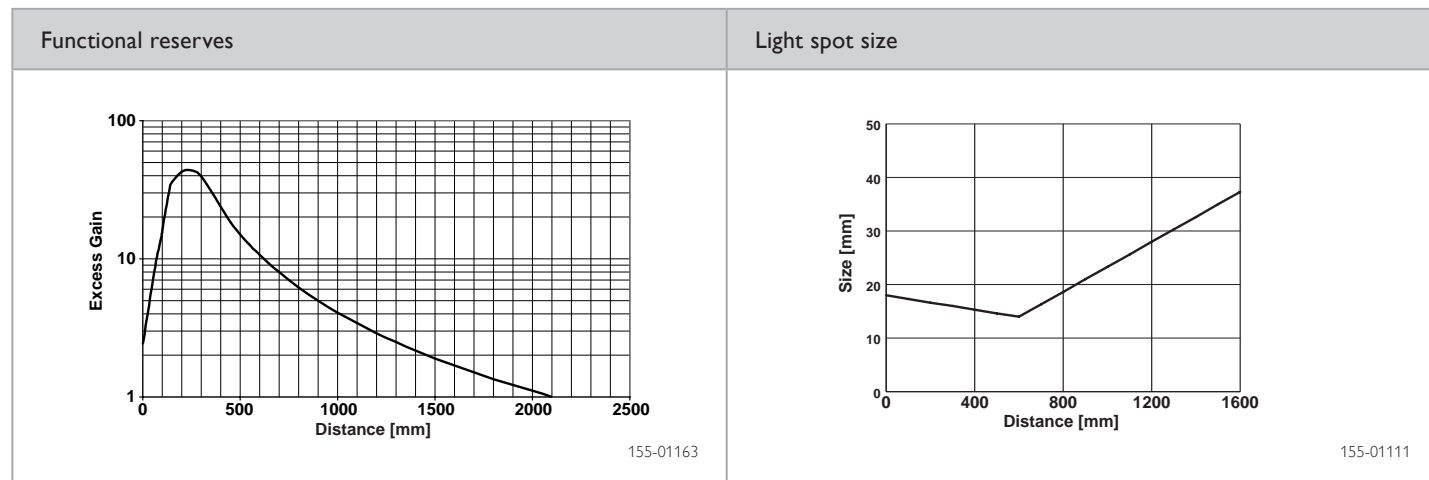


PRODUCT HIGHLIGHTS

- Stable stainless steel housing – ideal for use in hygiene zones, e.g. in the food and beverages industries
- Housing concept designed for intensive cleaning processes
- Sensor adjustment via teach-in and control input
- Simple alignment thanks to easily visible light spot



| Optical data | | Functions | |
|------------------------------------|--|---------------------------------|--|
| Scanning distance | 0 ... 1750 mm ¹ | Indicator LED, green | Operating voltage indicator |
| Type of light | LED, red, 640 nm | Indicator LED, yellow | Switching output indicator / contamination indicator |
| Light spot size | See diagram | 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. scanning distance and N.O. |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30 V DC ² | Dimensions | 52 × 50.07 × 23 mm ³ |
| No-load current, I ₀ | ≤ 30 mA | Enclosure rating | IP 69K & IP 67 ³ |
| Output current, I _e | ≤ 100 mA | Material, housing | Stainless steel, 316L |
| Protective circuits | Reverse-polarity protection, U _B / short-circuit protection (Q) | Material, front screen | PMMA |
| Standby time | < 300 ms | Type of connection | (See Selection Table) |
| Switching output, Q | PNP/NPN (see Selection Table) | Ambient temperature: operation | -20 ... +60 °C |
| Output function | N.O./N.C. | Ambient temperature: storage | -20 ... +80 °C |
| Switching frequency, f (ti/tp 1:1) | ≤ 600 Hz | Weight (plug device) | 138 g |
| Response time | 830 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: white, 90 % reflectivity ² Max. 10 % ripple, within U_B ~ 50 Hz / 100 Hz ³ With connected IP 67 / IP 69K plug

| Scanning distance | Switching output | Type of connection | Part number | Article number |
|-------------------|------------------|--------------------|----------------|----------------|
| 0 ... 1750 mm | PNP | Plug, M12x1, 4-pin | FT 55-RM-PS-L4 | 622-21012 |
| 0 ... 1750 mm | NPN | Plug, M12x1, 4-pin | FT 55-RM-NS-L4 | 622-21013 |

| Reference material | Detection range |
|--------------------|-----------------|
| White (90 %) | 0 ... 1750 mm |
| Grey (18 %) | 15 ... 1100 mm |
| Black (6 %) | 90 ... 550 mm |

Accessories

| | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



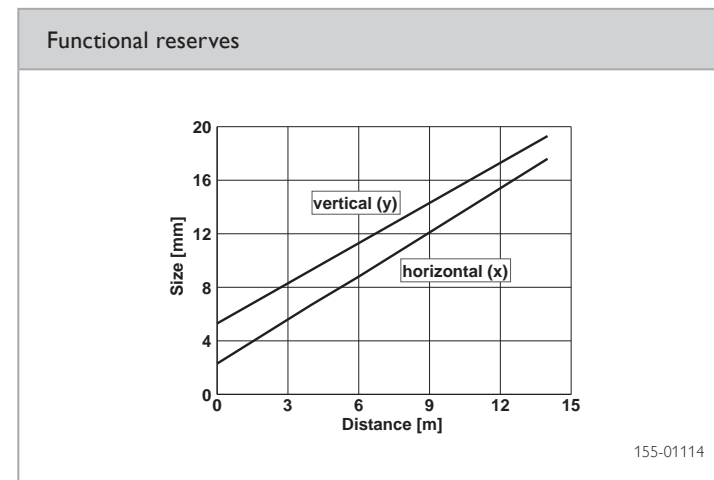
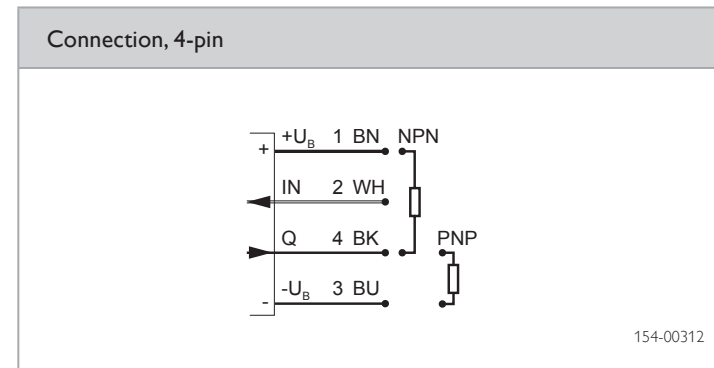
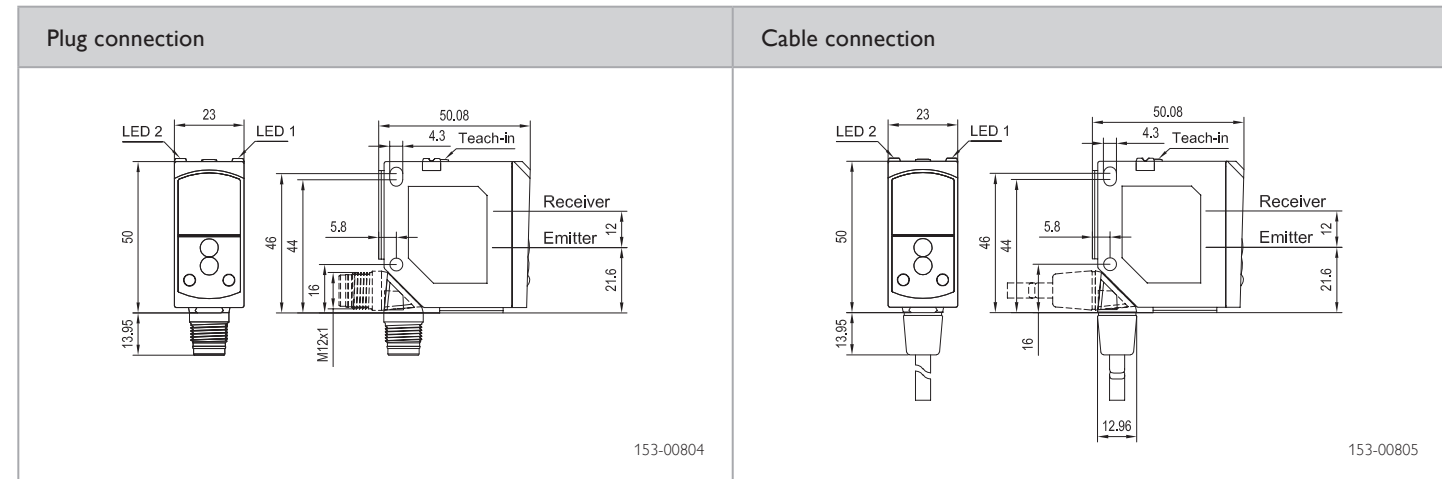
PRODUCT HIGHLIGHTS

- Particularly suitable for the detection of the smallest of objects – smallest detectable part < 2 mm
- Bright, precise laser light spot in Laser Class 1
- Suitable for a wide variety of different reflectors
- Sensor adjustment via teach-in and control input

| Optical data | | Functions | |
|-------------------------------------|---|---------------------------------|--|
| Limit range | 0.3 ... 14 m ¹ | Indicator LED, green | Operating voltage indicator |
| Operating range | 0.3 ... 12 m ¹ | Indicator LED, yellow | Switching output indicator / contamination indicator |
| Type of light | Laser, red, 655 nm | Sensitivity adjustment | Via Teach-in button and control input |
| Light spot size | See diagram | Teach-in modes | Mode 1: during running process Mode 2: during standing process |
| Laser Class (DIN EN 60825-1:2008-5) | 1 | Adjustment possibilities | N.O./N.C. via Teach-in button and control input Button lock via control input |
| Polarising filter | Yes | Default settings | Max. range and N.O. |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30 V DC ² | Dimensions | 50 x 50.08 x 23 mm ³ |
| No-load current, I ₀ | ≤ 30 mA | Enclosure rating | IP 69K & IP 67 ³ |
| Output current, I _e | ≤ 100 mA | Material, housing | PC-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) |
| Standby time | < 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) | 35 g |
| Switching frequency, f (ti/tp 1:1) | ≤ 2000 Hz | Weight (cable device) | 125 g |
| Response time | 250 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 Max. 10 % ripple, within U_B, ~ 50 Hz / 100 Hz ³ With connected IP 67 / IP 69K plug

| Operating range | Switching output | Type of connection | Part number | Article number |
|-----------------|------------------|--------------------|----------------|----------------|
| 0.3 ... 12 m | PNP | Plug, M12x1, 4-pin | FR 55-RL-PS-L4 | 621-11006 |
| 0.3 ... 12 m | NPN | Plug, M12x1, 4-pin | FR 55-RL-NS-L4 | 621-11007 |
| 0.3 ... 12 m | PNP | Cable, 3 m, 4-wire | FR 55-RL-PS-K4 | 621-11009 |
| 0.3 ... 12 m | NPN | Cable, 3 m, 4-wire | FR 55-RL-NS-K4 | 621-11010 |



| Reflector / reflective foil* | Operating range |
|------------------------------|-----------------|
| R5/L | 0.3 ... 12 m |
| RF-230 KL* | 0.2 ... 6 m |

| Accessories | |
|-------------------|---------------|
| Reflectors | From Page 654 |
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



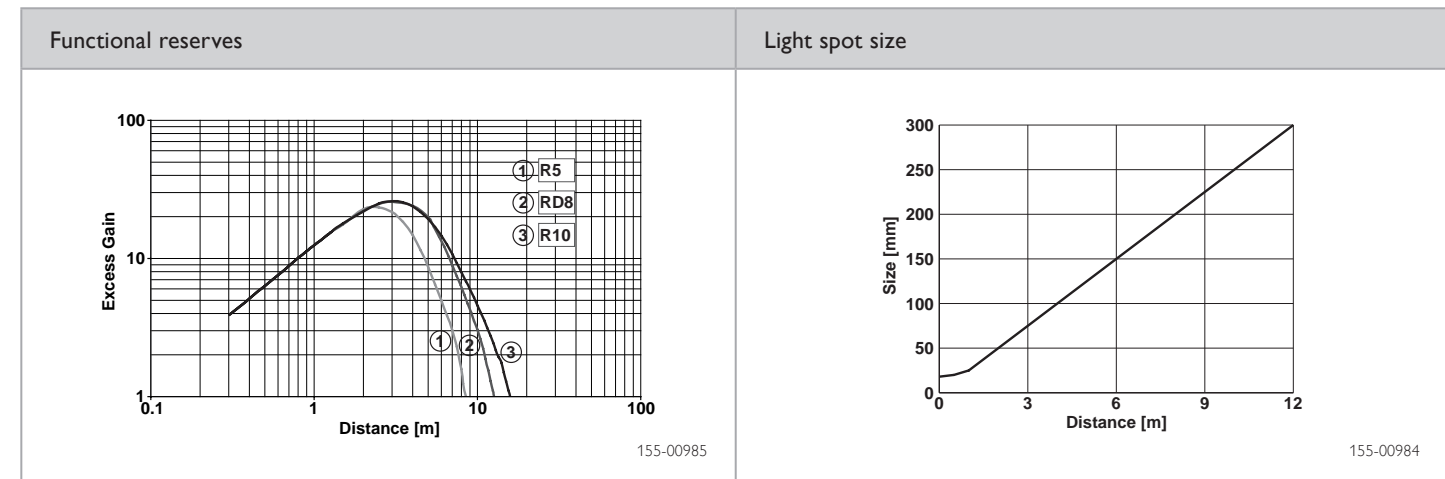
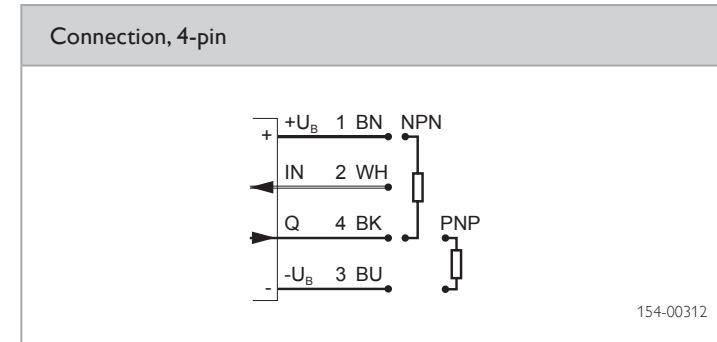
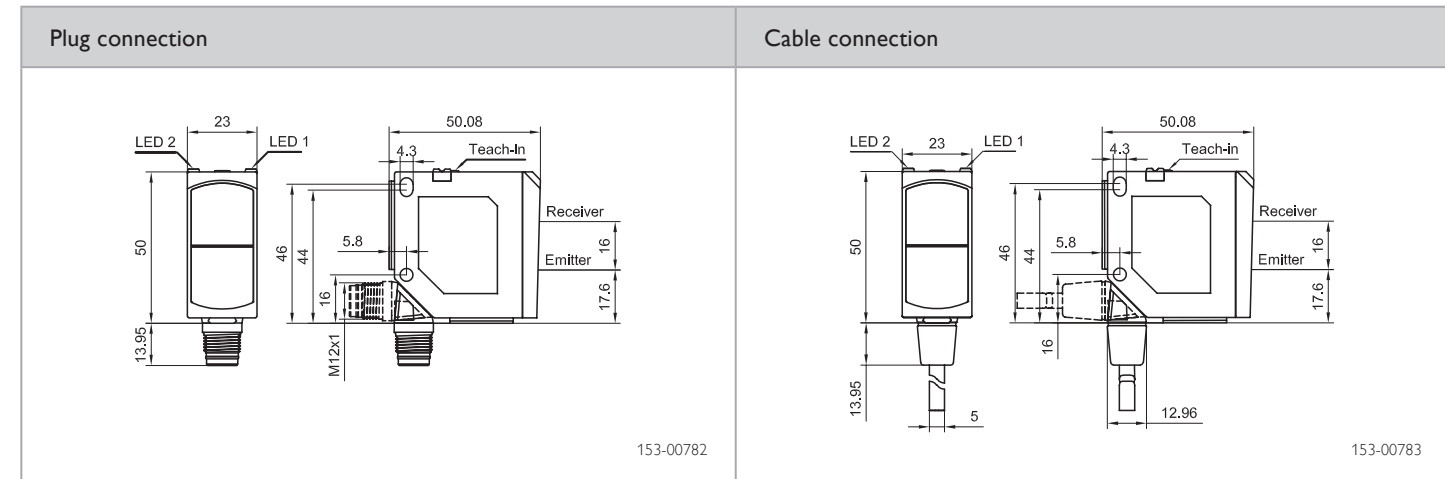
PRODUCT HIGHLIGHTS

- Simple alignment thanks to easily visible light spot
- Suitable for a wide variety of different reflectors
- Sensor adjustment via teach-in and control input
- Plug and cable connection rotatable

| Optical data | | Functions | |
|------------------------------------|--|---------------------------------|--|
| Limit range | 0.3 ... 14 m ¹ | Indicator LED, green | Operating voltage indicator |
| Operating range | 0.3 ... 12 m ¹ | Indicator LED, yellow | Switching output indicator / contamination indicator |
| Type of light | LED, red, 640 nm | Sensitivity adjustment | Via Teach-in button and control input |
| Light spot size | See diagram | Teach-in modes | Mode 1: during running process Mode 2: during standing process |
| Polarising filter | Yes | Adjustment possibilities | N.O./N.C. via Teach-in button and control input Button lock via control input |
| | | Default settings | S _n = 8 m and N.O. |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30 V DC ² | Dimensions | 50 x 50.08 x 23 mm ³ |
| No-load current, I ₀ | ≤ 30 mA | Enclosure rating | IP 69K & IP 67 ³ |
| Output current, I _e | ≤ 100 mA | Material, housing | PC-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) |
| Standby time | < 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) | 35 g |
| Switching frequency, f (ti/tp 1:1) | ≤ 600 Hz | Weight (cable device) | 125 g |
| Response time | 830 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: R10 reflector ² Max. 10 % ripple, within U_B ~ 50 Hz / 100 Hz ³ With connected IP 67 / IP 69K plug

| Operating range | Switching output | Type of connection | Part number | Article number |
|-----------------|------------------|--------------------|---------------|----------------|
| 0.3 ... 12 m | PNP | Plug, M12x1, 4-pin | FR 55-R-PS-L4 | 621-11000 |
| 0.3 ... 12 m | NPN | Plug, M12x1, 4-pin | FR 55-R-NS-L4 | 621-11001 |
| 0.3 ... 12 m | PNP | Cable, 3 m, 4-wire | FR 55-R-PS-K4 | 621-11003 |
| 0.3 ... 12 m | NPN | Cable, 3 m, 4-wire | FR 55-R-NS-K4 | 621-11004 |



| Reflector / reflective tape* | Operating range | Accessories |
|------------------------------|-----------------|-------------------|
| R10 | 0.3 ... 12 m | Reflectors |
| RD8 | 0.3 ... 10 m | Connection cables |
| R5 | 0.3 ... 6 m | Brackets |
| RF-230 KL * | 0.25 ... 6 m | |



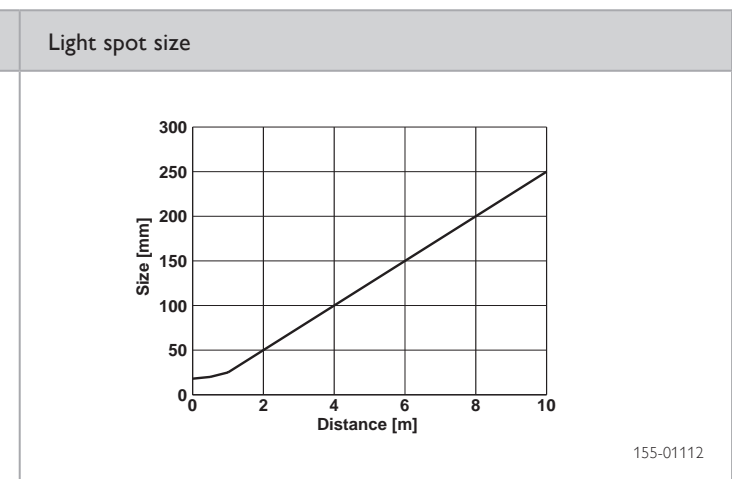
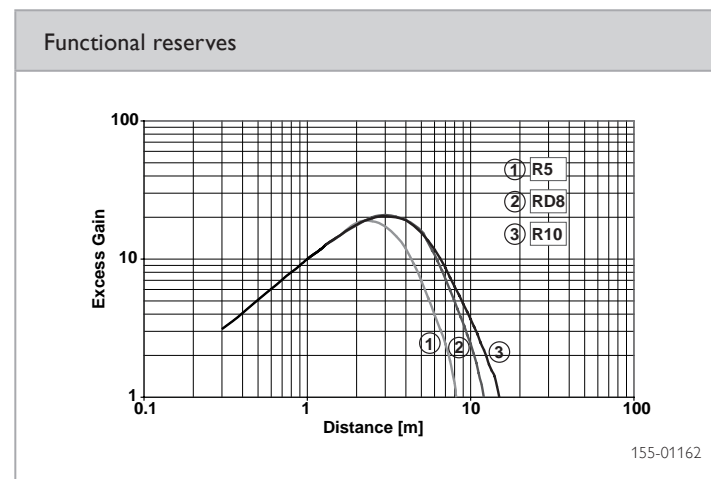
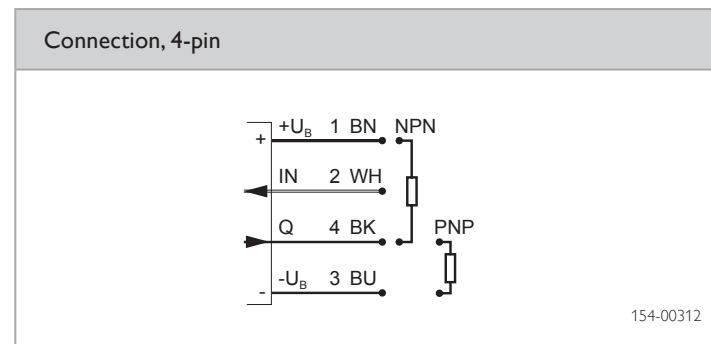
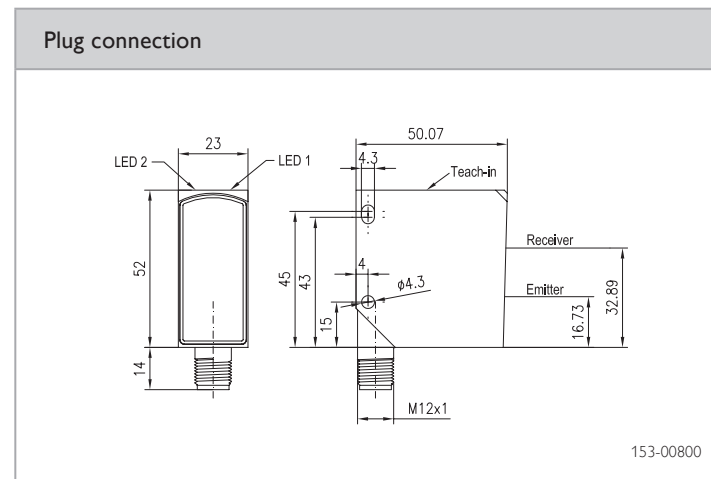
PRODUCT HIGHLIGHTS

- Stable stainless steel housing – ideal for use in hygiene zones, e.g. in the food and beverages industries
- Housing concept designed for intensive cleaning processes
- Sensor adjustment via teach-in and control input
- Simple alignment thanks to easily visible light spot

| Optical data | | Functions | |
|------------------------------------|--|---------------------------------|--|
| Limit range | 0.4 ... 13 m ¹ | Indicator LED, green | Operating voltage indicator |
| Operating range | 0.4 ... 11 m ¹ | Indicator LED, yellow | Switching output indicator / contamination indicator |
| Type of light | LED, red, 640 nm | Sensitivity adjustment | Via Teach-in button and control input |
| Light spot size | See diagram | Teach-in modes | Mode 1: during running process Mode 2: during standing process |
| Polarising filter | Yes | Adjustment possibilities | N.O./N.C. via Teach-in button and control input Button lock via control input |
| | | Default settings | S _n = 8 m and N.O. |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30 V DC ² | Dimensions | 52 x 50.07 x 23 mm ³ |
| No-load current, I ₀ | ≤ 30 mA | Enclosure rating | IP 69K & IP 67 ³ |
| Output current, I _e | ≤ 100 mA | Material, housing | Stainless steel, 316L |
| Protective circuits | Reverse-polarity protection, U _B / short-circuit protection (Q) | Material, front screen | PMMA |
| Standby time | < 300 ms | Type of connection | (See Selection Table) |
| Switching output, Q | PNP/NPN (see Selection Table) | Ambient temperature: operation | -20 ... +60 °C |
| Output function | N.O./N.C. | Ambient temperature: storage | -20 ... +80 °C |
| Switching frequency, f (ti/tp 1:1) | ≤ 600 Hz | Weight (plug device) | 138 g |
| Response time | 830 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: R10 reflector ² Max. 10 % ripple, within U_B ~ 50 Hz / 100 Hz ³ With connected IP 67 / IP 69K plug

| Operating range | Switching output | Type of connection | Part number | Article number |
|-----------------|------------------|--------------------|----------------|----------------|
| 0.4 ... 11 m | PNP | Plug, M12x1, 4-pin | FR 55-RM-PS-L4 | 621-11012 |
| 0.4 ... 11 m | NPN | Plug, M12x1, 4-pin | FR 55-RM-NS-L4 | 621-11013 |



| Reflector | Operating range | Accessories | |
|-----------|-----------------|-------------------|---------------|
| R10 | 0.4 ... 11 m | Reflectors | From Page 654 |
| RD8 | 0.4 ... 9 m | Connection cables | From Page 670 |
| R5 | 0.4 ... 6 m | Brackets | From Page 642 |



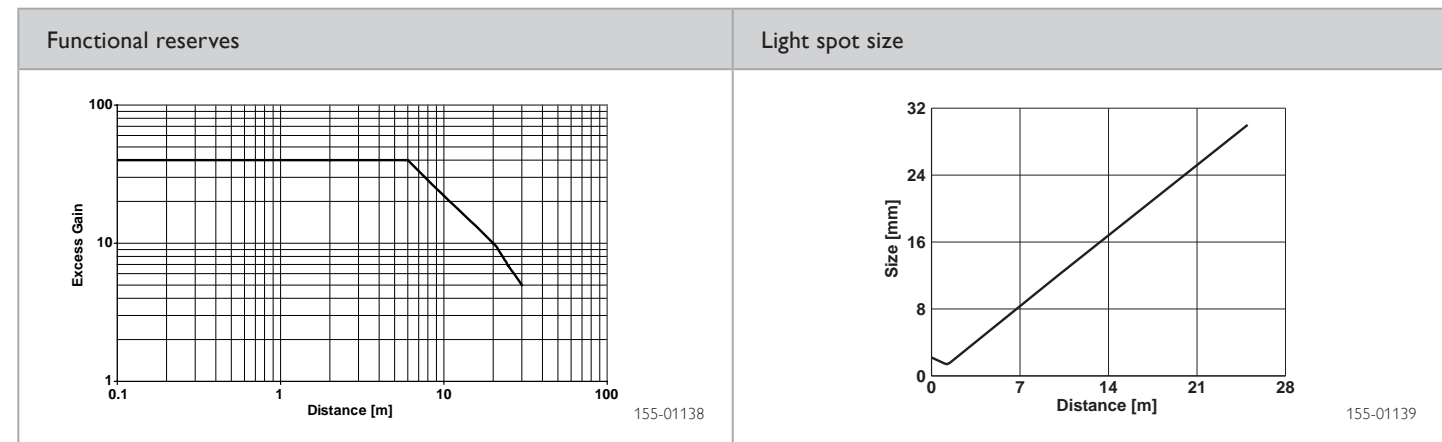
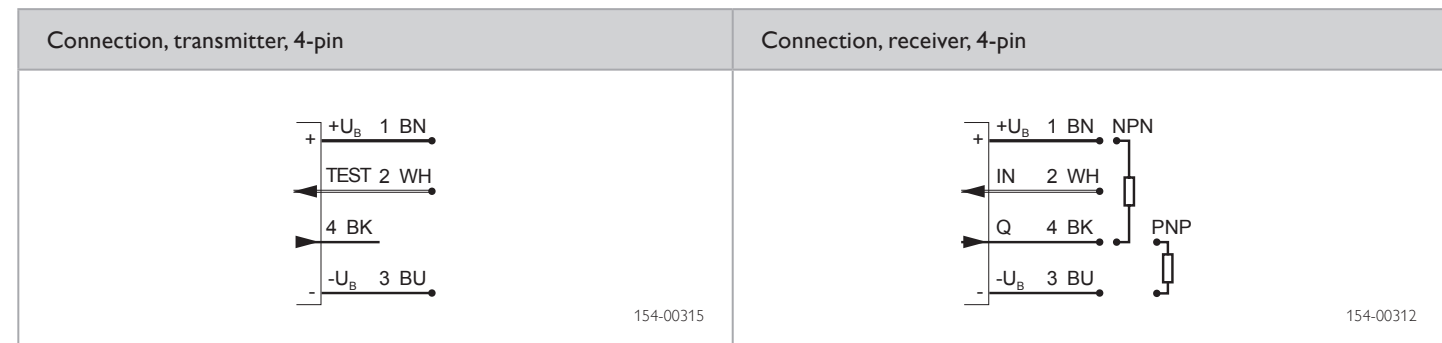
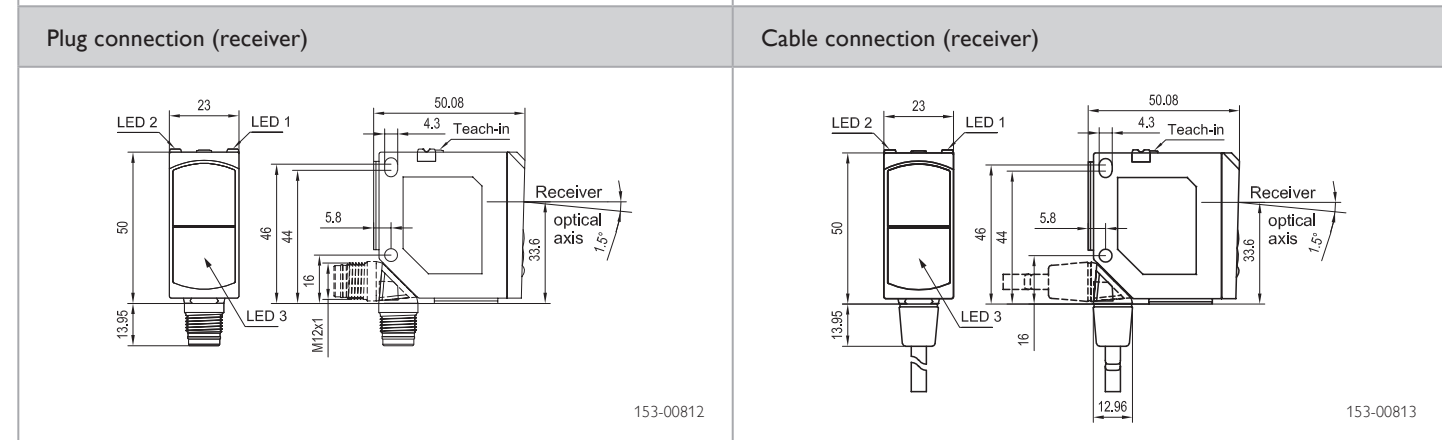
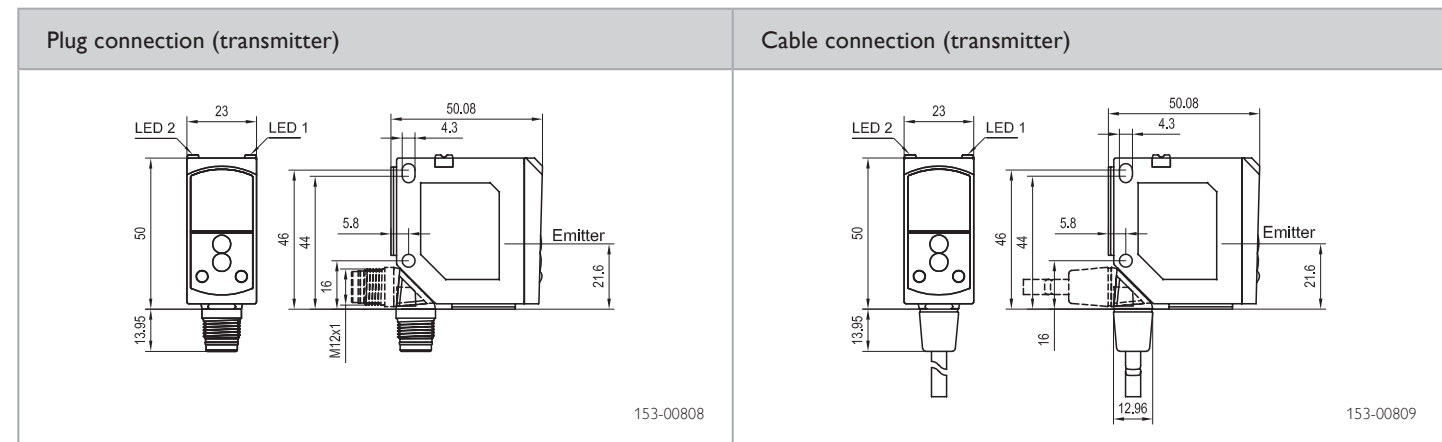
PRODUCT HIGHLIGHTS

- Long range combined with precise laser light spot for extremely accurate small-part detection
- High switching frequency for the reliable detection of even the most rapid processes
- Sensor adjustment via teach-in and control input
- Plug and cable connection rotatable

| Optical data | | Functions | |
|-------------------------------------|--|-------------------------------------|--|
| Limit range | 0 ... 30 m | Indicator LED, green | Operating voltage indicator |
| Operating range | 0 ... 25 m | Indicator LED, yellow | Switching output indicator / contamination indicator |
| Type of light | Laser, red, 655 nm | Indicator LED, red (receiver) | Alignment indicator |
| Light spot size | See diagram | Sensitivity adjustment (receiver) | Via Teach-in button and control input |
| Laser Class (DIN EN 60825-1:2008-5) | 1 | 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 | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30V DC ¹ | Dimensions | 50 x 50.08 x 23 mm ³ |
| No-load current, I ₀ | ≤ 30mA | Enclosure rating | IP 69K & IP 67 ² |
| Output current, I _e | ≤ 100 mA | Material, housing | PC-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) |
| Standby time | < 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) | 35 g |
| Switching frequency, f (ti/tp 1:1) | ≤ 3500 Hz | Weight (cable device) | 125 g |
| Response time | 140 μs | Vibration and impact resistance | EN 60947-5-2 |
| Control input, IN (receiver) | +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 | | |

¹ Max. 10 % ripple, within U_B, ~ 50 Hz / 100 Hz ² With connected IP 67 / IP 69K plug

| Operating range | Switching output | Type of connection | Part number | Article number |
|-----------------|------------------|--------------------|----------------|----------------|
| 0 ... 25 m | PNP | Plug, M12x1, 4-pin | FE 55-RL-PS-L4 | 620-21006 |
| 0 ... 25 m | NPN | Plug, M12x1, 4-pin | FE 55-RL-NS-L4 | 620-21007 |
| 0 ... 25 m | - | Plug, M12x1, 4-pin | FS 55-RL-L4 | 620-11002 |
| 0 ... 25 m | PNP | Cable, 3 m, 4-wire | FE 55-RL-PS-K4 | 620-21009 |
| 0 ... 25 m | NPN | Cable, 3 m, 4-wire | FE 55-RL-NS-K4 | 620-21010 |
| 0 ... 25 m | - | Cable, 3 m, 4-wire | FS 55-RL-K4 | 620-11003 |



| Accessories | | | |
|-------------------|---------------|----------|---------------|
| Connection cables | From Page 670 | Brackets | From Page 642 |



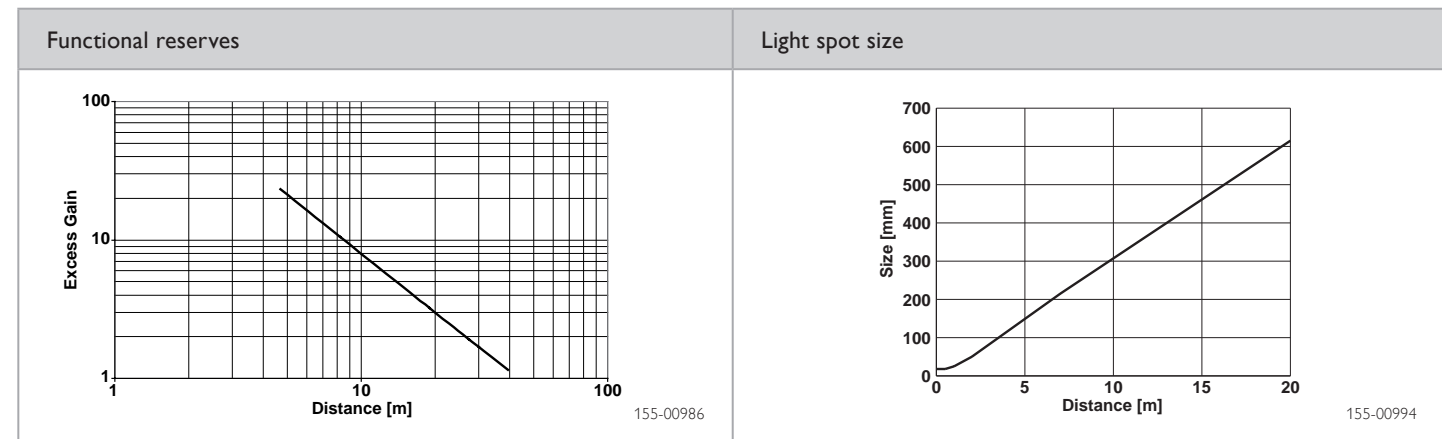
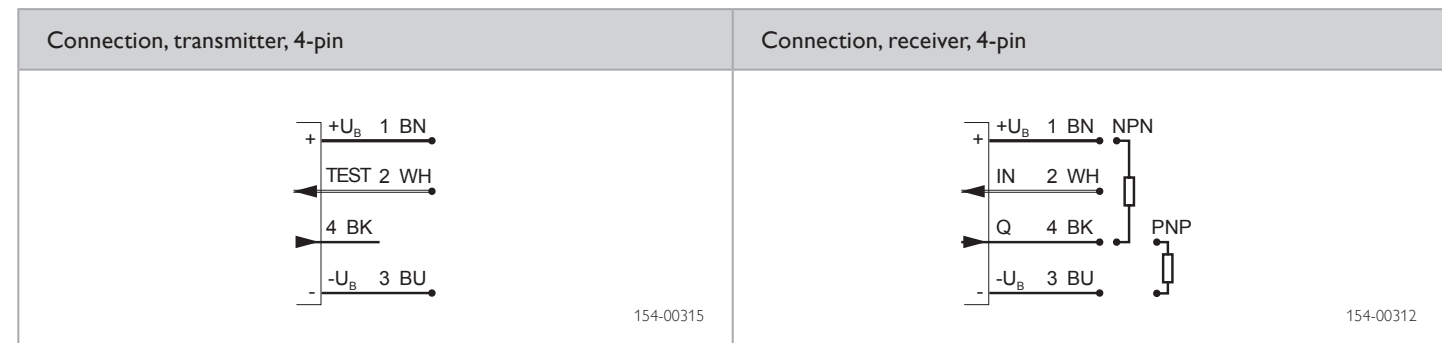
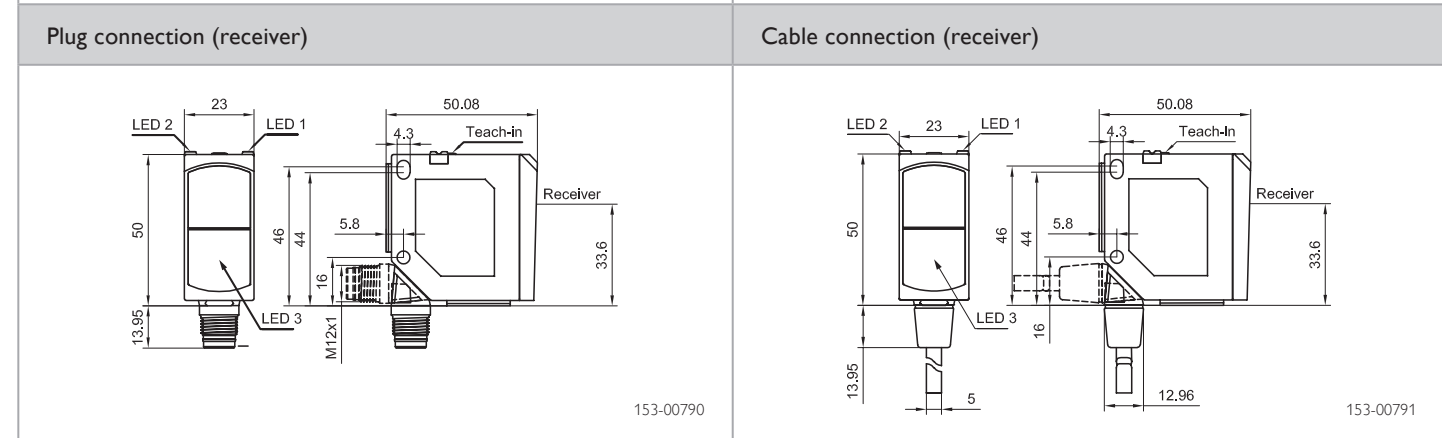
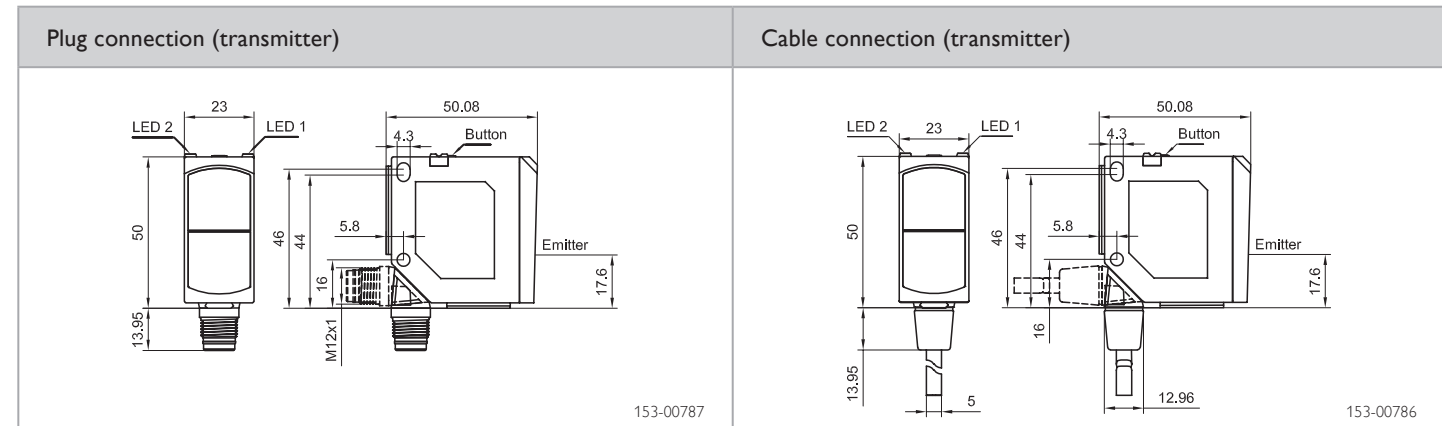
PRODUCT HIGHLIGHTS

- Alignment indicator and easily visible light spot for simple alignment of the through-beam system
- Test input to check sensor pair function
- Sensor adjustment via teach-in and control input
- Plug and cable connection rotatable

| Optical data | | Functions | |
|------------------------------------|--|-------------------------------------|--|
| Limit range | 0 ... 25 m | Indicator LED, green | Operating voltage indicator |
| Operating range | 0 ... 20 m | Indicator LED, yellow | Switching output indicator / contamination indicator |
| Type of light | LED, red, 640 nm | Indicator LED, red (receiver) | Alignment indicator |
| Light spot size | See diagram | Sensitivity adjustment (receiver) | 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 | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30V DC ¹ | Dimensions | 50 x 50.08 x 23 mm ³ |
| No-load current, I ₀ | ≤ 30 mA | Enclosure rating | IP 69K & IP 67 ² |
| Output current, I _e | ≤ 100 mA | Material, housing | PC-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) |
| Standby time | < 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) | 35 g |
| Switching frequency, f (ti/tp 1:1) | ≤ 500 Hz | Weight (cable device) | 125 g |
| Response time | 1 ms | Vibration and impact resistance | EN 60947-5-2 |
| Control input, IN (receiver) | +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 | | |

¹ Max. 10 % ripple, within U_B, ~ 50 Hz / 100 Hz ² With connected IP 67 / IP 69K plug

| Operating range | Switching output | Type of connection | Part number | Article number |
|-----------------|------------------|--------------------|---------------|----------------|
| 0 ... 20 m | PNP | Plug, M12x1, 4-pin | FE 55-R-PS-L4 | 620-21000 |
| 0 ... 20 m | NPN | Plug, M12x1, 4-pin | FE 55-R-NS-L4 | 620-21001 |
| 0 ... 20 m | - | Plug, M12x1, 4-pin | FS 55-R-L4 | 620-11000 |
| 0 ... 20 m | PNP | Cable, 3 m, 4-wire | FE 55-R-PS-K4 | 620-21003 |
| 0 ... 20 m | NPN | Cable, 3 m, 4-wire | FE 55-R-NS-K4 | 620-21004 |
| 0 ... 20 m | - | Cable, 3 m, 4-wire | FS 55-R-K4 | 620-11001 |



| Accessories | | | |
|-------------------|---------------|----------|---------------|
| Connection cables | From Page 670 | Brackets | From Page 642 |



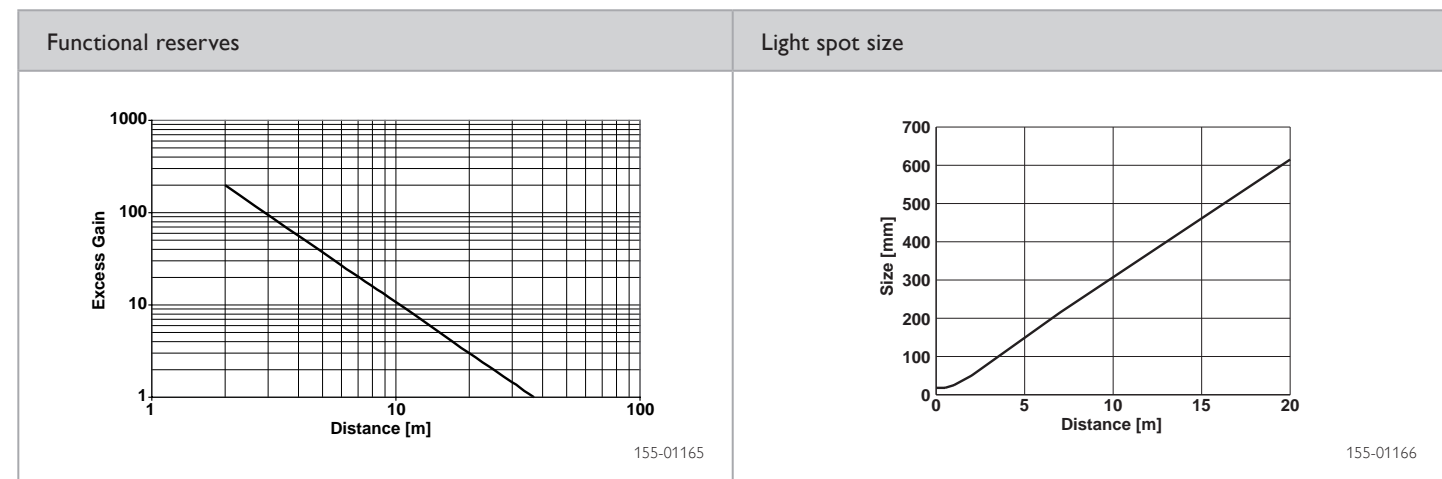
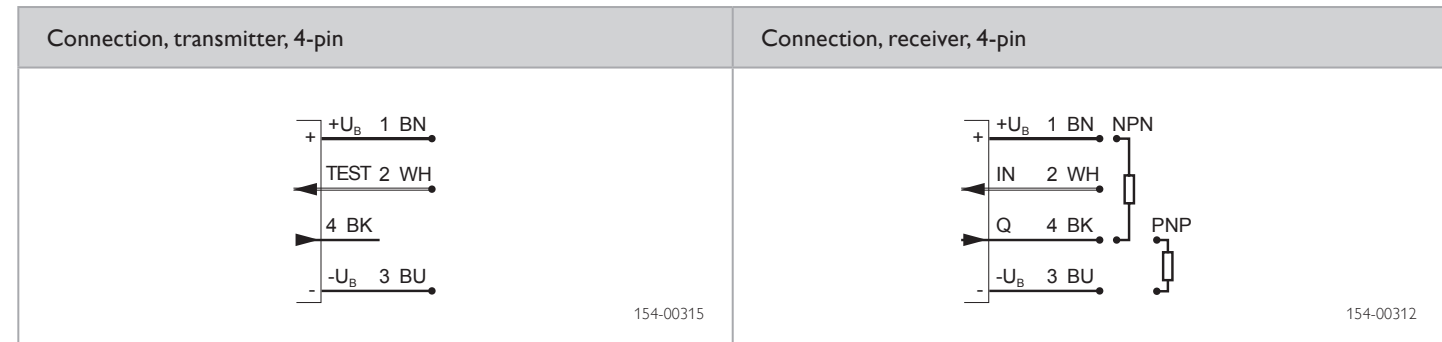
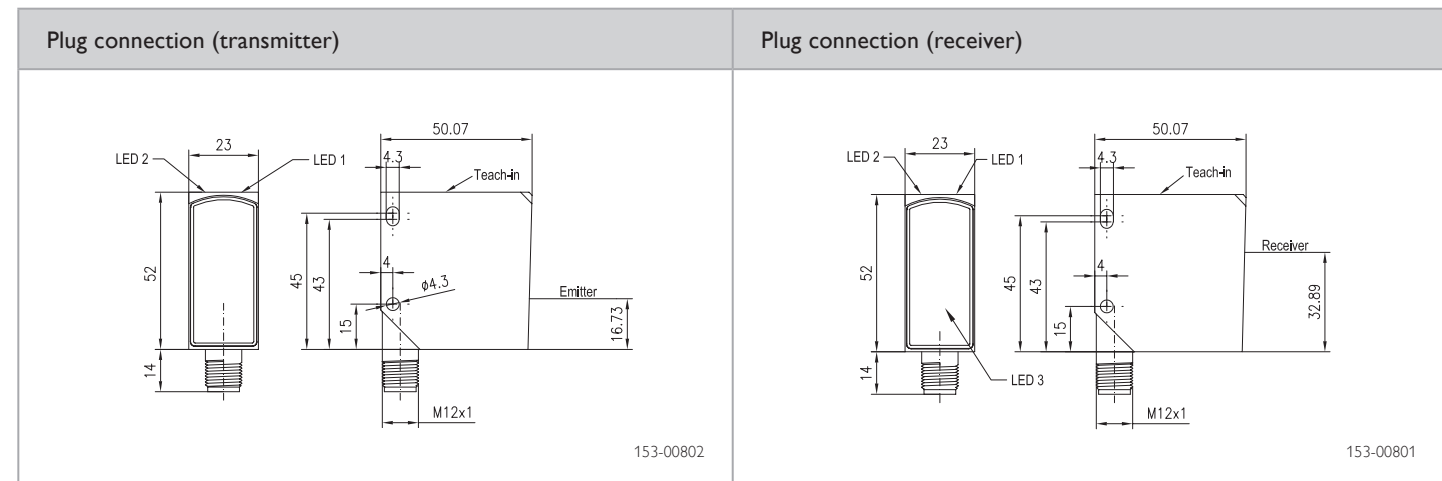
PRODUCT HIGHLIGHTS

- Stable stainless steel housing – ideal for use in hygiene zones, e.g. in the food and beverages industries
- Housing concept designed for intensive cleaning processes
- Sensor adjustment via teach-in and control input
- Simple alignment thanks to easily visible light spot and alignment indicator

| Optical data | | Functions | |
|------------------------------------|--|-------------------------------------|--|
| Limit range | 0 ... 20 m | Indicator LED, green | Operating voltage indicator |
| Operating range | 0 ... 15 m | Indicator LED, yellow | Switching output indicator / contamination indicator |
| Type of light | LED, red, 640 nm | Indicator LED, red (receiver) | Alignment indicator |
| Light spot size | See diagram | Sensitivity adjustment (receiver) | 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 | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30V DC ¹ | Dimensions | 52 x 50.07 x 23 mm ³ |
| No-load current, I ₀ | ≤ 30 mA | Enclosure rating | IP 69K & IP 67 ² |
| Output current, I _e | ≤ 100 mA | Material, housing | Stainless steel, 316L |
| Protective circuits | Reverse-polarity protection, U _B / short-circuit protection (Q) | Material, front screen | PMMA |
| Standby time | < 300 ms | Type of connection | (See Selection Table) |
| Switching output, Q | PNP/NPN (see Selection Table) | Ambient temperature: operation | -20 ... +60 °C |
| Output function | N.O./N.C. | Ambient temperature: storage | -20 ... +80 °C |
| Switching frequency, f (ti/tp 1:1) | ≤ 500Hz | Weight (plug device) | 138 g |
| Response time | 1 ms | Vibration and impact resistance | EN 60947-5-2 |
| Control input, IN (receiver) | +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 | | |

¹ Max. 10 % ripple, within U_B, ~ 50 Hz / 100 Hz ² With connected IP 67 / IP 69K plug

| Operating range | Switching output | Type of connection | Part number | Article number |
|-----------------|------------------|--------------------|----------------|----------------|
| 0 ... 15 m | PNP | Plug, M12x1, 4-pin | FE 55-RM-PS-L4 | 620-21012 |
| 0 ... 15 m | NPN | Plug, M12x1, 4-pin | FE 55-RM-NS-L4 | 620-21013 |
| 0 ... 15 m | – | Plug, M12x1, 4-pin | FS 55-RM-L4 | 620-11004 |



| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |

F 20 – photoelectric sensors and proximity sensors in miniature housings

The well-proven sensor series



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 | | 276 |
| FT 20 RLHD | Laser | Teach-in | 110 mm | Long scanning distance | 278 |
| FT 20 RH | LED | Teach-in | 100 mm | | 280 |
| FT 20 IH | Infrared | Teach-in | 150 mm | | 282 |
| FT 23 RF | LED | Fixed focus | 40 / 60 / 80 mm | | 284 |
| Photoelectric proximity sensors | | | | | |
| FT 20 RL | Laser | Teach-in | 150 mm | | 286 |
| FT 20 R | LED | Teach-in | 300 mm | | 288 |
| FT 23 R | LED | Fixed setting | 300 mm | | 290 |
| Retroreflective photoelectric sensors | | | | | |
| FR 20 RG1 | LED | Teach-in | 0.5 m | For transparent objects, using autocollimation principle | 292 |
| FR 20 RG | LED | Teach-in | 0.5 m | For transparent objects | 294 |
| FR 20 RLO | Laser | Teach-in | 4 m | Very accurate object positioning, no blind zone | 296 |
| FR 20 RL | Laser | Teach-in | 3 m | Very accurate object positioning | 298 |
| FR 20 R | LED | Teach-in | 2.5 m | | 300 |
| FR 20 RD | LED | Teach-in | 3.5 m | | 302 |
| FR 23 R | LED | Fixed setting | 2.5 m | | 304 |
| Through-beam photoelectric sensors | | | | | |
| FS/FE 20 R | LED | Teach-in | 8 m | | 306 |
| FS/FE 23 R | LED | Fixed setting | 4 m | | 308 |



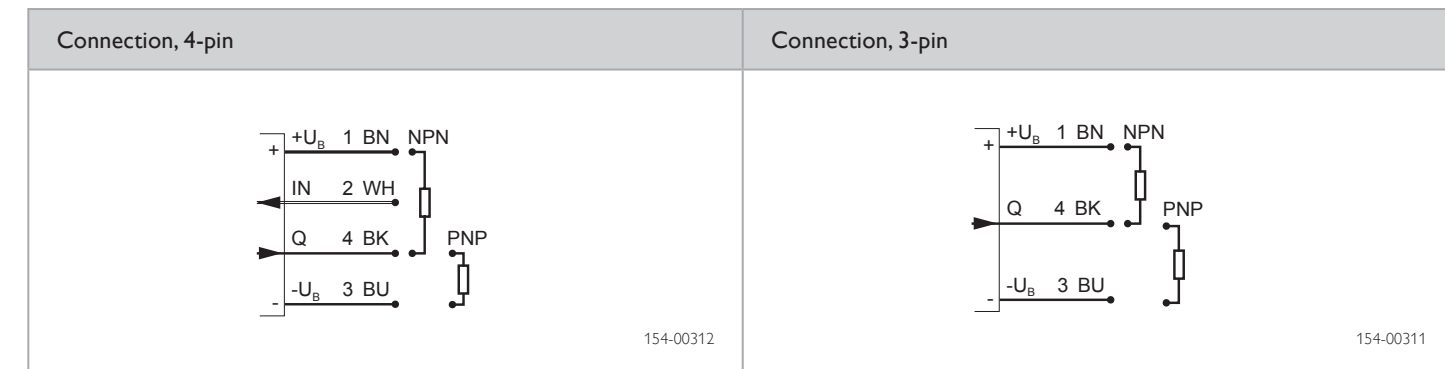
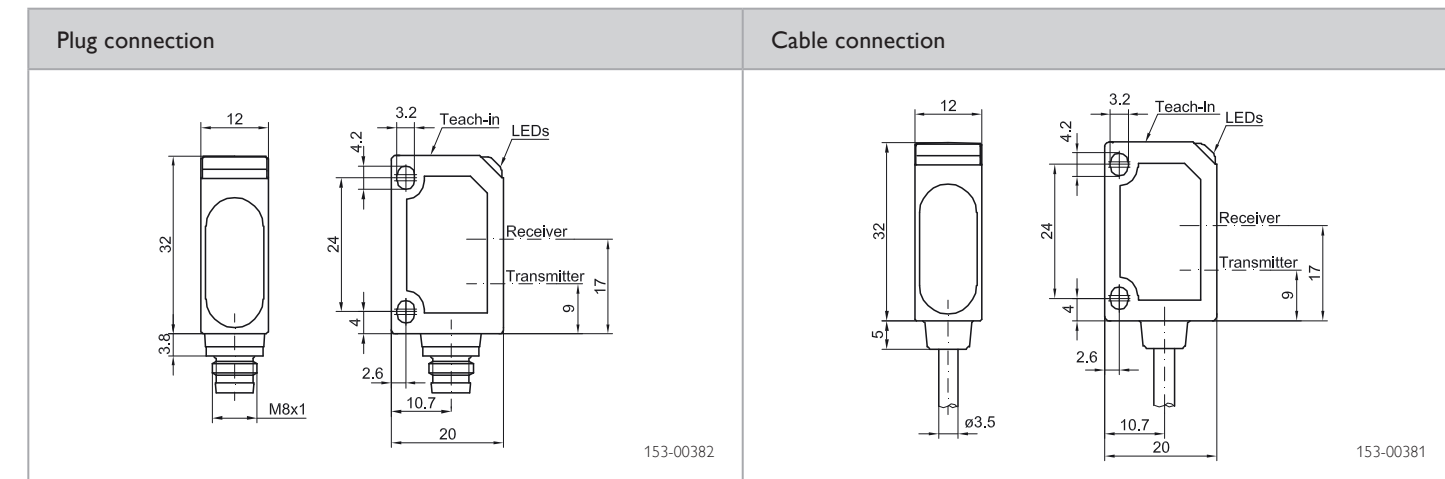
PRODUCT HIGHLIGHTS

- 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 | 1 | Teach-in modes | Mode 1: during running operation Mode 2: during standing process |
| (DIN EN 60825-1:2008-5) | | 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) |
| Standby time | ≤ 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 | | |

¹Reference material: grey, 18 % reflectivity ²Only 4-pin design ³With 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 670 |
| Brackets | From Page 642 |

FT 20 RLHD

Laser photoelectric proximity sensor with background suppression



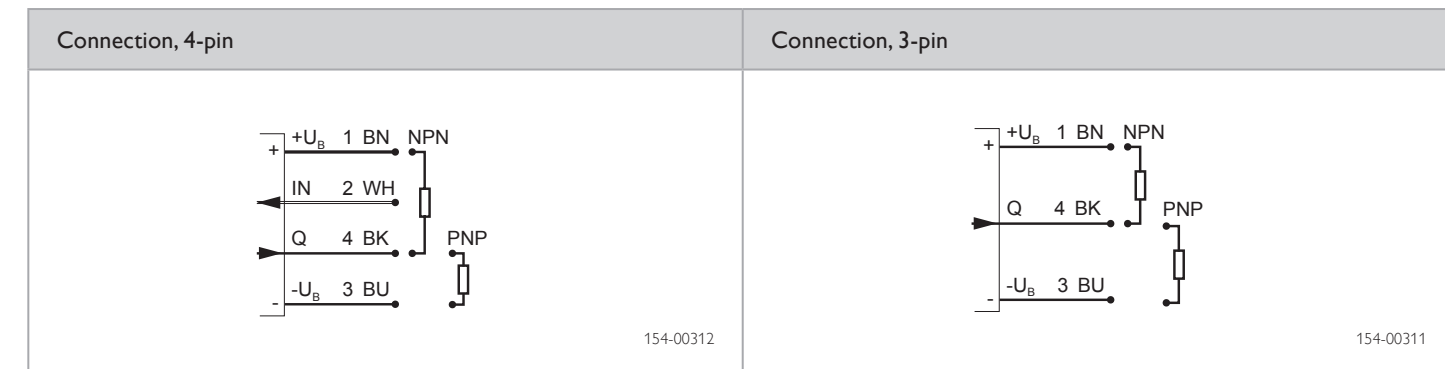
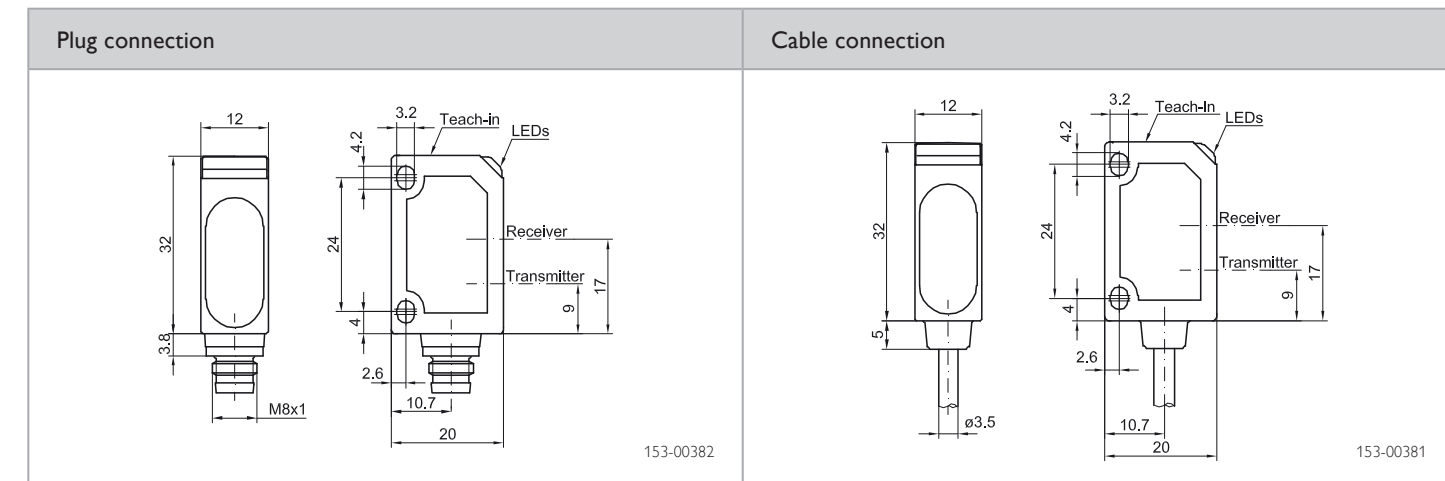
PRODUCT HIGHLIGHTS

- Detection of the smallest parts
- Precise background suppression
- Very small, easily visible laser light spot
- Laser Protection Class 1
- 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) |
| Standby time | ≤ 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 670 |
| Brackets | From Page 642 |



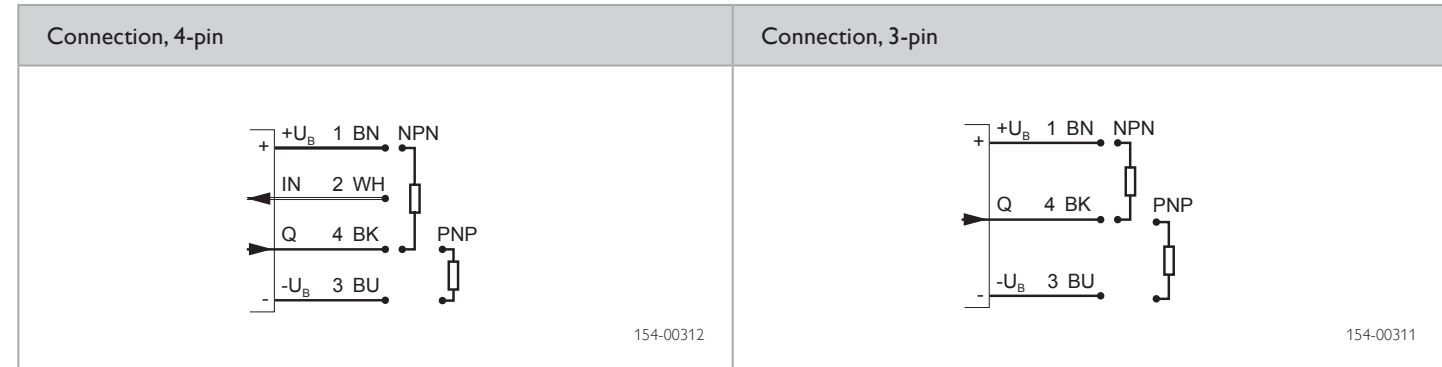
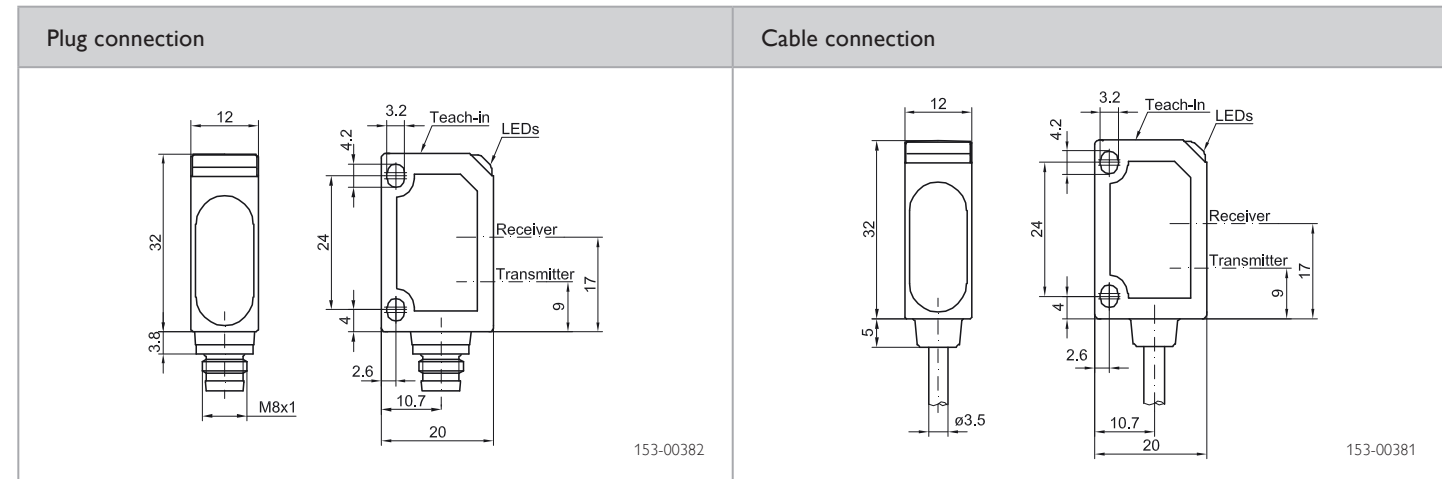
PRODUCT HIGHLIGHTS

- 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) |
| Standby time | ≤ 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 670 |
| Brackets | From Page 642 |

Infrared photoelectric proximity sensor with background suppression



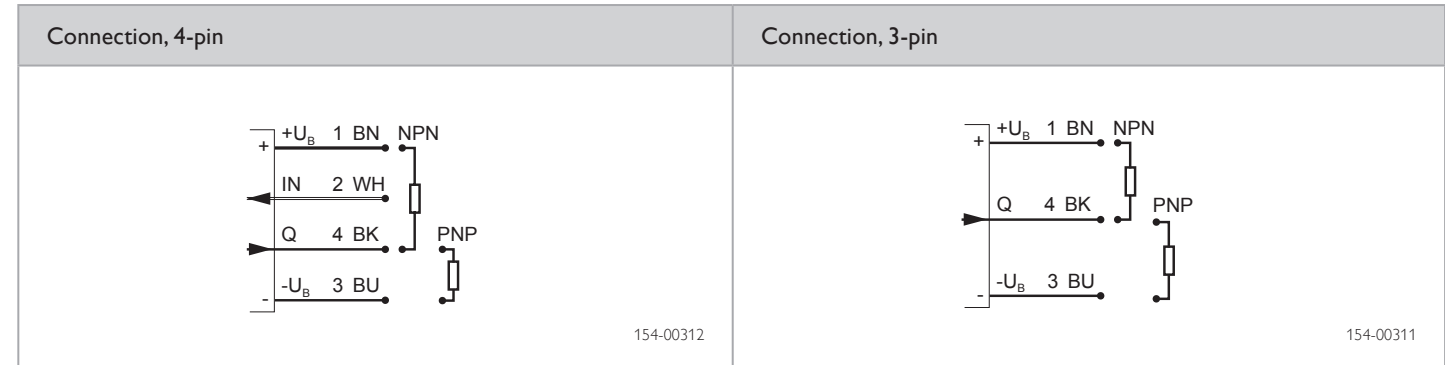
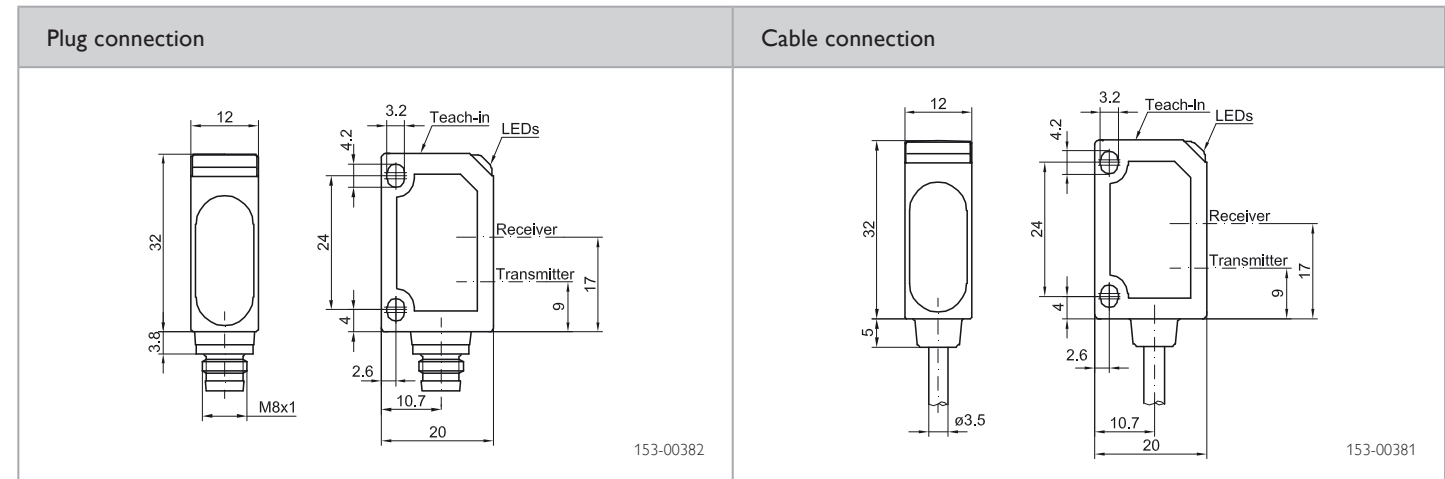
PRODUCT HIGHLIGHTS

- 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) |
| Standby time | ≤ 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 670 |
| Brackets | From Page 642 |

Photoelectric proximity sensor with background suppression, fixed focus

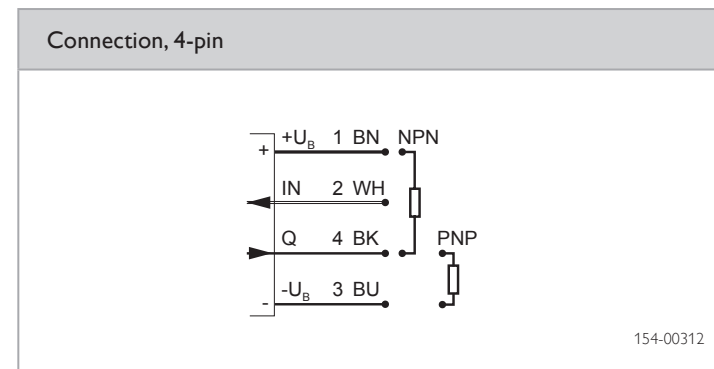
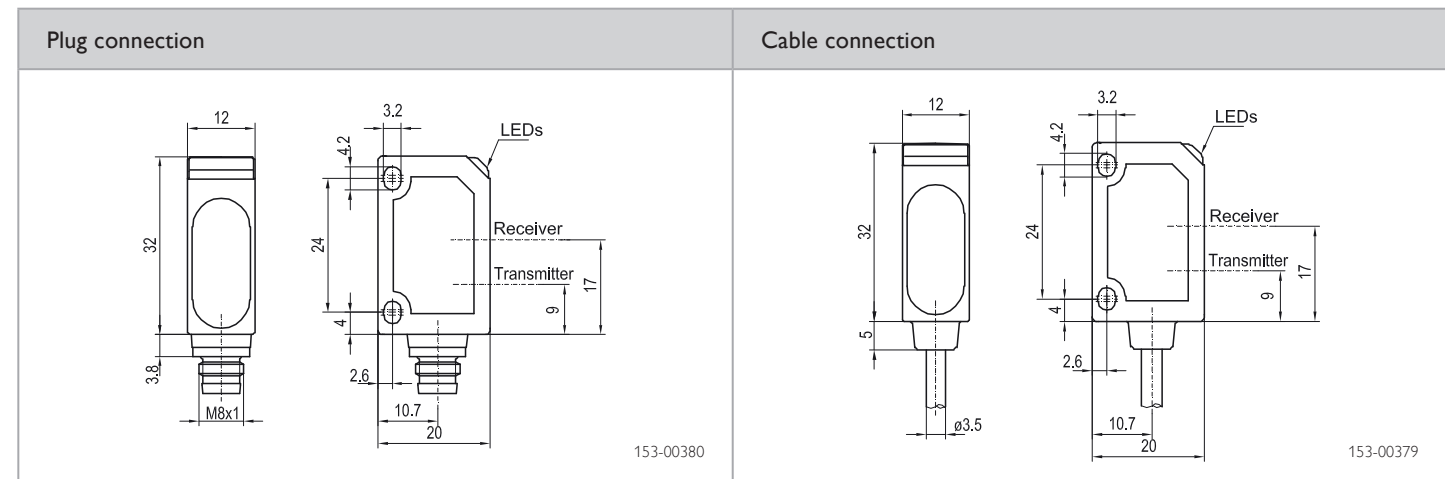


PRODUCT HIGHLIGHTS

- 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) |
| Standby time | ≤ 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



| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |

| 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 |

FT 20 RL

Diffuse laser photoelectric proximity sensor



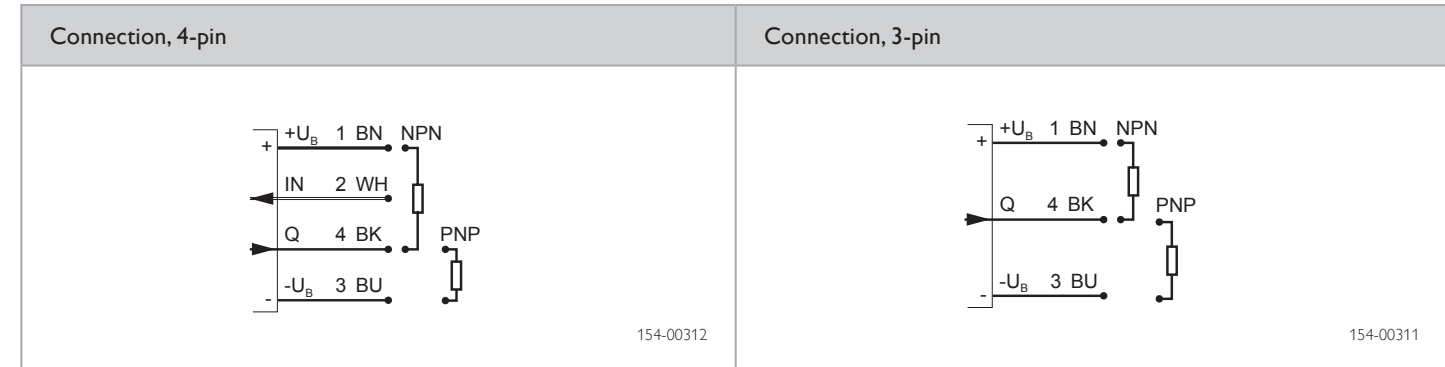
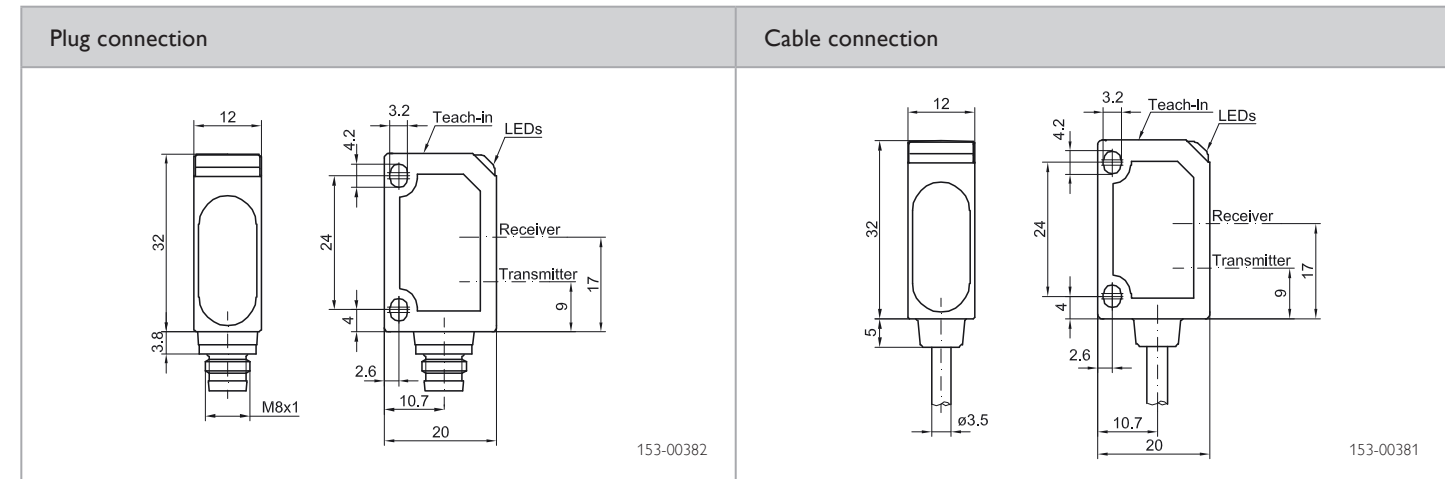
PRODUCT HIGHLIGHTS

- 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 | 2 | Teach-in modes | Mode 1: during running operation Mode 2: during standing process |
| (DIN EN 60825-1:2008-5) | | 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) |
| Standby time | ≤ 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 670 |
| Brackets | From Page 642 |



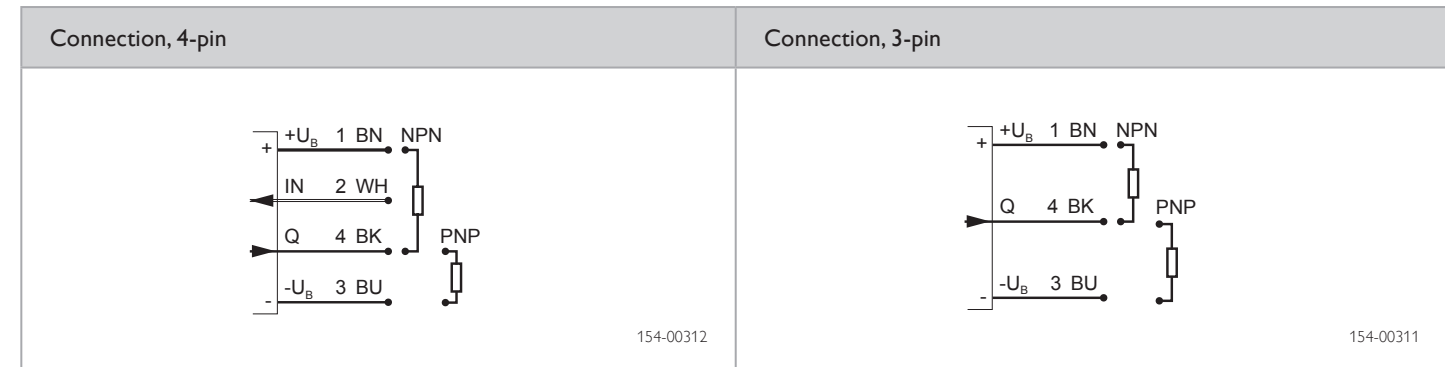
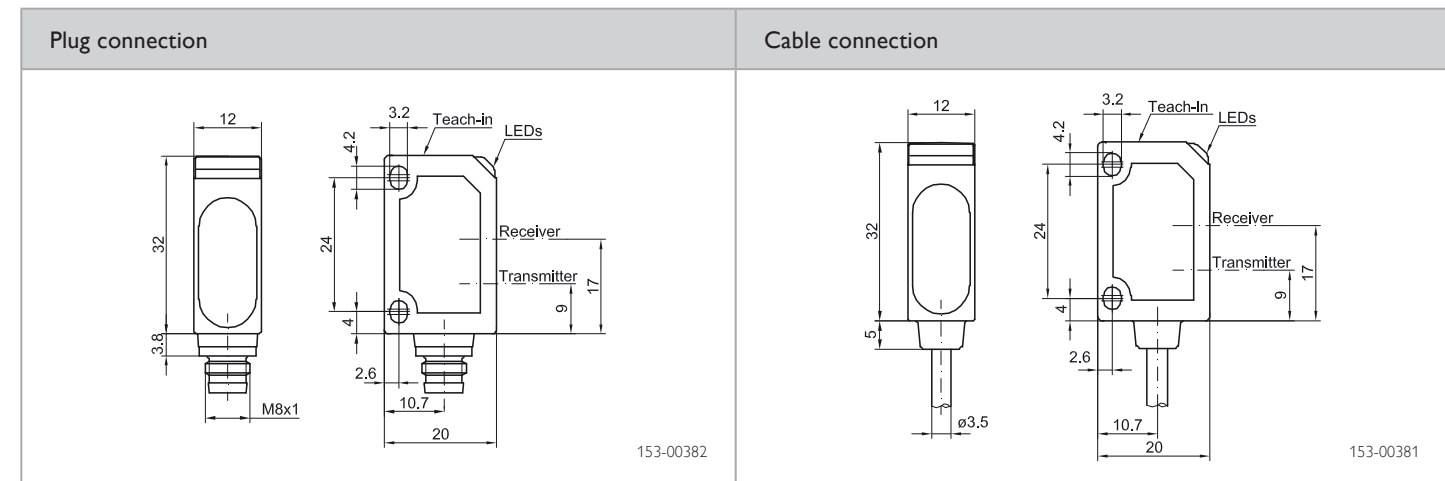
PRODUCT HIGHLIGHTS

- 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) |
| Standby time | ≤ 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 670 |
| Brackets | From Page 642 |

Diffuse photoelectric proximity sensor, fixed setting



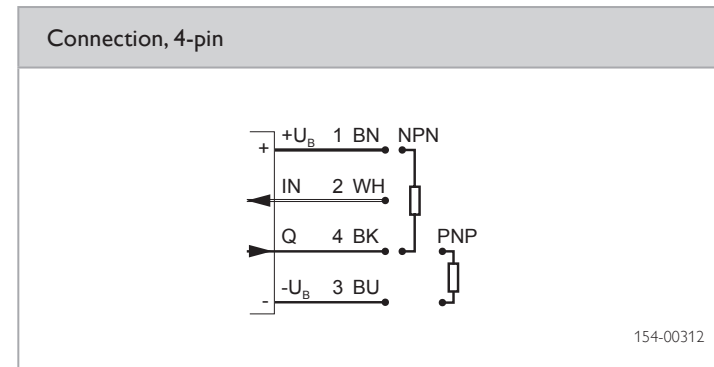
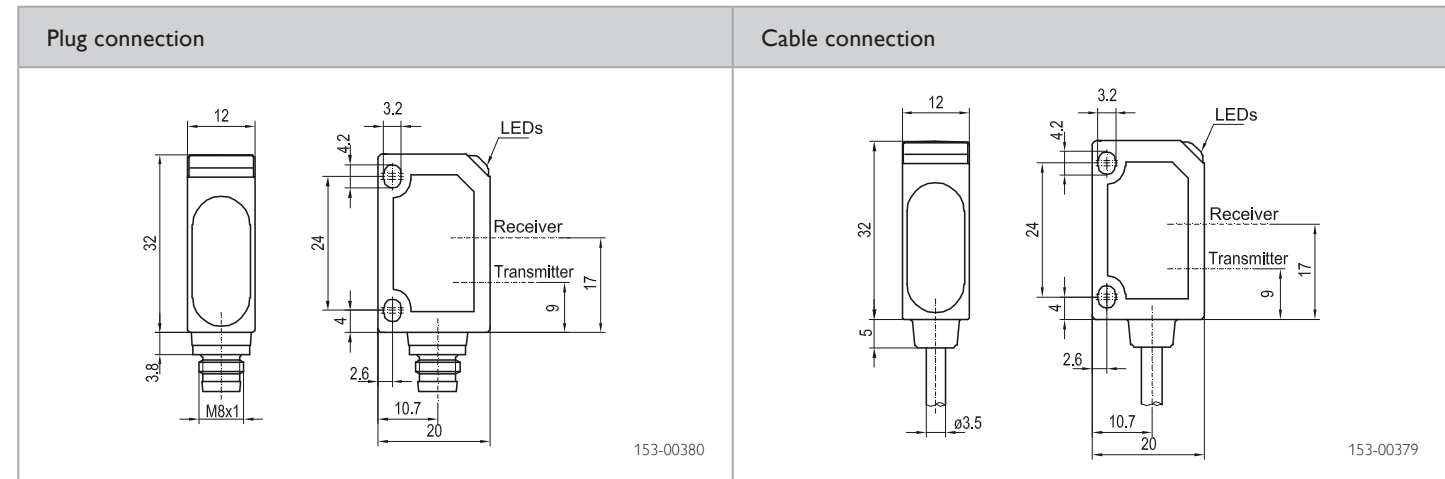
PRODUCT HIGHLIGHTS

- 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) |
| Standby time | ≤ 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 670 |
| Brackets | From Page 642 |

Retroreflective photoelectric sensor for detecting transparent objects, autocollimation



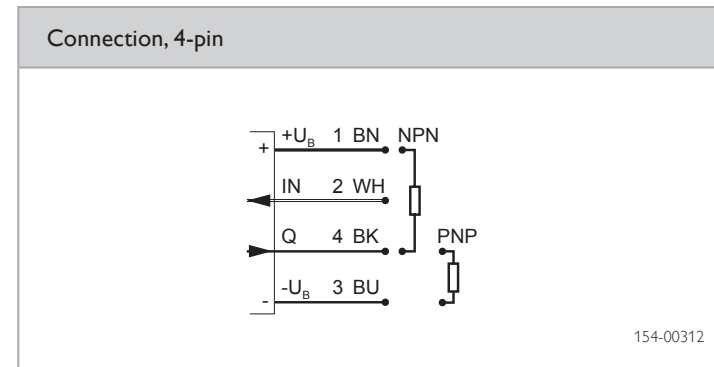
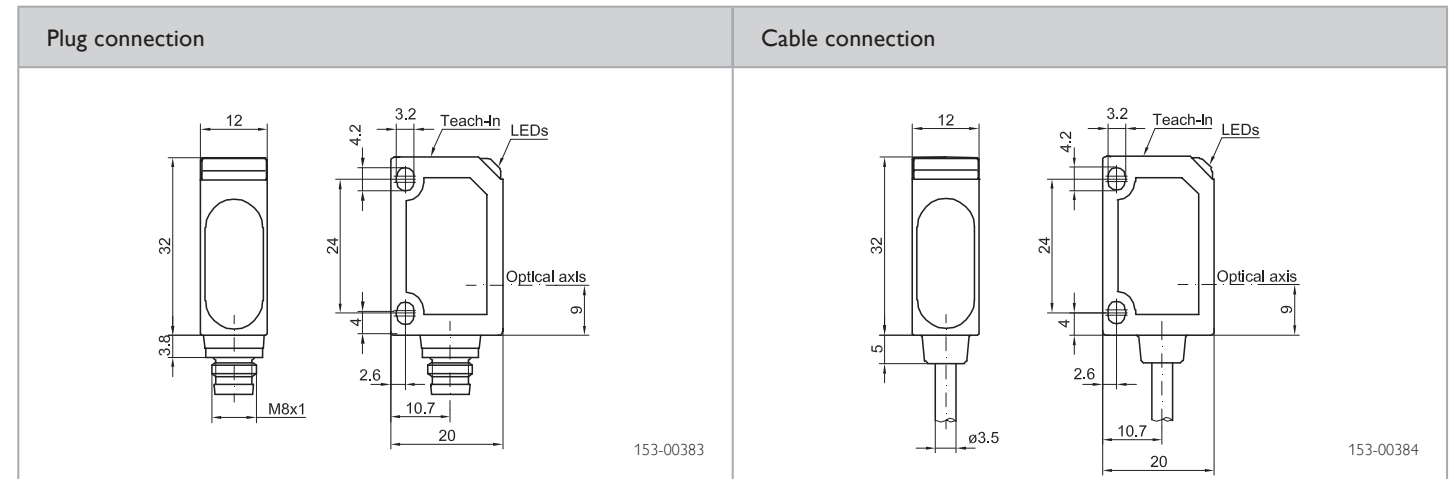
PRODUCT HIGHLIGHTS

- 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) |
| Standby time | ≤ 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 654 |
| Connection cables | From Page 670 |
| Brackets | From Page 642 |

Retroreflective photoelectric sensor for detecting transparent objects



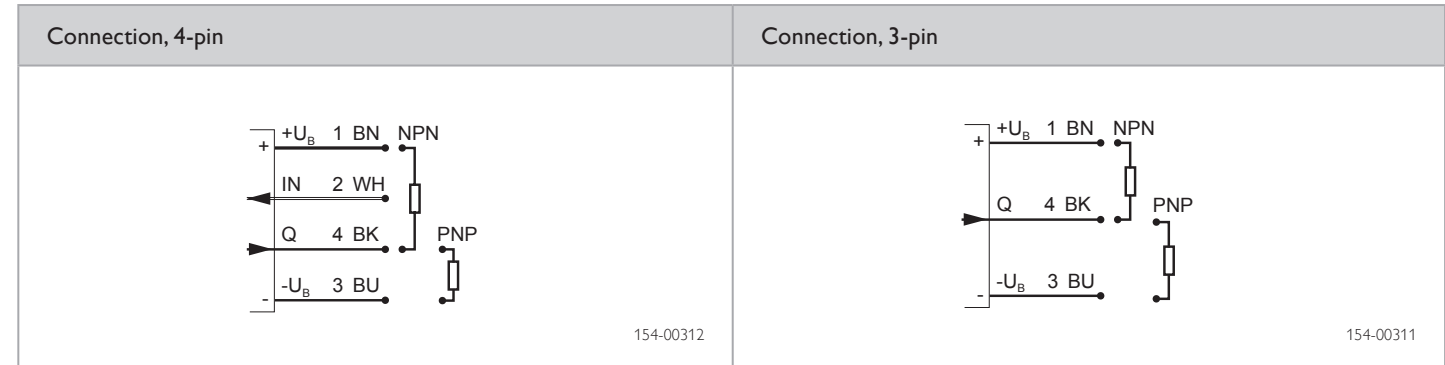
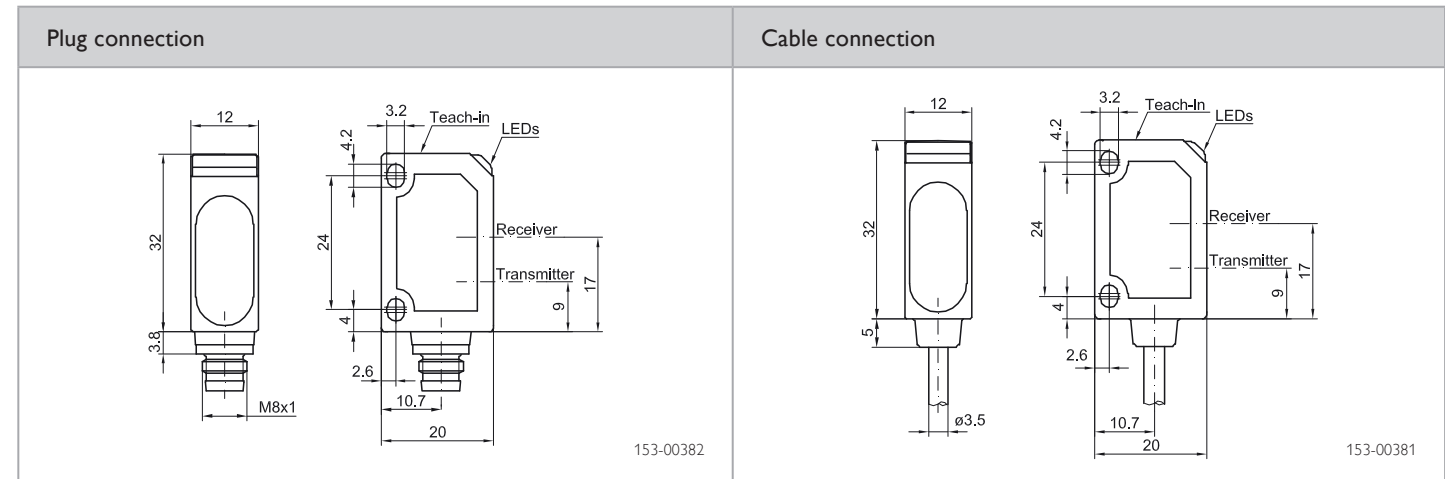
PRODUCT HIGHLIGHTS

- 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) |
| Standby time | ≤ 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 654 |
| Connection cables | From Page 670 |
| Brackets | From Page 642 |

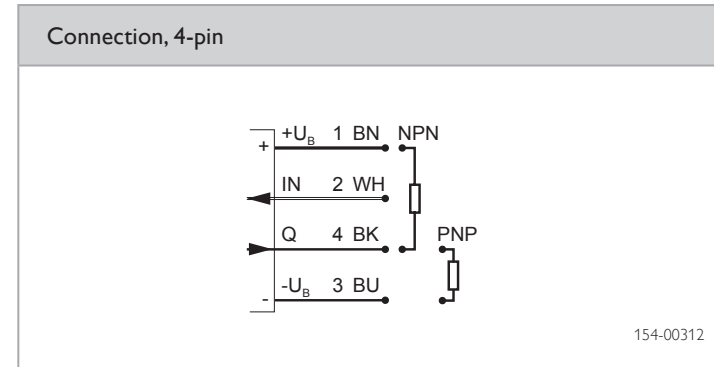
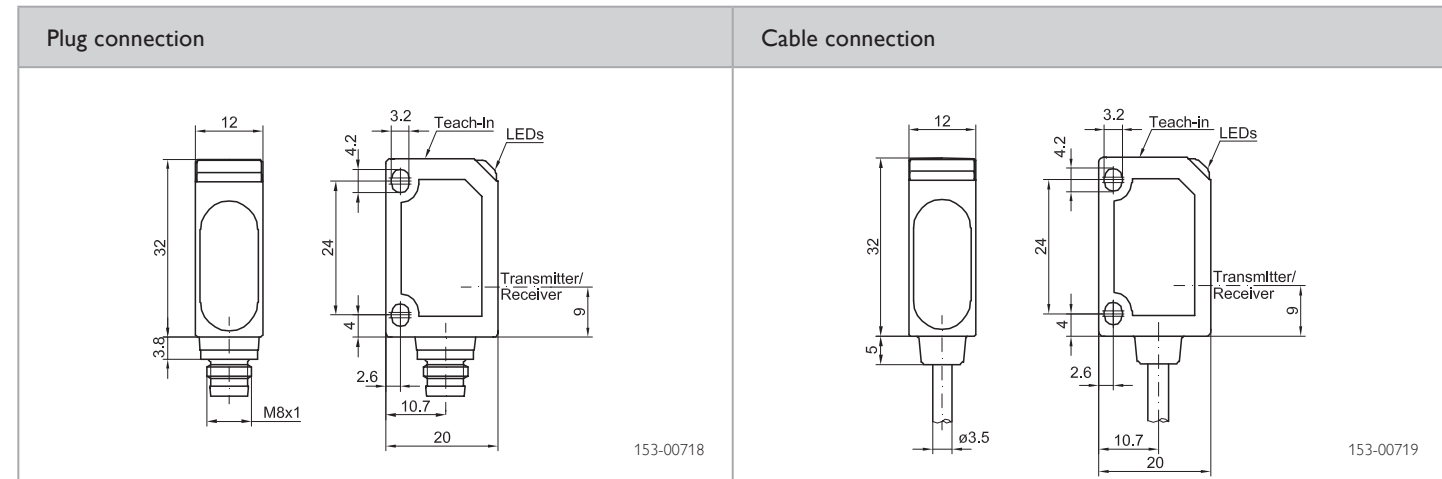


PRODUCT HIGHLIGHTS

- Most accurate small-part detection of tenths 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) |
| Standby time | ≤ 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



| 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 x 61 mm) | RD-25 KL reflector (Ø 25.2 mm) | RF-50 KL reflective tape (51 x 51 mm) | RF-230 KL reflective tape (230 x 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 654 |
| Connection cables | From Page 670 |
| Brackets | From Page 642 |

| 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 |

FR 20 RL

Laser retroreflective photoelectric sensor



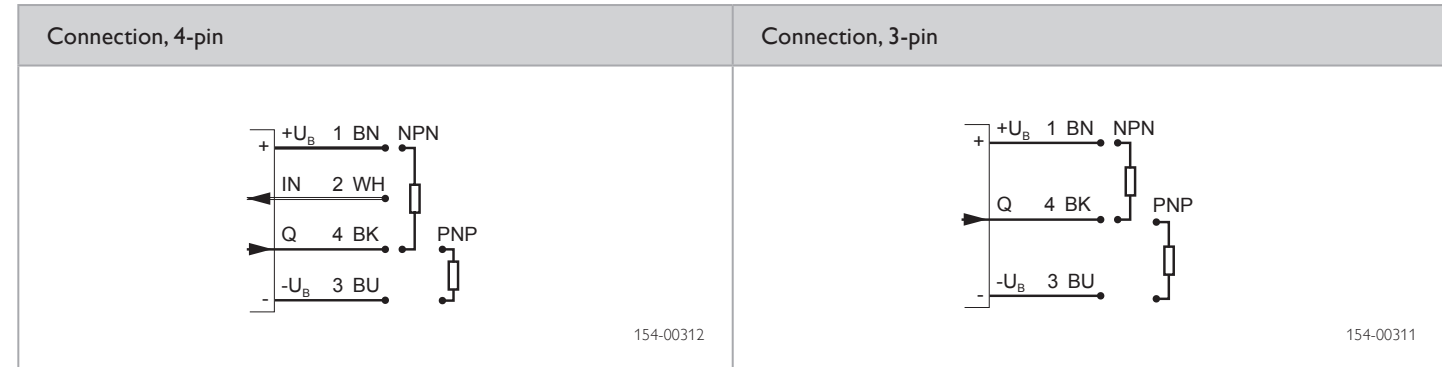
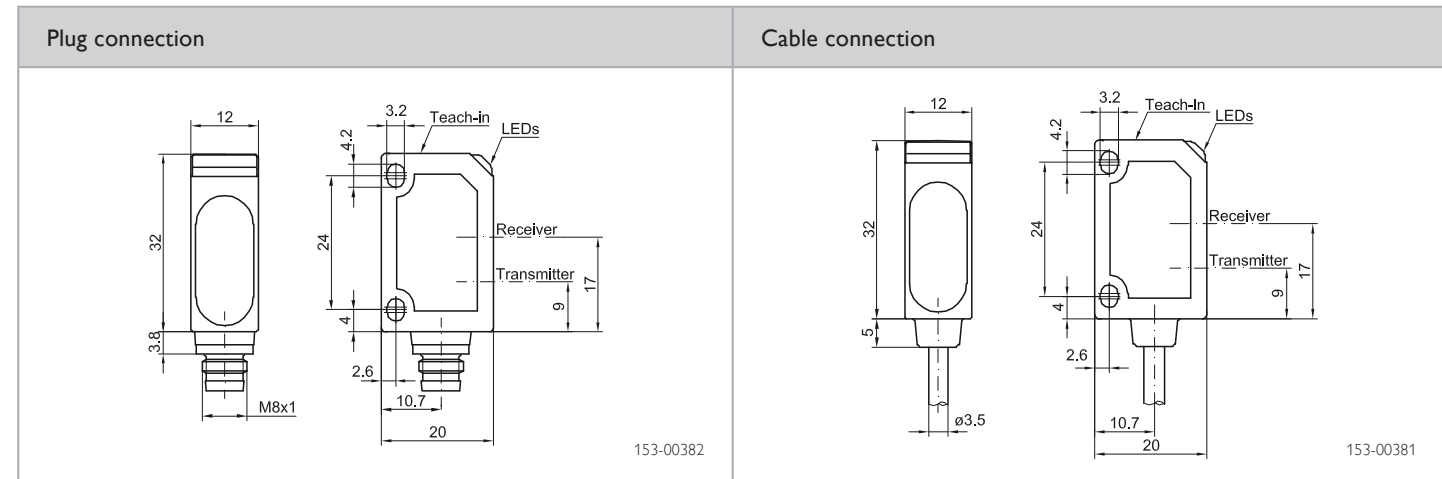
PRODUCT HIGHLIGHTS

- 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) |
| Standby time | ≤ 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 654 |
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



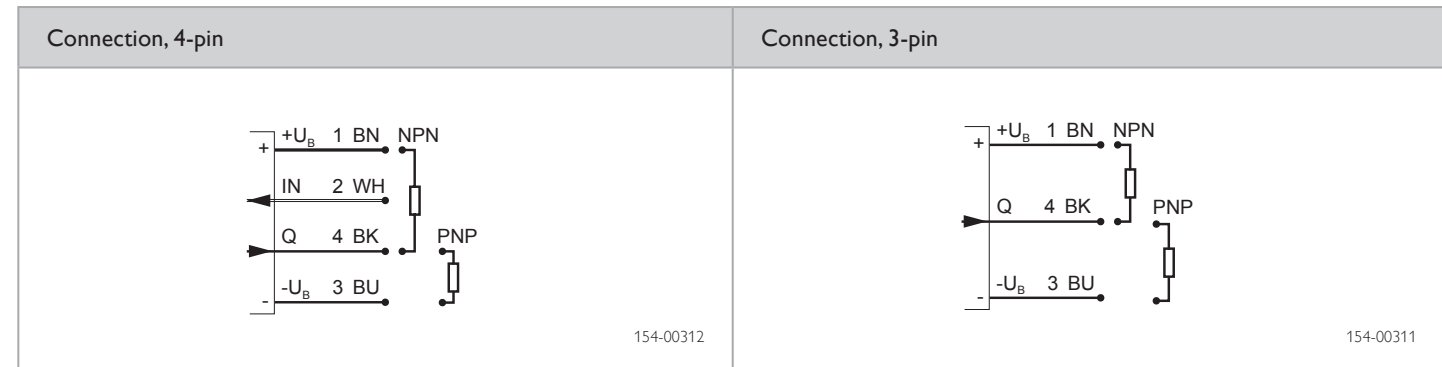
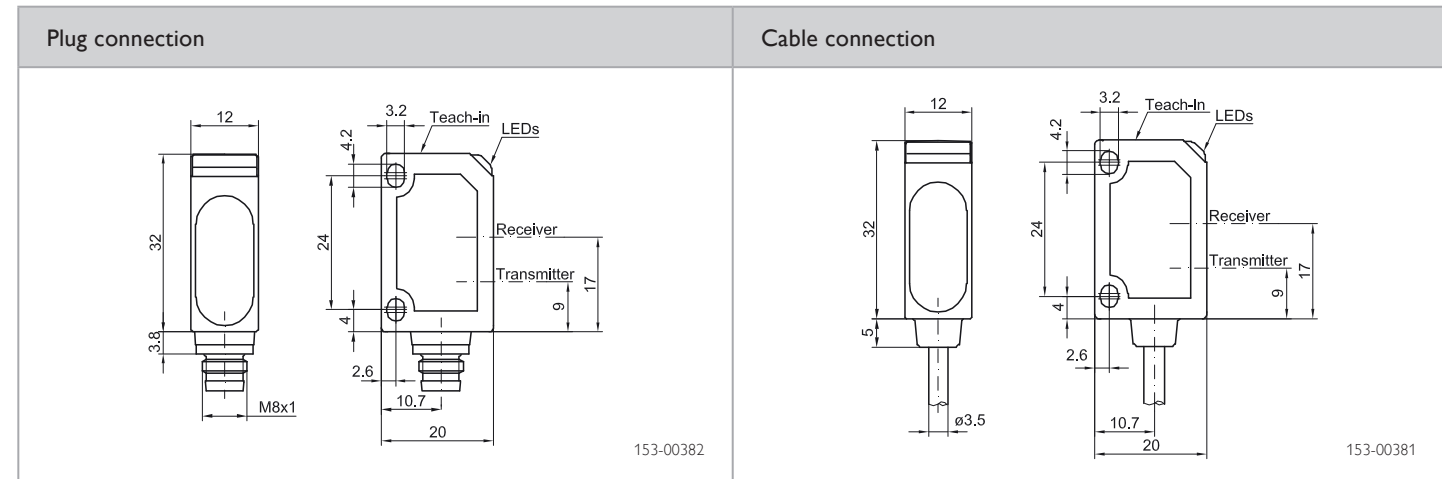
PRODUCT HIGHLIGHTS

- 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) |
| Standby time | ≤ 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 654 |
| Connection cables | From Page 670 |
| Brackets | From Page 642 |

FR 20 RD

Retroreflective photoelectric sensor



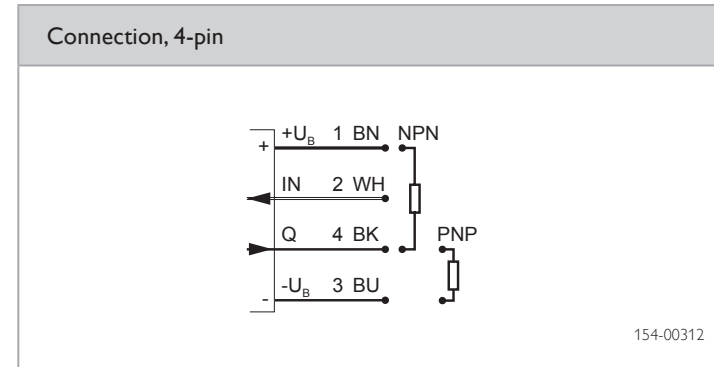
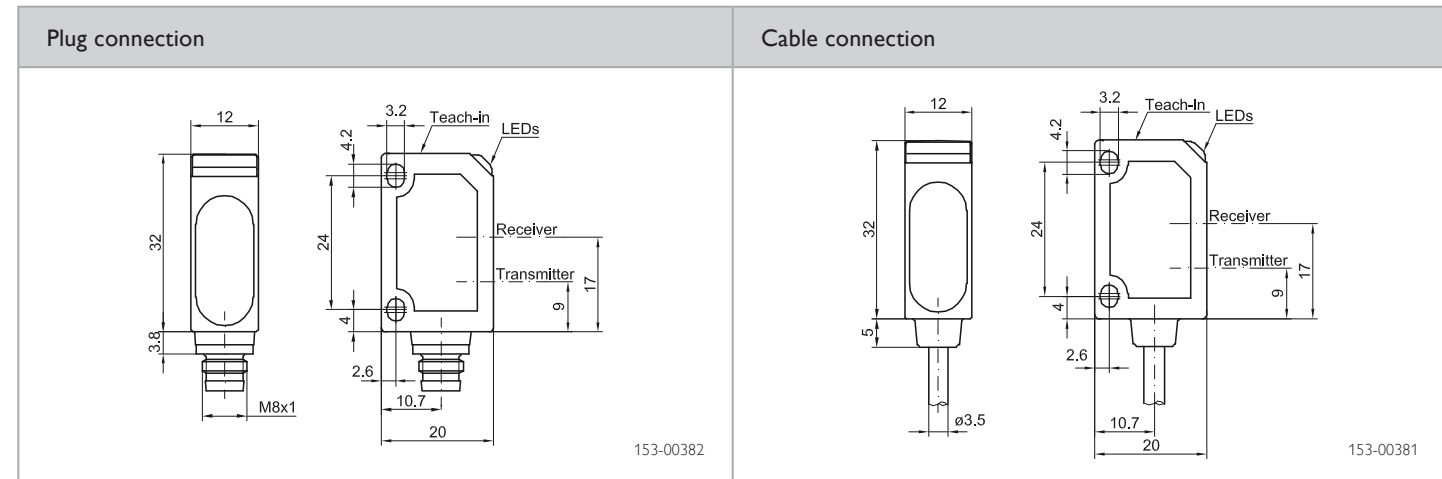
PRODUCT HIGHLIGHTS

- 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) |
| Standby time | ≤ 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 654 |
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



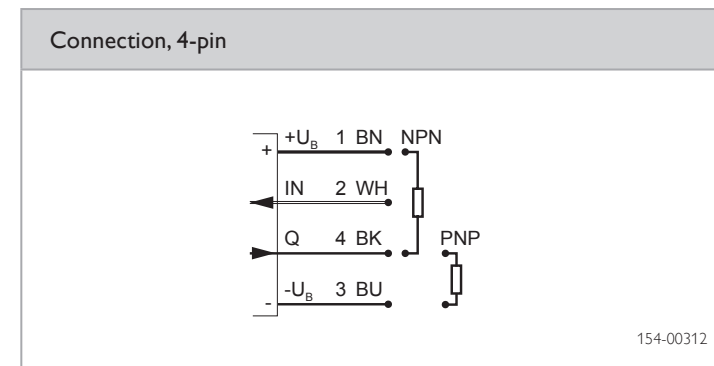
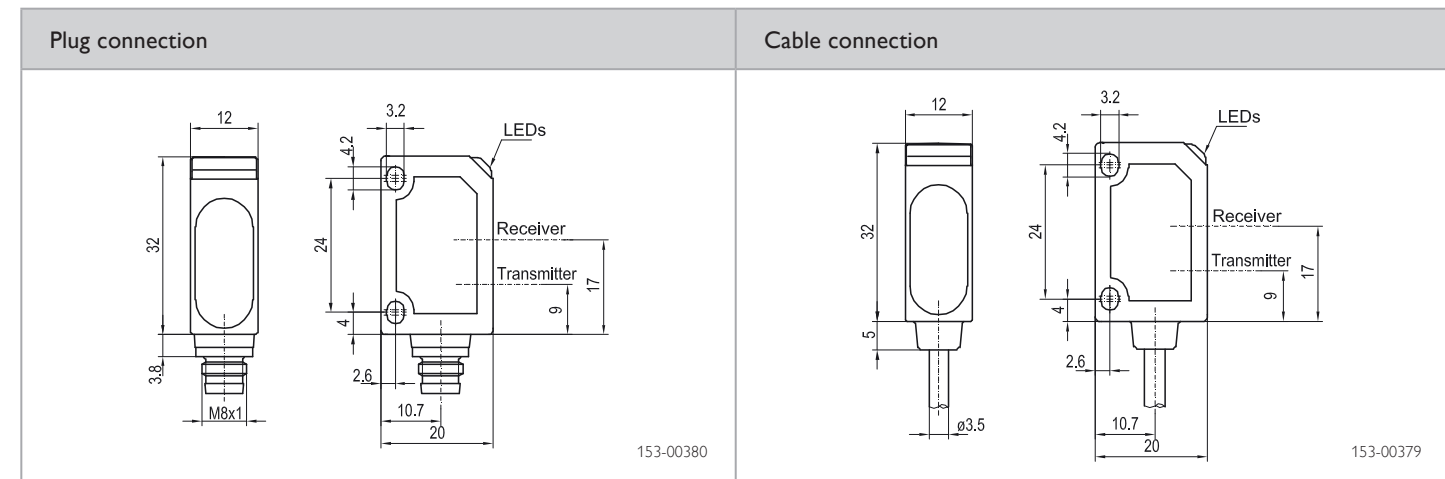
PRODUCT HIGHLIGHTS

- 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 | |
| Type of light | LED, red, 660 nm | Adjustment possibilities | |
| Light spot size ² | 75 x 75 mm ² | | Switching output indicator / contamination indicator |
| | | | 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) |
| Standby time | ≤ 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 654 |
| Connection cables | From Page 670 |
| Brackets | From Page 642 |

FS/FE 20 R

Through-beam photoelectric sensor



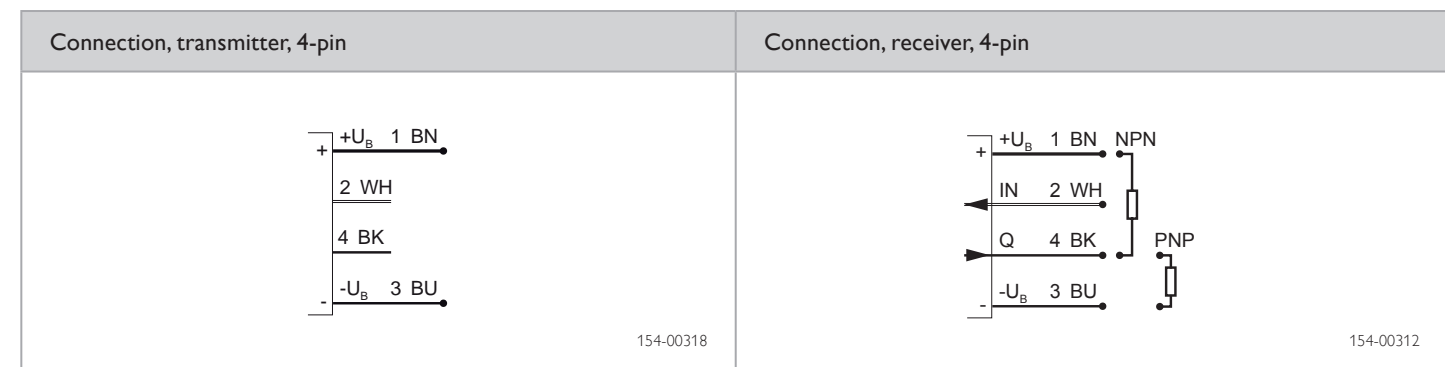
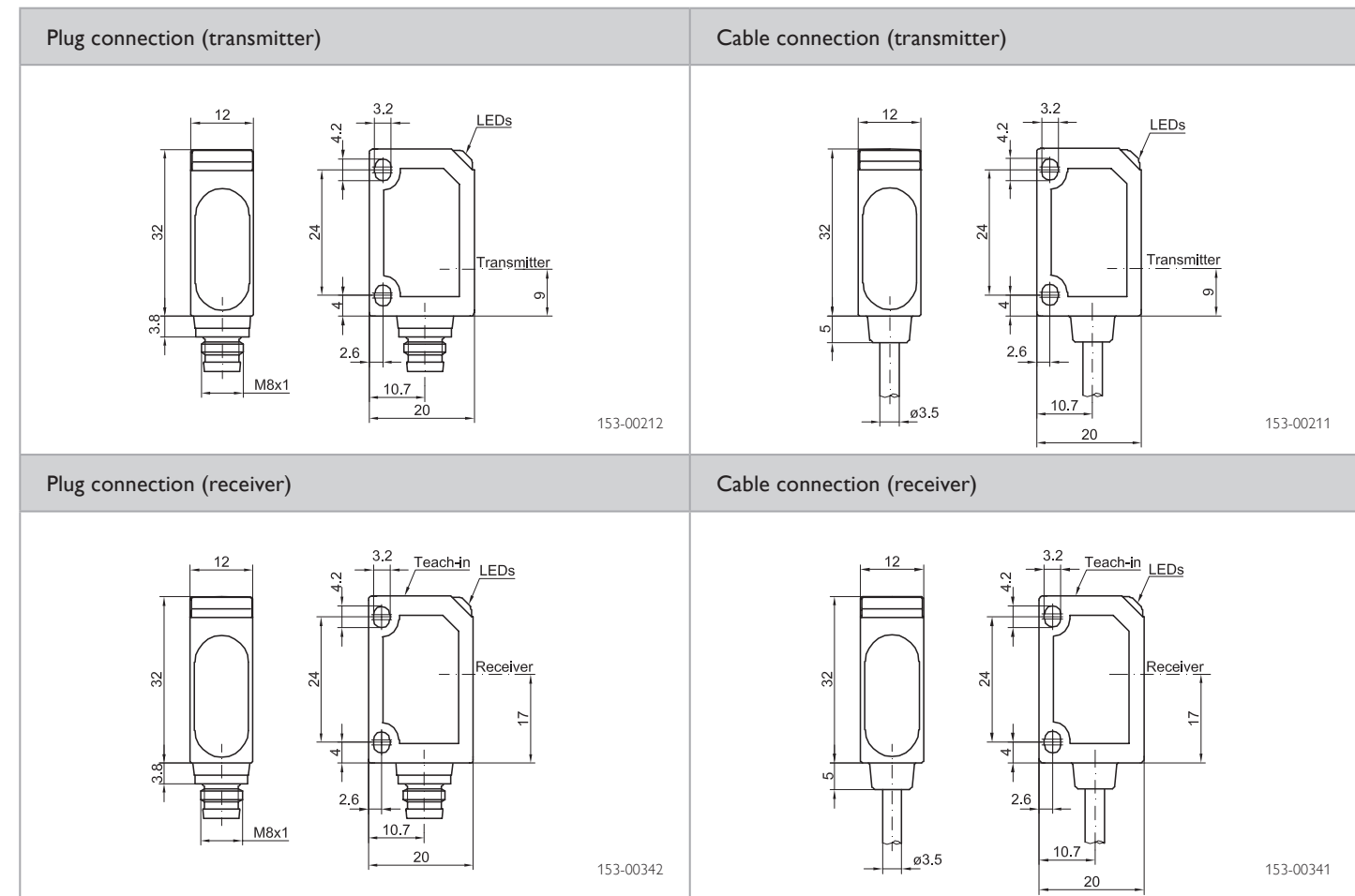
PRODUCT HIGHLIGHTS

- 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) |
| Standby time | ≤ 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 |



Accessories

| | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |

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 | |
| Type of light | LED, red, 660 nm | Adjustment possibilities (receiver) | Switching output indicator / contamination indicator |
| | | | 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) |
| Standby time | ≤ 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. | | |

¹With 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 |

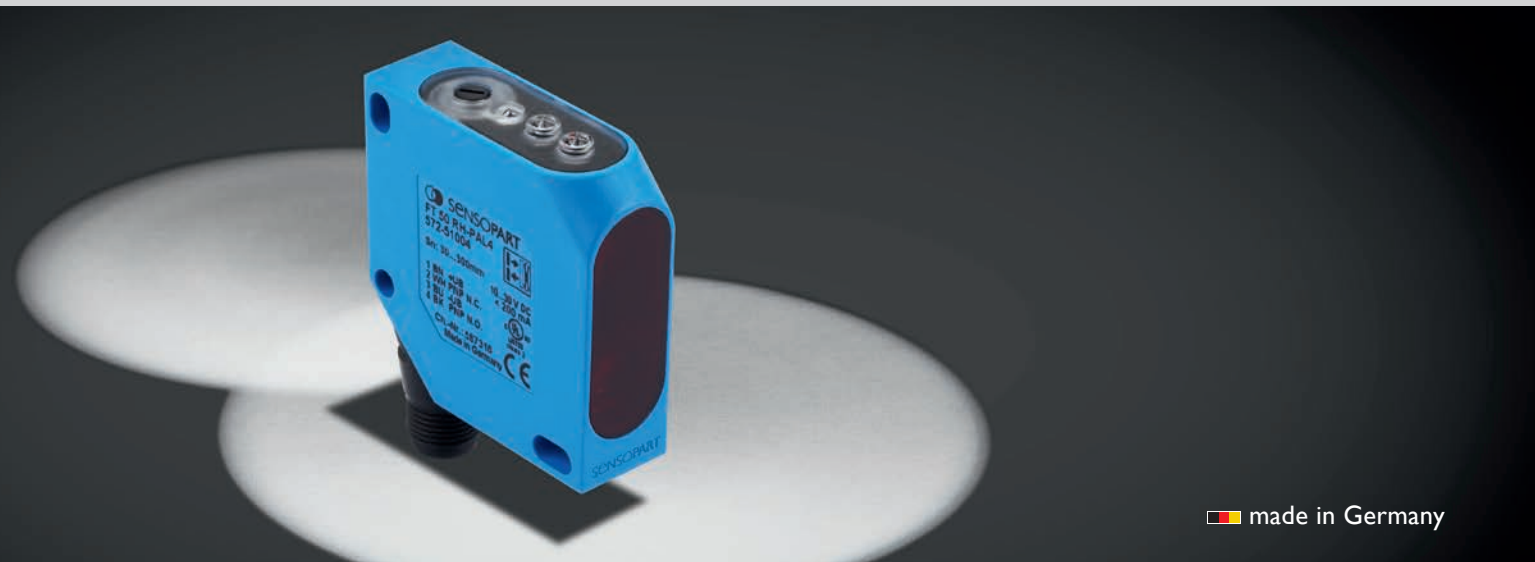
| Plug connection (transmitter) | Cable connection (transmitter) |
|-------------------------------|--------------------------------|
| <p>153-00212</p> | <p>153-00211</p> |
| Plug connection (receiver) | Cable connection (receiver) |
| <p>153-00418</p> | <p>153-00423</p> |

| Connection, transmitter, 4-pin | Connection, receiver, 4-pin |
|--------------------------------|-----------------------------|
| <p>154-00318</p> | <p>154-00312</p> |

| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |

F 50 – photoelectric sensors and proximity sensors in compact housings

The reliable standard series



Well thought-out mounting accessories: Sensopart offers the right mounting aid for almost every mounting situation. This considerably simplifies sensor installation and adjustment. Designs with a supplementary protective function are also available.

TYPICAL F 50

- Universal use in numerous automation applications
- Autocollimation variants with high precision and no blind zone
- Precise background suppression
- Laser, LED or infrared light transmitter options
- Simple adjustment via potentiometer, with numeric display
- Rotatable plug (270°)
- Well thought-out mounting accessories
- UL-certification

The photoelectric sensors and photoelectric proximity sensors of the F 50 series are virtually synonymous with versatile use and particularly reliable products. They have guaranteed user-satisfaction in a wide variety of sectors from the automotive industry, through mechanical engineering and wood processing, to the packaging and print industries.

The F 50 sensors' reliable detection (with laser-light, red-light or infrared LED options) and precise background suppression are impressive. Automation tasks such as (small) part detection, checking presence and positioning are their usual areas of use. Sensopart also offers product variants for special applications: for example, the FR 50-R / RL autocollimation photoelectric sensor that can detect objects from a range of 0 mm.

The sensors of the F 50 series, however, not only offer very reliable operation, but also make users' lives easy. Thus mounting is considerably simplified by the connection plug that can be rotated through 270° and the well thought-out mounting accessories, while adjustment and commissioning are also easy and user-friendly thanks to the direct numeric display. You simply cannot go wrong with an F 50 device!

| F 50 – Product Overview | | | | | |
|--|---------------|---------------|---------------------------|------------------------------------|------|
| | Type of light | Adjustment | Scanning distance / range | Special features | Page |
| Photoelectric proximity sensors with background suppression | | | | | |
| FT 50 RLH | Laser | Potentiometer | 150 mm | Most accurate small-part detection | 312 |
| FT 50 RLHD | Laser | Potentiometer | 300 mm | Most accurate small-part detection | 314 |
| FT 50 RH | LED | Potentiometer | 300 mm | | 316 |
| FT 50 IH | Infrared | Potentiometer | 600 mm | | 318 |
| Photoelectric proximity sensors | | | | | |
| FR 50 RL | Laser | Potentiometer | 25 m | Autocollimation | 320 |
| FR 50 R | LED | Potentiometer | 6 m | Autocollimation | 322 |
| Through-beam photoelectric sensor | | | | | |
| FS/FE 50 I | Infrared | Potentiometer | 18 m | | 324 |

Laser photoelectric proximity sensor with background suppression



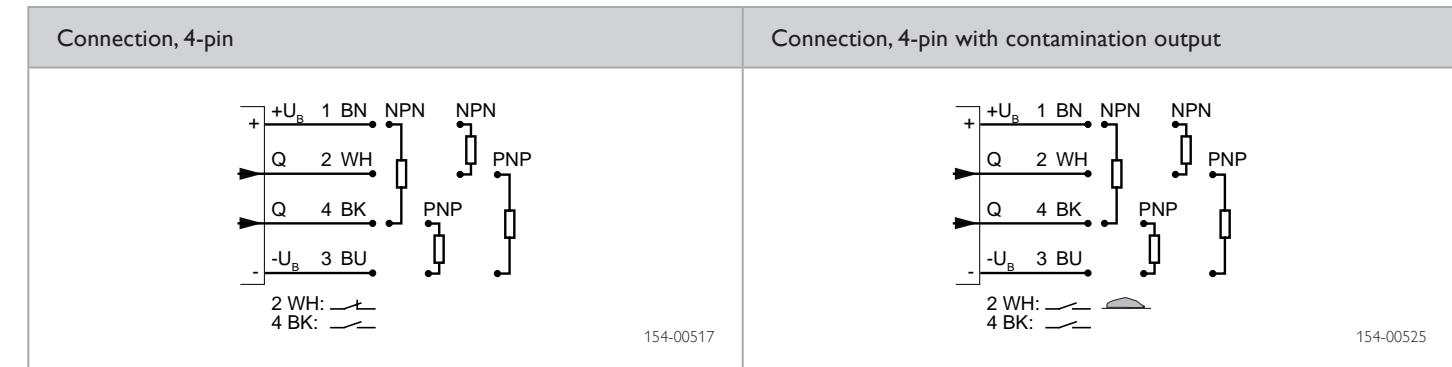
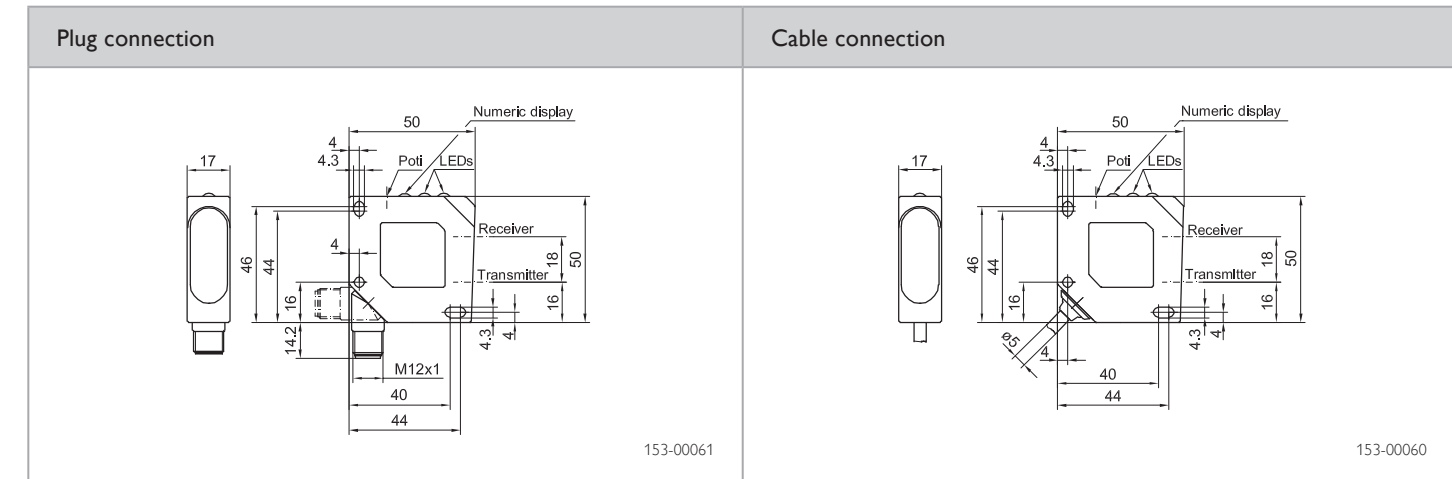
PRODUCT HIGHLIGHTS

- Particularly suitable for detecting the smallest of objects
- Precisely adjustable background suppression
- Simple scanning distance adjustment thanks to indicator scale
- High switching frequency of 2500 Hz

| Optical data | | Functions | |
|-------------------------------------|--|---------------------------------|------------------------------|
| Scanning distance | 30 ... 150 mm ¹ | Indicator LED, green | Operating voltage indicator |
| Type of light | Laser, red, 655 nm | Indicator LED, yellow | Switching output indicator |
| Light spot size | See table | Indicator LED, red | Contamination indicator |
| Laser Class (DIN EN 60825-1:2008-5) | 2 | Scanning distance adjustment | Via potentiometer |
| Hysteresis ² | < 5 % | | |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30V DC ³ | Dimensions | 50 x 50 x 17 mm ³ |
| No-load current, I ₀ | ≤ 50 mA ⁴ | Enclosure rating | IP 67 ⁶ |
| Output current, I _e | ≤ 200 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) |
| Standby time | ≤ 300 ms | Ambient temperature: operation | -20 ... +45 °C |
| Switching output, Q | PNP/NPN, antivalent (see Selection Table) | Ambient temperature: storage | -20 ... +80 °C |
| Output function | N.O./N.C. (see Selection Table) | Weight (plug device) | 40 g |
| Switching frequency, f (ti/tp 1:1) | ≤ 2500 Hz | Weight (cable device) | 130 g |
| Response time | 200 μs | Vibration and impact resistance | EN 60947-5-2 |
| Connection, BK | N.O. | | |
| Connection, WH ⁵ | N.C. | | |
| Contamination output, WH (optional) | N.O. (see Selection Table) | | |

¹ Reference material: grey, 18 % reflectivity ² 18 % / 18 % ³ Max. 10 % ripple, within U_B ⁴ At 24V DC ⁵ Without contamination output ⁶ With connected IP 67 plug

| Scanning distance | Switching output | Type of connection | Contamination output | Part number | Article number |
|-------------------|------------------|--------------------|----------------------|-----------------|----------------|
| 30 ... 150 mm | PNP, antivalent | Plug, M12x1, 4-pin | No | FT 50 RLH-PAL4 | 572-51008 |
| 30 ... 150 mm | NPN, antivalent | Plug, M12x1, 4-pin | No | FT 50 RLH-NAL4 | 572-51011 |
| 30 ... 150 mm | PNP (N.O.) | Plug, M12x1, 4-pin | Yes | FT 50 RLH-PSVL4 | 572-51010 |
| 30 ... 150 mm | NPN (N.O.) | Plug, M12x1, 4-pin | Yes | FT 50 RLH-NSVL4 | 572-51012 |
| 30 ... 150 mm | PNP, antivalent | Cable, 3 m, 4-wire | No | FT 50 RLH-PAK4 | 572-51013 |
| 30 ... 150 mm | NPN, antivalent | Cable, 3 m, 4-wire | No | FT 50 RLH-NAK4 | 572-51015 |
| 30 ... 150 mm | PNP (N.O.) | Cable, 3 m, 4-wire | Yes | FT 50 RLH-PSVK4 | 572-51014 |
| 30 ... 150 mm | NPN (N.O.) | Cable, 3 m, 4-wire | Yes | FT 50 RLH-NSVK4 | 572-51016 |



| Light spot size | | | | | |
|--------------------------|-----|-----|-----|-----|-----|
| Scanning distance (mm) | 30 | 60 | 80 | 100 | 150 |
| Light spot diameter (mm) | 1.8 | 0.7 | 0.1 | 1.1 | 2.5 |

| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |

Laser photoelectric proximity sensor with background suppression



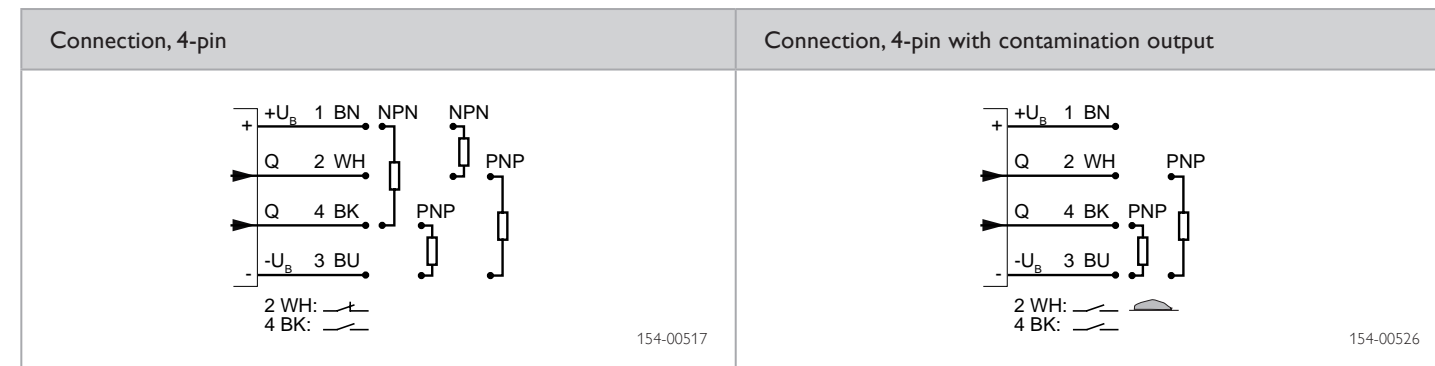
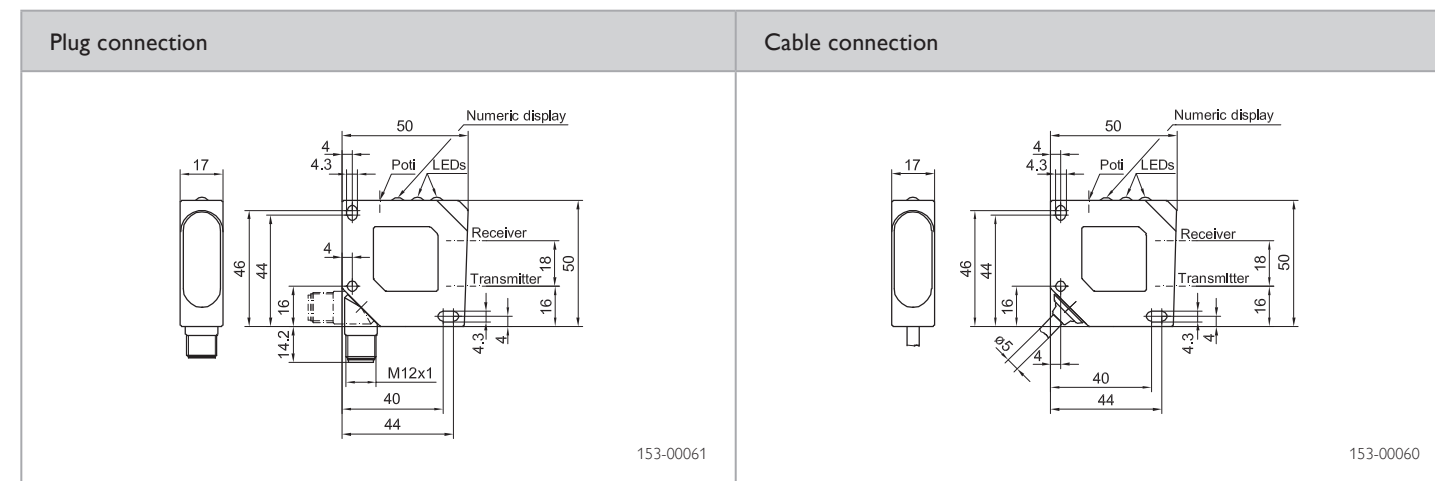
PRODUCT HIGHLIGHTS

- Precise small part detection even at long scanning distances of up to 300 mm
- Very small, easily visible laser light spot
- Precisely adjustable background suppression
- High switching frequency of 2500 Hz

| Optical data | | Functions | |
|-------------------------------------|--|---------------------------------|------------------------------|
| Scanning distance | 50 ... 300 mm ¹ | Indicator LED, green | Operating voltage indicator |
| Type of light | Laser, red, 650 nm | Indicator LED, yellow | Switching output indicator |
| Light spot size | See table | Indicator LED, red | Contamination indicator |
| Laser Class (DIN EN 60825-1:2008-5) | 2 | Scanning distance adjustment | Via potentiometer |
| Hysteresis ² | < 5 % | | |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30V DC ³ | Dimensions | 50 x 50 x 17 mm ³ |
| No-load current, I ₀ | ≤ 50 mA ⁴ | Enclosure rating | IP 67 ⁶ |
| Output current, I _e | ≤ 200 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) |
| Standby time | ≤ 300 ms | Ambient temperature: operation | -20 ... +45 °C |
| Switching output, Q | PNP/NPN, antivalent (see Selection Table) | Ambient temperature: storage | -20 ... +80 °C |
| Output function | N.O./N.C. (see Selection Table) | Weight (plug device) | 40 g |
| Switching frequency, f (ti/tp 1:1) | ≤ 2500 Hz | Weight (cable device) | 130 g |
| Response time | 200 μs | Vibration and impact resistance | EN 60947-5-2 |
| Connection, BK | N.O. | | |
| Connection, WH ⁵ | N.C. | | |
| Contamination output, WH (optional) | N.O. (see Selection Table) | | |

¹ Reference material: grey, 18 % reflectivity ² 18 % / 18 % ³ Max. 10 % ripple, within U_B ⁴ At 24V DC ⁵ Without contamination output ⁶ With connected IP 67 plug

| Scanning distance | Switching output | Type of connection | Contamination output | Part number | Article number |
|-------------------|------------------|--------------------|----------------------|------------------|----------------|
| 50 ... 300 mm | PNP, antivalent | Plug, M12x1, 4-pin | No | FT 50 RLHD-PAL4 | 572-51062 |
| 50 ... 300 mm | NPN, antivalent | Plug, M12x1, 4-pin | No | FT 50 RLHD-NAL4 | 572-51063 |
| 50 ... 300 mm | PNP (N.O.) | Plug, M12x1, 4-pin | Yes | FT 50 RLHD-PSVL4 | 572-51051 |
| 50 ... 300 mm | PNP, antivalent | Cable, 3 m, 4-wire | No | FT 50 RLHD-PAK4 | 572-51064 |
| 50 ... 300 mm | NPN, antivalent | Cable, 3 m, 4-wire | No | FT 50 RLHD-NAK4 | 572-51065 |



| Light spot size | | | | | | | | |
|--------------------------|----------|------------|-----------|---------|-----------|-----------|---------|-------|
| Scanning distance (mm) | 50 | 80 | 100 | 150 | 180 | 200 | 250 | 300 |
| Light spot diameter (mm) | 5 x 1.75 | 4.8 x 1.75 | 4.5 x 1.5 | 4 x 1.5 | 3.8 x 1.5 | 3.8 x 1.2 | 3.2 x 1 | 3 x 1 |

| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



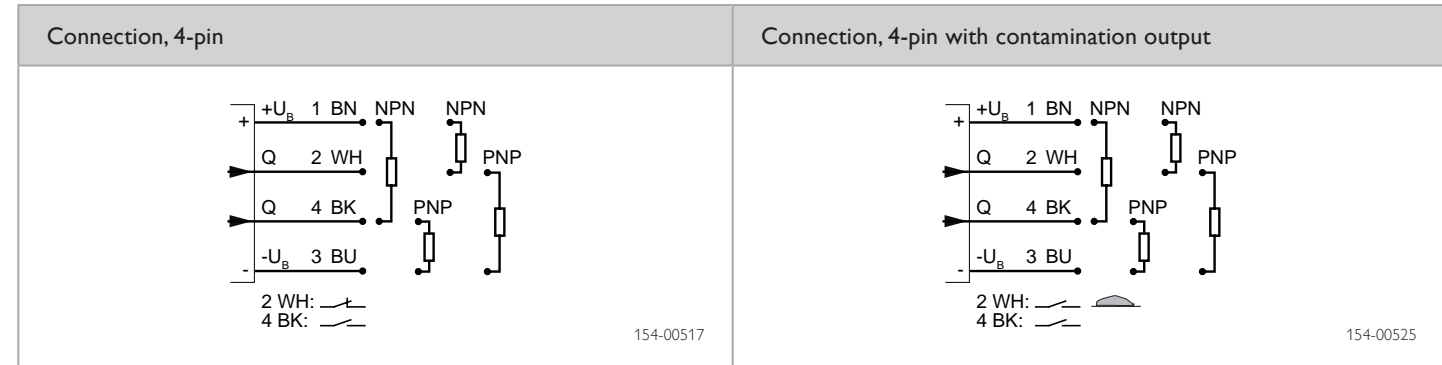
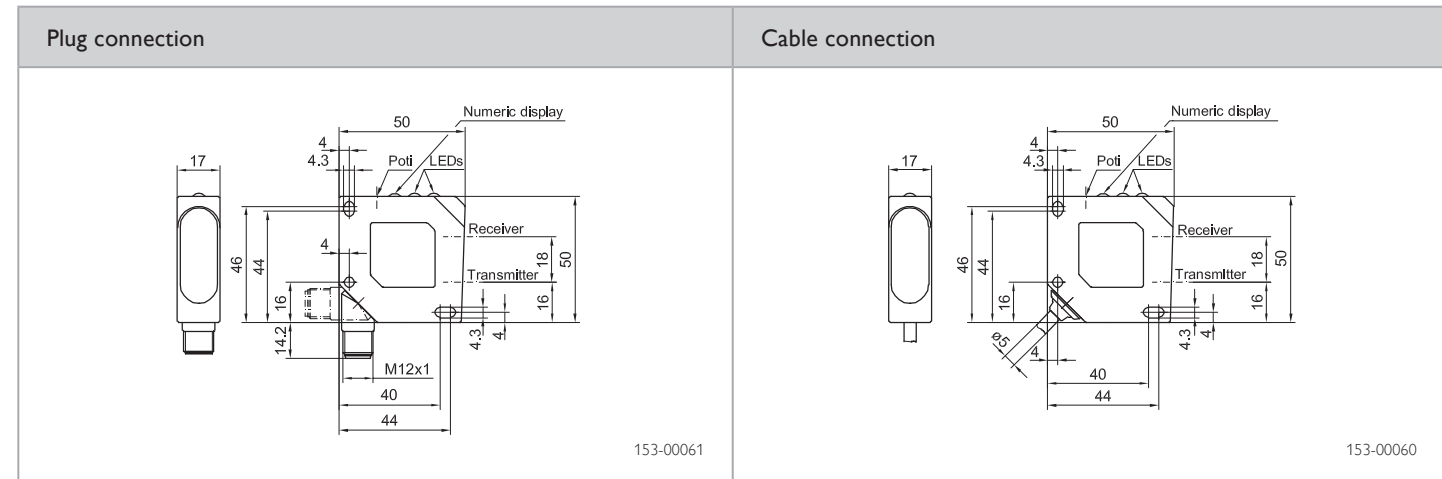
PRODUCT HIGHLIGHTS

- Precisely adjustable background suppression
- Simple scanning distance adjustment thanks to indicator scale
- Optional contamination output
- Plug connector rotatable

| Optical data | | Functions | |
|-------------------------------------|--|---------------------------------|------------------------------|
| Scanning distance | 30 ... 300 mm ¹ | Indicator LED, green | Operating voltage indicator |
| Type of light | LED, red, 660 nm | Indicator LED, yellow | Switching output indicator |
| Light spot size ² | 8 x 8 mm ² | Indicator LED, red | Contamination indicator |
| | | Scanning distance adjustment | Via potentiometer |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30 V DC ³ | Dimensions | 50 x 50 x 17 mm ³ |
| No-load current, I ₀ | ≤ 35 mA ⁴ | Enclosure rating | IP 67 ⁶ |
| Output current, I _e | ≤ 200 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) |
| Standby time | ≤ 300 ms | Ambient temperature: operation | -20 ... +60 °C |
| Switching output, Q | PNP/NPN, antivalent (see Selection Table) | Ambient temperature: storage | -20 ... +80 °C |
| Output function | N.O./N.C. (see Selection Table) | Weight (plug device) | 40 g |
| Switching frequency, f (ti/tp 1:1) | ≤ 1000 Hz | Weight (cable device) | 130 g |
| Response time | 500 μs | Vibration and impact resistance | EN 60947-5-2 |
| Connection, BK | N.O. | | |
| Connection, WH ⁵ | N.C. | | |
| Contamination output, WH (optional) | N.O. (see Selection Table) | | |

¹ Reference material: grey, 18 % reflectivity ² At scanning distance of 200 mm ³ Max. 10 % ripple, within U_B ⁴ At 24 V DC ⁵ Without contamination output

⁶ With connected IP 67 plug



| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |

| Scanning distance | Switching output | Type of connection | Contamination output | Part number | Article number |
|-------------------|------------------|--------------------|----------------------|----------------|----------------|
| 30 ... 300 mm | PNP, antivalent | Plug, M12x1, 4-pin | No | FT 50 RH-PAL4 | 572-51004 |
| 30 ... 300 mm | NPN, antivalent | Plug, M12x1, 4-pin | No | FT 50 RH-NAL4 | 572-51005 |
| 30 ... 300 mm | PNP (N.O.) | Plug, M12x1, 4-pin | Yes | FT 50 RH-PSVL4 | 572-51006 |
| 30 ... 300 mm | NPN (N.O.) | Plug, M12x1, 4-pin | Yes | FT 50 RH-NSVL4 | 572-51007 |
| 30 ... 300 mm | PNP, antivalent | Cable, 3 m, 4-wire | No | FT 50 RH-PAK4 | 572-51000 |
| 30 ... 300 mm | NPN, antivalent | Cable, 3 m, 4-wire | No | FT 50 RH-NAK4 | 572-51001 |
| 30 ... 300 mm | PNP (N.O.) | Cable, 3 m, 4-wire | Yes | FT 50 RH-PSVK4 | 572-51002 |
| 30 ... 300 mm | NPN (N.O.) | Cable, 3 m, 4-wire | Yes | FT 50 RH-NSVK4 | 572-51003 |

Infrared photoelectric proximity sensor with background suppression



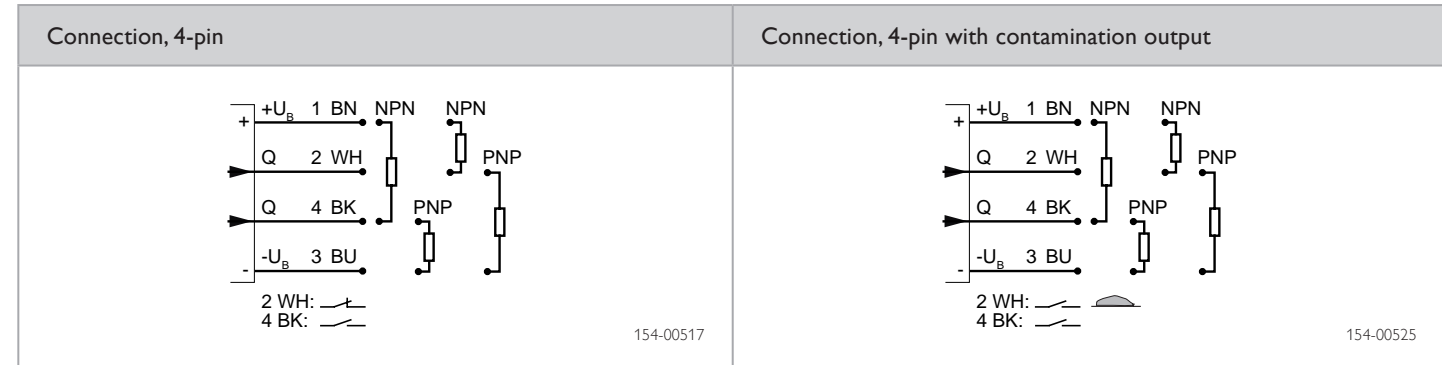
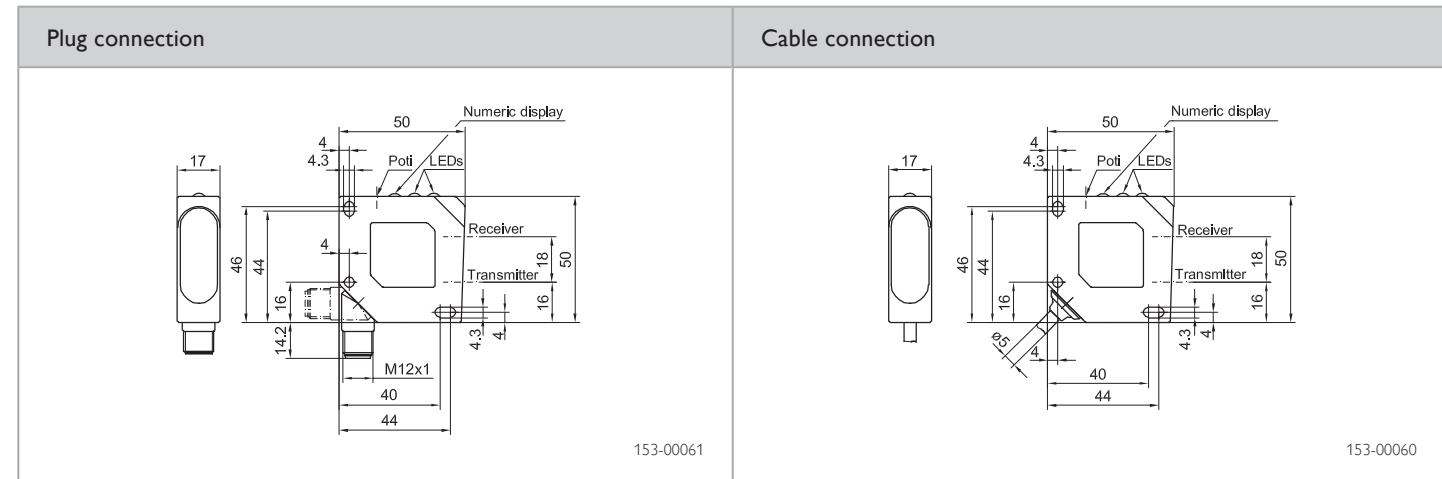
PRODUCT HIGHLIGHTS

- Long scanning distance of 600 mm
- Precisely adjustable background suppression
- Simple scanning distance adjustment thanks to indicator scale
- Optional contamination output

| Optical data | | Functions | |
|-------------------------------------|--|---------------------------------|------------------------------|
| Scanning distance | 150 ... 600 mm ¹ | Indicator LED, green | Operating voltage indicator |
| Type of light | LED, infrared, 880 nm | Indicator LED, yellow | Switching output indicator |
| Light spot size ² | 20 x 20 mm ² | Indicator LED, red | Contamination indicator |
| Hysteresis ³ | < 5 % | Scanning distance adjustment | Via potentiometer |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30 V DC ⁴ | Dimensions | 50 x 50 x 17 mm ³ |
| No-load current, I ₀ | ≤ 70 mA ⁵ | Enclosure rating | IP 67 ⁷ |
| Output current, I _e | ≤ 200 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) |
| Standby time | ≤ 300 ms | Ambient temperature: operation | -20 ... +60 °C |
| Switching output, Q | PNP/NPN, antivalent (see Selection Table) | Ambient temperature: storage | -20 ... +80 °C |
| Output function | N.O./N.C. (see Selection Table) | Weight (plug device) | 40 g |
| Switching frequency, f (ti/tp 1:1) | ≤ 800 Hz | Weight (cable device) | 130 g |
| Response time | 625 μs | Vibration and impact resistance | EN 60947-5-2 |
| Connection, BK | N.O. | | |
| Connection, WH ⁶ | N.C. | | |
| Contamination output, WH (optional) | N.O. (see Selection Table) | | |

¹ Reference material: grey, 18 % reflectivity ² At scanning distance of 400 mm ³ 18 % / 18 % ⁴ Max. 10 % ripple, within U_B ⁵ At 24 V DC ⁶ Without contamination output
⁷ With connected IP 67 plug

| Scanning distance | Switching output | Type of connection | Contamination output | Part number | Article number |
|-------------------|------------------|--------------------|----------------------|----------------|----------------|
| 150 ... 600 mm | PNP, antivalent | Plug, M12x1, 4-pin | No | FT 50 IH-PAL4 | 572-51029 |
| 150 ... 600 mm | NPN, antivalent | Plug, M12x1, 4-pin | No | FT 50 IH-NAL4 | 572-51038 |
| 150 ... 600 mm | PNP (N.O.) | Plug, M12x1, 4-pin | Yes | FT 50 IH-PSVL4 | 572-51031 |
| 150 ... 600 mm | NPN (N.O.) | Plug, M12x1, 4-pin | Yes | FT 50 IH-NSVL4 | 572-51058 |
| 150 ... 600 mm | PNP, antivalent | Cable, 3 m, 4-wire | No | FT 50 IH-PAK4 | 572-51032 |
| 150 ... 600 mm | NPN, antivalent | Cable, 3 m, 4-wire | No | FT 50 IH-NAK4 | 572-51037 |
| 150 ... 600 mm | PNP (N.O.) | Cable, 3 m, 4-wire | Yes | FT 50 IH-PSVK4 | 572-51033 |
| 150 ... 600 mm | NPN (N.O.) | Cable, 3 m, 4-wire | Yes | FT 50 IH-NSVK4 | 572-51057 |



| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |

FR 50 RL

Laser retroreflective photoelectric sensor



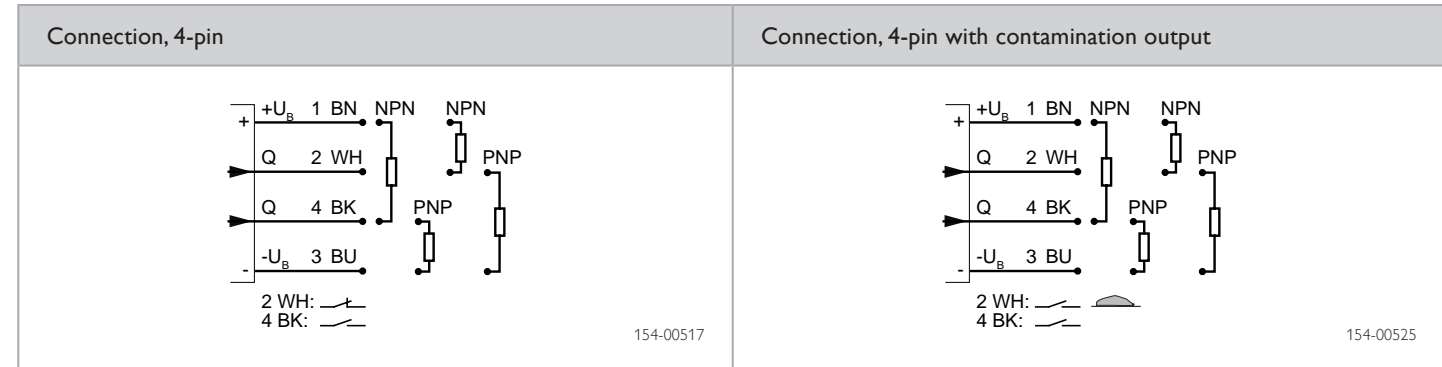
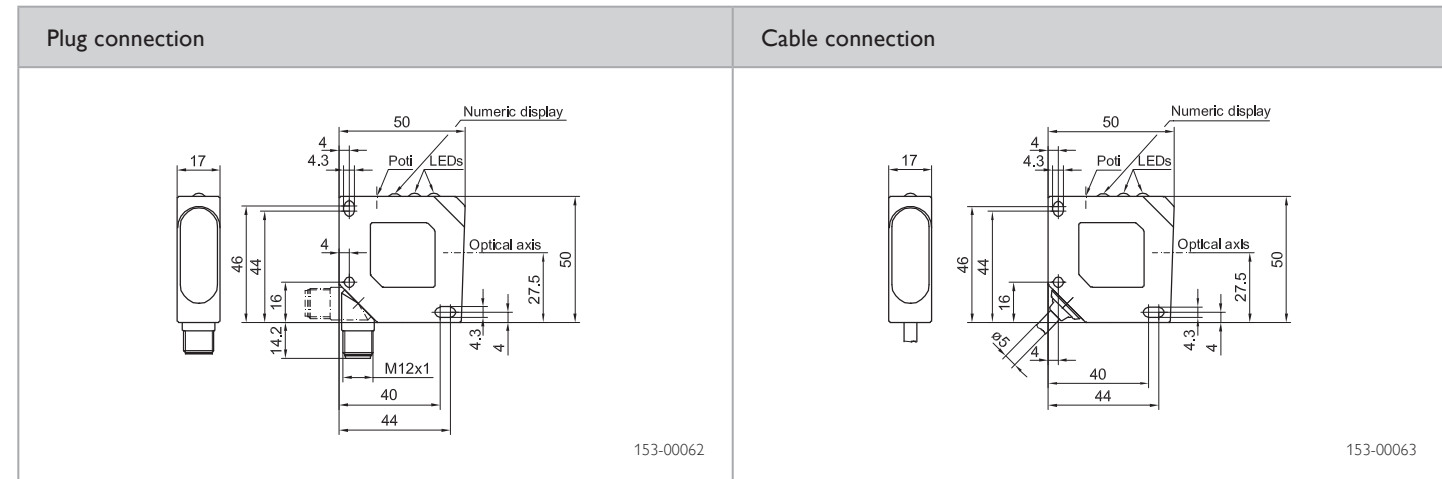
PRODUCT HIGHLIGHTS

- Autocollimation principle for maximum precision even at long ranges
- No blind zone – detection from range of 0 mm
- Particularly suitable for detecting the smallest of objects
- High switching frequency of 2500 Hz
- Very small, easily visible laser light spot

| Optical data | | Functions | |
|--|--|---------------------------------|------------------------------|
| Limit operating range | 0 ... 25 m ¹ | Indicator LED, green | Operating voltage indicator |
| Operating range | 0 ... 20 m ¹ | Indicator LED, yellow | Switching output indicator |
| Type of light | Laser, red, 650 nm | Indicator LED, red | Contamination indicator |
| Light spot size | See table | Sensitivity adjustment | Via potentiometer |
| Laser Class (DIN EN 60825-1:2008-5) | 1 | | |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30V DC ² | Dimensions | 50 x 50 x 17 mm ³ |
| No-load current, I ₀ | ≤ 40 mA ³ | Enclosure rating | IP 67 ⁵ |
| Output current, I _e | ≤ 200 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) |
| Standby time | ≤ 300 ms | Ambient temperature: operation | -20 ... +45 °C |
| Switching output, Q | PNP/NPN, antivalent (see Selection Table) | Ambient temperature: storage | -20 ... +80 °C |
| Output function | N.O./N.C. (see Selection Table) | Weight (plug device) | 40 g |
| Switching frequency, f (ti/tp 1:1) | ≤ 2500 Hz | Weight (cable device) | 130 g |
| Response time | 200 μs | Vibration and impact resistance | EN 60947-5-2 |
| Connection, BK | N.O. | | |
| Connection, WH ⁴ | N.C. | | |
| Contamination output, WH (optional) | N.O. (see Selection Table) | | |

¹ Reference material: R5/L reflector ² Max. 10 % ripple, within U_B ³ At 24 V DC ⁴ Without contamination output ⁵ With connected IP 67 plug

| Operating range | Switching output | Type of connection | Contamination output | Part number | Article number |
|-----------------|------------------|--------------------|----------------------|----------------|----------------|
| 0 ... 20 m | PNP, antivalent | Plug, M12x1, 4-pin | No | FR 50 RL-PAL4 | 571-50009 |
| 0 ... 20 m | NPN, antivalent | Plug, M12x1, 4-pin | No | FR 50 RL-NAL4 | 571-50011 |
| 0 ... 20 m | PNP (N.O.) | Plug, M12x1, 4-pin | Yes | FR 50 RL-PSVL4 | 571-50010 |
| 0 ... 20 m | NPN (N.O.) | Plug, M12x1, 4-pin | Yes | FR 50 RL-NSVL4 | 571-50012 |
| 0 ... 20 m | PNP, antivalent | Cable, 3 m, 4-wire | No | FR 50 RL-PAK4 | 571-50013 |
| 0 ... 20 m | NPN, antivalent | Cable, 3 m, 4-wire | No | FR 50 RL-NAK4 | 571-50015 |
| 0 ... 20 m | PNP (N.O.) | Cable, 3 m, 4-wire | Yes | FR 50 RL-PSVK4 | 571-50014 |
| 0 ... 20 m | NPN (N.O.) | Cable, 3 m, 4-wire | Yes | FR 50 RL-NSVK4 | 571-50016 |



| Light spot size | | | |
|--------------------------|---|----|----|
| Operating range (m) | 4 | 12 | 20 |
| Light spot diameter (mm) | 5 | 15 | 24 |

| Accessories | |
|-------------------|---------------|
| Reflectors | From Page 654 |
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



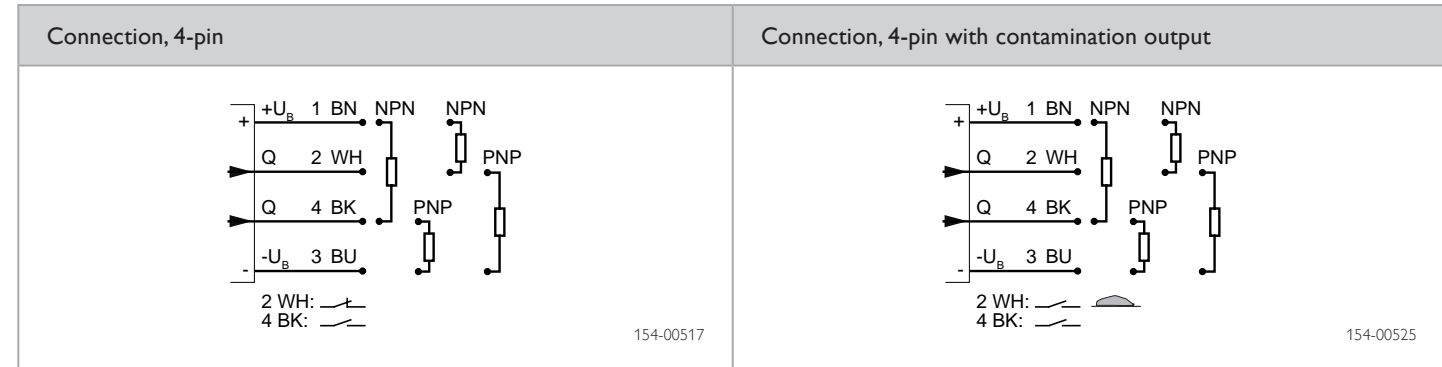
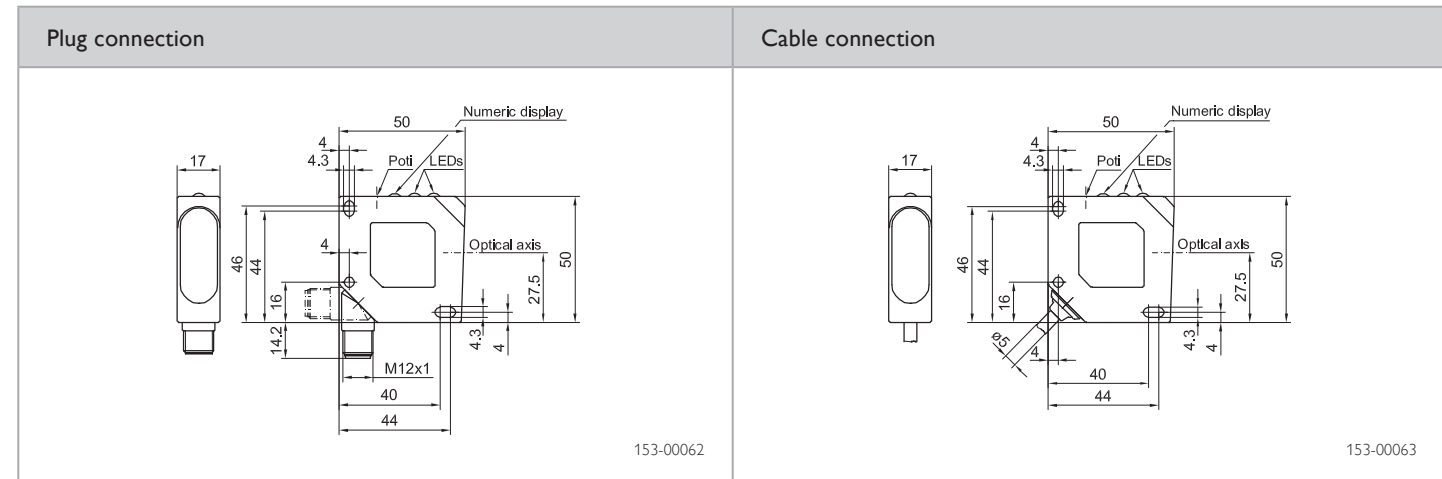
PRODUCT HIGHLIGHTS

- Autocollimation principle for maximum precision even at long ranges
- No blind zone – detection from range of 0 mm
- Simple alignment thanks to easily visible light spot
- Plug connector rotatable

| Optical data | | Functions | |
|-------------------------------------|--|---------------------------------|------------------------------|
| Limit operating range | 0 ... 6 m ¹ | Indicator LED, green | Operating voltage indicator |
| Operating range | 0 ... 5.5 mm ¹ | Indicator LED, yellow | Switching output indicator |
| Type of light | LED, red, 660 nm | Indicator LED, red | Contamination indicator |
| Light spot size | See table | Sensitivity adjustment | Via potentiometer |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30 V DC ² | Dimensions | 50 x 50 x 17 mm ³ |
| No-load current, I ₀ | ≤ 30 mA ³ | Enclosure rating | IP 67 ⁵ |
| Output current, I _e | ≤ 200 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) |
| Standby time | ≤ 300 ms | Ambient temperature: operation | -20 ... +60 °C |
| Switching output, Q | PNP/NPN, antivalent (see Selection Table) | Ambient temperature: storage | -20 ... +80 °C |
| Output function | N.O./N.C. (see Selection Table) | Weight (plug device) | 40 g |
| Switching frequency, f (ti/tp 1:1) | ≤ 1000 Hz | Weight (cable device) | 130 g |
| Response time | 500 μs | Vibration and impact resistance | EN 60947-5-2 |
| Connection, BK | N.O. | | |
| Connection, WH ⁴ | N.C. | | |
| Contamination output, WH (optional) | N.O. (see Selection Table) | | |

¹ Reference material: RD8 reflector ² Max. 10 % ripple, within U_B ³ At 24 V DC ⁴ Without contamination output ⁵ With connected IP 67 plug

| Operating range | Switching output | Type of connection | Contamination output | Part number | Article number |
|-----------------|------------------|--------------------|----------------------|---------------|----------------|
| 0 ... 5.5 m | PNP, antivalent | Plug, M12x1, 4-pin | No | FR 50 R-PAL4 | 571-50004 |
| 0 ... 5.5 m | NPN, antivalent | Plug, M12x1, 4-pin | No | FR 50 R-NAL4 | 571-50005 |
| 0 ... 5.5 m | PNP (N.O.) | Plug, M12x1, 4-pin | Yes | FR 50 R-PSVL4 | 571-50006 |
| 0 ... 5.5 m | NPN (N.O.) | Plug, M12x1, 4-pin | Yes | FR 50 R-NSVL4 | 571-50007 |
| 0 ... 5.5 m | PNP (N.C.) | Plug, M12x1, 4-pin | Yes | FR 50 R-POVL4 | 571-50033 |
| 0 ... 5.5 m | PNP, antivalent | Cable, 3 m, 4-wire | No | FR 50 R-PAK4 | 571-50000 |
| 0 ... 5.5 m | NPN, antivalent | Cable, 3 m, 4-wire | No | FR 50 R-NAK4 | 571-50001 |
| 0 ... 5.5 m | PNP (N.O.) | Cable, 3 m, 4-wire | Yes | FR 50 R-PSVK4 | 571-50002 |
| 0 ... 5.5 m | NPN (N.O.) | Cable, 3 m, 4-wire | Yes | FR 50 R-NSVK4 | 571-50003 |



| Light spot size | | |
|----------------------|---------|------|
| Operating range (m) | 0.1 | 0.5 |
| Light spot size (mm) | 15 x 10 | ∅ 15 |

| Accessories | |
|-------------------|---------------|
| Reflectors | From Page 654 |
| Connection cables | From Page 670 |
| Brackets | From Page 642 |

FS/FE 50 I

Infrared through-beam photoelectric sensor



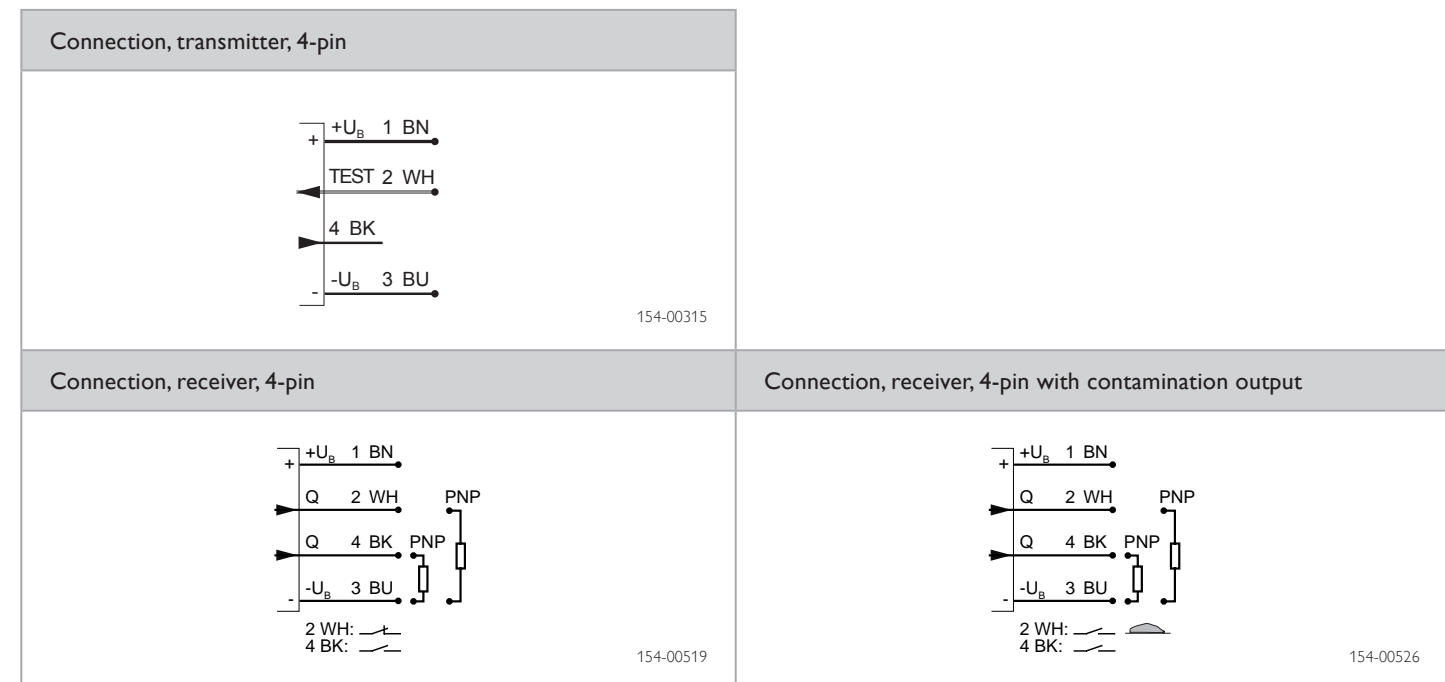
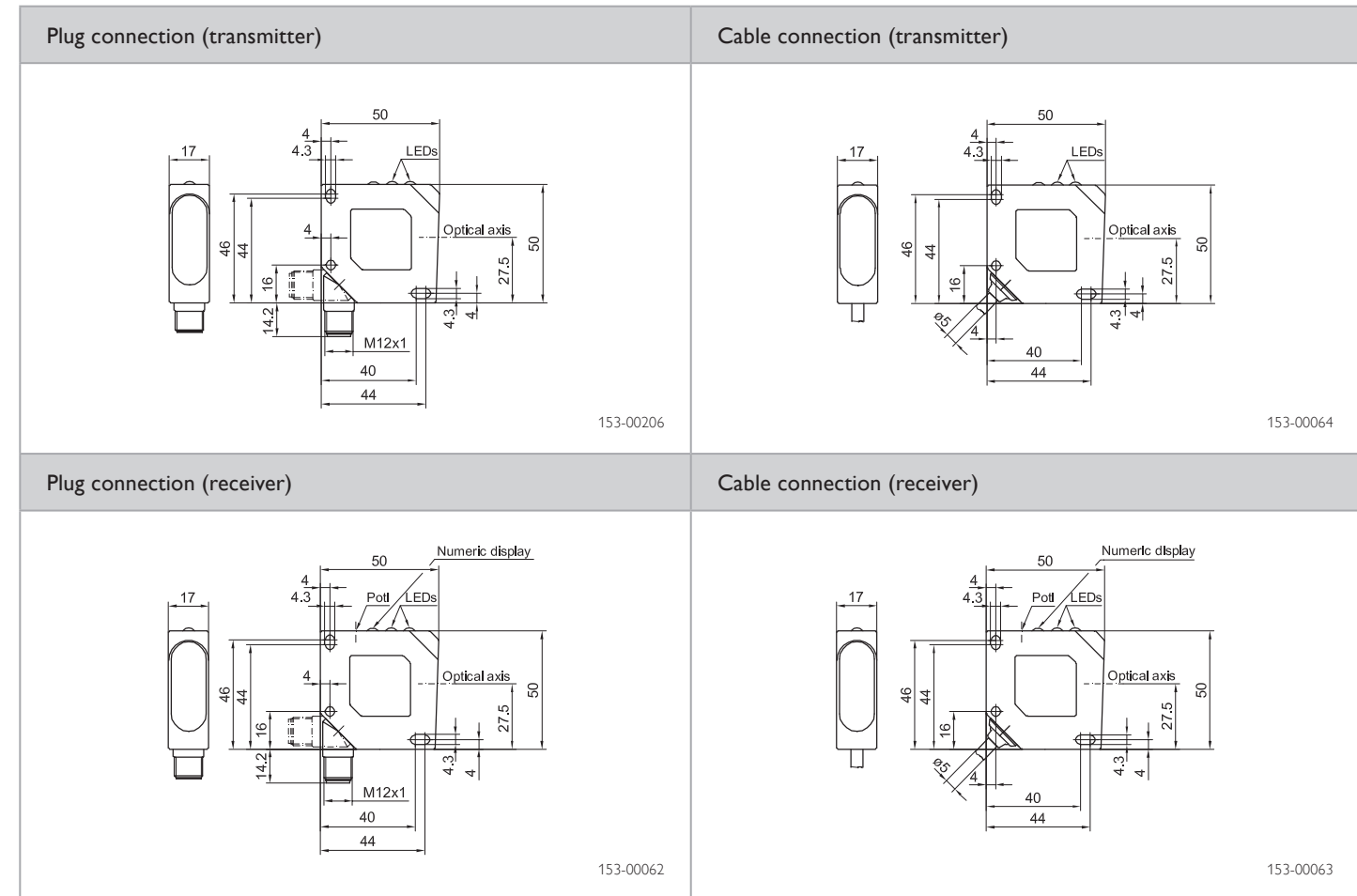
PRODUCT HIGHLIGHTS

- Simple range adjustment thanks to indicator scale
- Test input for controlling function of the sensor pair
- Optional contamination output
- Plug connector rotatable

| Optical data | | Functions | |
|---|---|-----------------------------------|---|
| Limit operating range | 0 ... 18 m | Indicator LED, green | Operating voltage indicator |
| Operating range | 0 ... 15 m | Indicator LED, yellow | Switching output indicator |
| Type of light | LED, infrared, 880 nm | Indicator LED, red (transmitter) | Operating voltage indicator (transmitter off) |
| | | Indicator LED, red (receiver) | Contamination indicator |
| | | Sensitivity adjustment (receiver) | Via potentiometer |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30 V DC ¹ | Dimensions | 50 x 50 x 17 mm ³ |
| No-load current, I ₀ | ≤ 30 mA | Enclosure rating | IP 67 ² |
| Output current, I _e | ≤ 200 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) |
| Standby time | ≤ 300 ms | Ambient temperature: operation | -20 ... +60 °C |
| Switching output, Q | PNP/NPN, antivalent (see Selection Table) | Ambient temperature: storage | -20 ... +80 °C |
| Output function | N.O./N.C. (see Selection Table) | Weight (plug device) | 40 g |
| Switching frequency, f (ti/tp 1:1) | ≤ 1000 Hz | Weight (cable device) | 130 g |
| Response time | 500 μs | Vibration and impact resistance | EN 60947-5-2 |
| Connection, BK (receiver) | N.O. | | |
| Connection, WH ² (receiver) | N.C. | | |
| Contamination output, WH (receiver; optional) | N.O. (see Selection Table) | | |
| Control input, (transmitter) | +U _B = Test (transmitter off) -U _B / Open = normal operation | | |

¹ Max. 10 % ripple, within U_B ² Without contamination output ³ With connected IP 67 plug

| Operating range | Switching output | Type of connection | Contamination output | Part number | Article number |
|-----------------|------------------|--------------------|----------------------|---------------|----------------|
| 0 ... 15 m | PNP, antivalent | Plug, M12x1, 4-pin | No | FE 50 I-PAL4 | 573-52007 |
| 0 ... 15 m | PNP (N.O.) | Plug, M12x1, 4-pin | Yes | FE 50 I-PSVL4 | 573-52004 |
| 0 ... 15 m | - | Plug, M12x1, 4-pin | No | FS 50 I-L4 | 573-52006 |
| 0 ... 15 m | PNP, antivalent | Cable, 3 m, 4-wire | No | FE 50 I-PAK4 | 573-52003 |
| 0 ... 15 m | PNP (N.O.) | Cable, 3 m, 4-wire | Yes | FE 50 I-PSVK4 | 573-52005 |
| 0 ... 15 m | - | Cable, 3 m, 4-wire | No | FS 50 I-K4 | 573-52002 |



| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |

F 88 – family of photoelectric sensors for harsh environmental conditions

The strong and solid series



TYPICAL F 88

- Very long ranges and scanning distances
- PNP or NPN variants with 2 switching outputs or relay with time function
- AC/DC devices with clamping space
- Simple adjustment via potentiometer
- Robust plastic housings
- Additional dovetail slot for simple mounting
- Well thought-out mounting accessories
- UL-certification

Above all else, the sensors of the F 88 series are robust and dependable! Their high system reserves guarantee reliable detection even in critical industrial environments. An F 88 fears neither dust and dirt nor vibrations, and the stable housing/plug unit is designed for these conditions.

The high-level light performance can be seen in the generously proportioned detection ranges: the FT 88 scanner with background suppression even “sees” objects at a distance of 700 mm, while the FS/FE 88 through-beam photoelectric sensor manages a range of 65 m. With these performance data, the F 88 series can be used in many demanding applications in sectors such as the automotive industry, wood processing or in mechanical engineering.

The robust sensors are also ideally suited for heavy industry as well as for protecting gates and doors.

The sensors of the F 88 series are also generously proportioned when it comes to signal outputs: they have two switching outputs (PNP or NPN), and a variant with relay output and time function is also available. The right output is therefore available for every supply voltage and the sensor offers flexible adaptation to operating conditions. User-friendly sensor mounting – with dovetail slot and well thought-out mounting accessories – is also typical SensoPart. There is thus something for almost every user requirement!

| F 88 – Product Overview | | | | | |
|--|---------------|---------------|---------------------------|------------------|------|
| | Type of light | Adjustment | Scanning distance / range | Special features | Page |
| Photoelectric proximity sensors with background suppression | | | | | |
| FT 88-RH | LED | Potentiometer | 700 mm | PNP, NPN | 328 |
| FT 88-RH | LED | Potentiometer | 700 mm | Relay output | 330 |
| FT 88-IH | Infrared | Potentiometer | 2 m | PNP, NPN | 332 |
| FT 88-IH | Infrared | Potentiometer | 2 m | Relay output | 334 |
| Photoelectric proximity sensor | | | | | |
| FT 88-R | LED | Potentiometer | 2 m | PNP, NPN | 336 |
| Retroreflective photoelectric sensors | | | | | |
| FR 88-R | LED | Potentiometer | 12 m | PNP, NPN | 338 |
| FR 88-R | LED | Potentiometer | 12 m | Relay output | 340 |
| Through-beam photoelectric sensors | | | | | |
| FS/FE 88-R | LED | Potentiometer | 30 m / 65 m | PNP, NPN | 342 |
| FS/FE 88-R | LED | Potentiometer | 30 m / 65 m | Relay output | 344 |



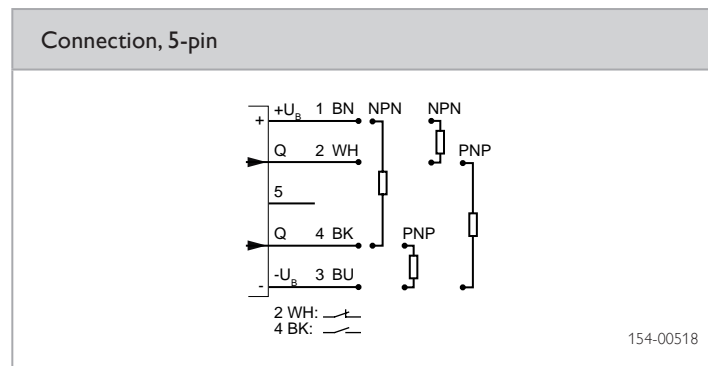
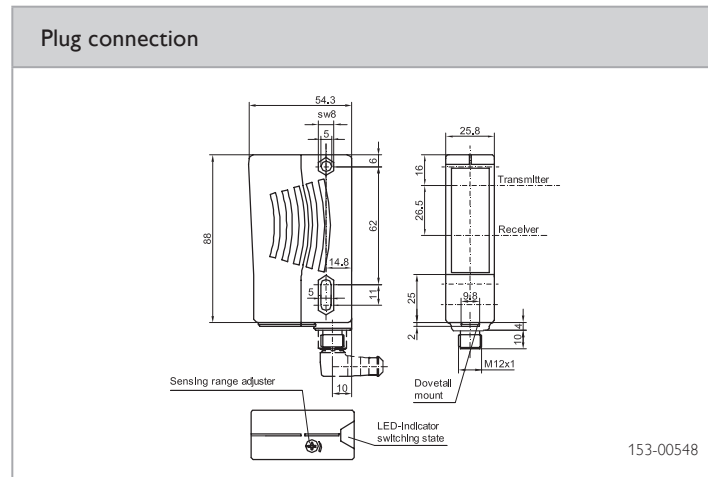
PRODUCT HIGHLIGHTS

- Long scanning distance of 700 mm
- Precise background suppression
- Antivalent switching output

| Optical data | | Functions | |
|------------------------------------|--|---------------------------------|----------------------------------|
| Scanning distance | 20 ... 700 mm ¹ | Indicator LED, yellow | Switching output indicator |
| Type of light | LED, red, 660 nm | Scanning distance adjustment | Via potentiometer |
| Light spot size ² | Ø 15 mm | Default setting | Max. scanning distance |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30 V DC ³ | Dimensions | 88 x 54.3 x 25.8 mm ³ |
| No-load current, I ₀ | ≤ 40 mA | Enclosure rating | IP 67 ⁴ |
| Output current, I _e | ≤ 200 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) |
| Standby time | ≤ 300 ms | Ambient temperature: operation | -40 ... +60 °C |
| Switching output, Q | PNP/NPN antivalent (see Selection Table) | Ambient temperature: storage | -40 ... +75 °C |
| Output function | N.O./N.C. | Weight (plug device) | 70 g |
| Switching frequency, f (ti/tp 1:1) | ≤ 250 Hz | Vibration and impact resistance | EN 60947-5-2 |
| Response time | 2 ms | | |
| Connection, BK | N.O. | | |
| Connection, WH | N.C. | | |

¹ Reference material: grey, 18 % reflectivity ² At scanning distance of 700 mm ³ Max. 10 % ripple, within U_B ⁴ With connected IP 67 plug

| Scanning distance | Switching output | Type of connection | Part number | Article number |
|-------------------|------------------|--------------------|----------------|----------------|
| 20 ... 700 mm | PNP | Plug, M12x1, 5-pin | FT 88-RH-PA-L5 | 821-11010 |
| 20 ... 700 mm | NPN | Plug, M12x1, 5-pin | FT 88-RH-NA-L5 | 821-11011 |



Accessories

| | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



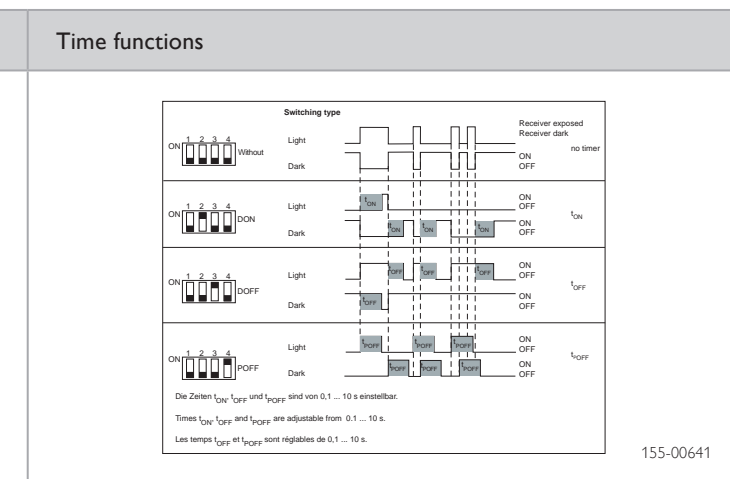
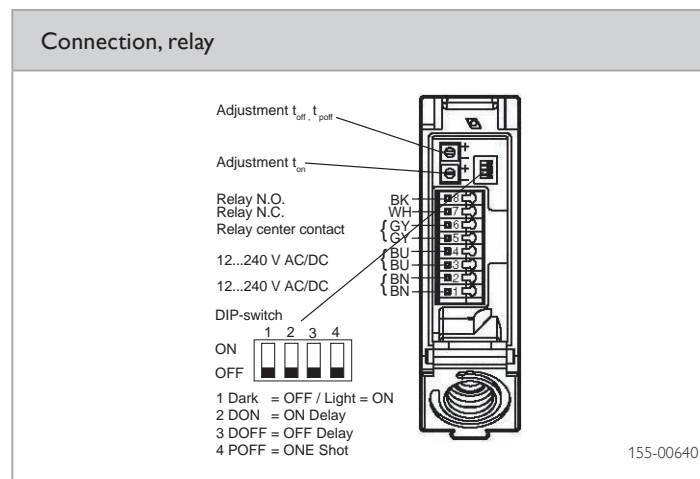
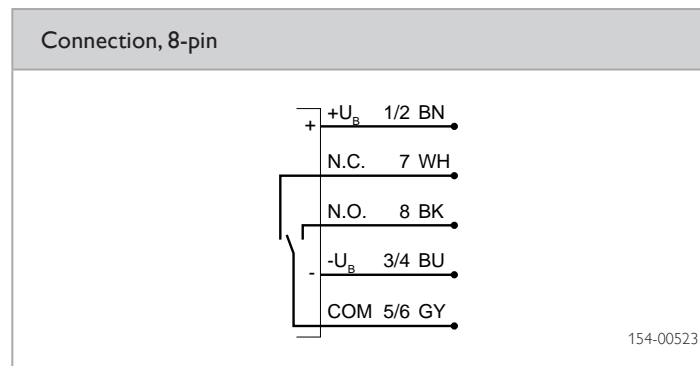
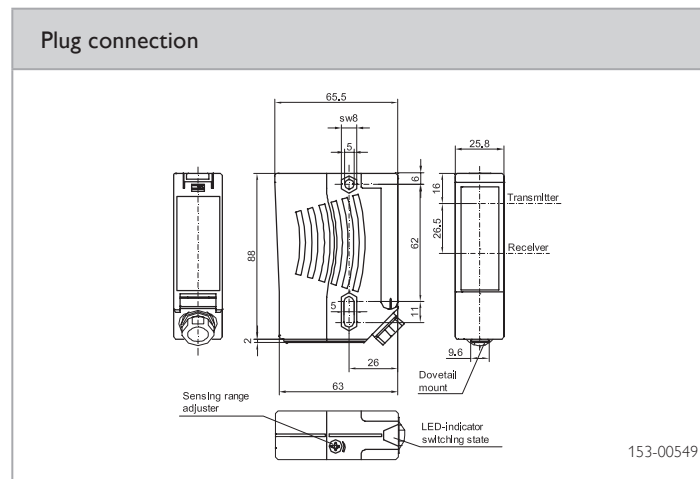
PRODUCT HIGHLIGHTS

- Long scanning distance of 700 mm
- Precise background suppression
- Relay output
- Adjustable time function
- N.O. / N.C. switchable

| Optical data | | Functions | |
|------------------------------------|---------------------------------|---------------------------------|---|
| Scanning distance | 20 ... 700 mm ¹ | Indicator LED, yellow | Switching output indicator |
| Type of light | LED, red, 660 nm | Sensitivity adjustment | Via potentiometer |
| Light spot size ² | Ø 15 mm | Adjustment possibilities | Time and output function (N.O./N.C.) via operating elements in clamping space |
| | | Default setting | Max. scanning distance |
| Electrical data | | Mechanical data | |
| Operating voltage, ~U _B | 12 ... 240 V AC / DC | Dimensions | 88 x 65,5 x 25,8 mm ³ |
| Power consumption | ≤ 3.5 VA | Enclosure rating | IP 67 ⁴ |
| Output current, I _e | ≤ 2 A (≤ 250 V AC/DC) | Material, housing | ABS |
| Protection Class | 2 ³ | Material, front screen | PMMA |
| Standby time | ≤ 300 ms | Type of connection | (See Selection Table) |
| Switching output, Q | Relay | Ambient temperature: operation | -25 ... +60 °C |
| Output function | Change-over contact (N.O./N.C.) | Ambient temperature: storage | -40 ... +75 °C |
| Switching frequency, f (ti/tp 1:1) | ≤ 25 Hz | Weight (clamping space device) | 120 g |
| | | Vibration and impact resistance | EN 60947-5-2 |

¹ Reference material: grey, 18 % reflectivity ² At scanning distance of 700 mm ³ With closed clamping space ⁴ With connected IP 67 plug

| Scanning distance | Switching output | Type of connection | Part number | Article number |
|-------------------|------------------|--|-----------------|----------------|
| 20 ... 700 mm | Relay | Clamping space, 8 spring clamp terminals, cable gland, M16x1.5 | FT 88-RH-RAT-PM | 821-11009 |



Accessories

| | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |

Infrared photoelectric proximity sensor with background suppression



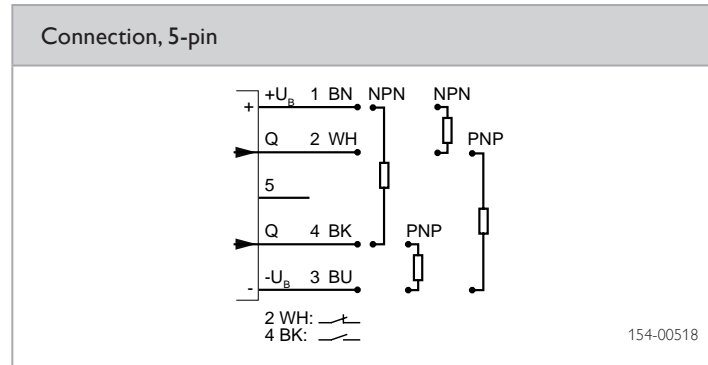
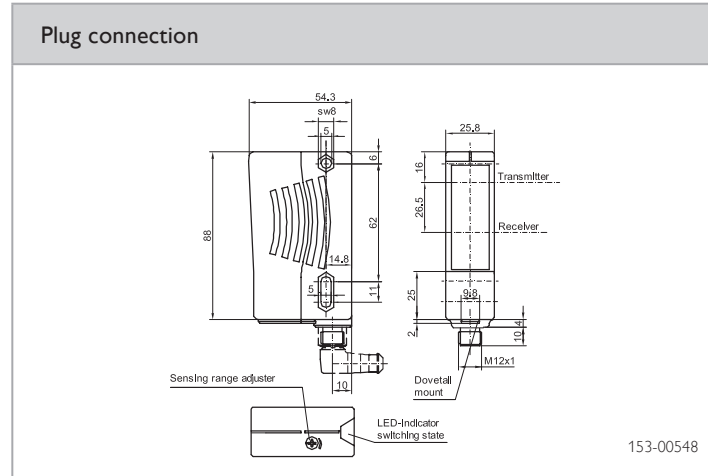
PRODUCT HIGHLIGHTS

- Long scanning distance of 2000 mm
- Precise background suppression
- Antivalent switching output

| Optical data | | Functions | |
|------------------------------------|--|---------------------------------|----------------------------------|
| Scanning distance | 20 ... 2000 mm ¹ | Indicator LED, yellow | Switching output indicator |
| Type of light | LED, infrared, 880 nm | Scanning distance adjustment | Via potentiometer |
| Light spot size ² | Ø 70 mm | Default setting | Max. scanning distance |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30 V DC ³ | Dimensions | 88 x 54.3 x 25.8 mm ³ |
| No-load current, I ₀ | ≤ 40 mA | Enclosure rating | IP 67 ⁴ |
| Output current, I _e | ≤ 200 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) |
| Standby time | ≤ 300 ms | Ambient temperature: operation | -40 ... +60 °C |
| Switching output, Q | PNP/NPN antivalent (see Selection Table) | Ambient temperature: storage | -40 ... +75 °C |
| Output function | N.O./N.C. | Weight (plug device) | 70 g |
| Switching frequency, f (ti/tp 1:1) | ≤ 250 Hz | Vibration and impact resistance | EN 60947-5-2 |
| Response time | 2 ms | | |
| Connection, BK | N.O. | | |
| Connection, WH | N.C. | | |

¹ Reference material: grey, 18 % reflectivity ² At scanning distance of 2000 mm ³ Max. 10 % ripple, within U_B ⁴ With connected IP 67 plug

| Scanning distance | Switching output | Type of connection | Part number | Article number |
|-------------------|------------------|--------------------|----------------|----------------|
| 20 ... 2000 mm | PNP | Plug, M12x1, 5-pin | FT 88-IH-PA-L5 | 821-11013 |
| 20 ... 2000 mm | NPN | Plug, M12x1, 5-pin | FT 88-IH-NA-L5 | 821-11014 |



Accessories

| | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |

Infrared photoelectric proximity sensor with background suppression, relay output



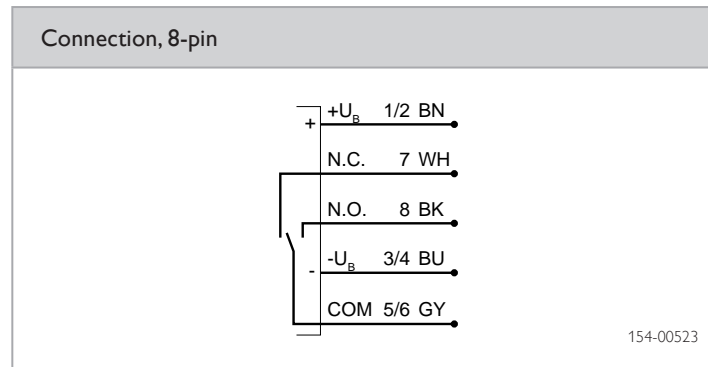
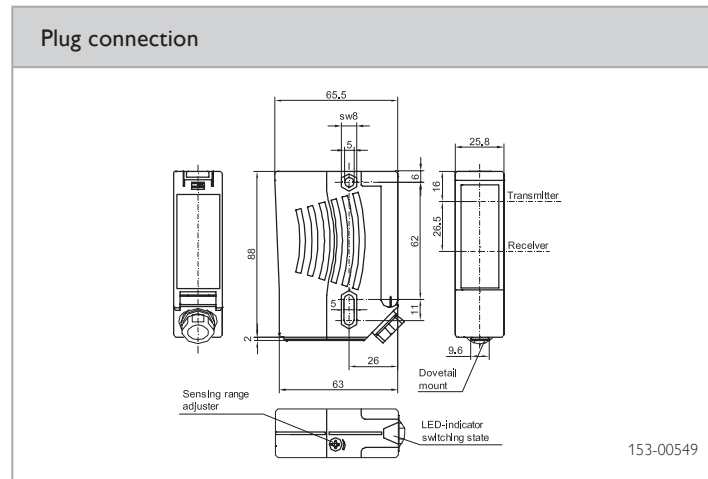
PRODUCT HIGHLIGHTS

- Long scanning distance of 2000 mm
- Precise background suppression
- Relay output
- Adjustable time function
- N.O./N.C. switchable

| Optical data | | Functions | |
|------------------------------------|---------------------------------|---------------------------------|---|
| Scanning distance | 20 ... 2000 mm ¹ | Indicator LED, yellow | Switching output indicator |
| Type of light | LED, infrared, 880 nm | Scanning distance adjustment | Via potentiometer |
| Light spot size ² | Ø 70 mm | Adjustment possibilities | Time and output function (N.O./N.C.) via operating elements in clamping space |
| | | Default setting | Max. scanning distance |
| Electrical data | | Mechanical data | |
| Operating voltage, ~U _B | 12 ... 240 V AC / DC | Dimensions | 88 x 65,5 x 25,8 mm ³ |
| Power consumption | ≤ 3.5 VA | Enclosure rating | IP 67 ⁴ |
| Output current, I _e | ≤ 2 A (≤ 250 V AC / DC) | Material, housing | ABS |
| Protection Class | 2 ³ | Material, front screen | PMMA |
| Standby time | ≤ 300 ms | Type of connection | (See Selection Table) |
| Switching output, Q | Relay | Ambient temperature: operation | -40 ... +60 °C |
| Output function | Change-over contact (N.O./N.C.) | Ambient temperature: storage | -40 ... +75 °C |
| Switching frequency, f (ti/tp 1:1) | ≤ 25 Hz | Weight (clamping space device) | 120 g |
| | | Vibration and impact resistance | EN 60947-5-2 |

¹ Reference material: grey, 18 % reflectivity ² At scanning distance of 2000 mm ³ With closed clamping space ⁴ With connected IP 67 plug

| Scanning distance | Switching output | Type of connection | Part number | Article number |
|-------------------|------------------|--|-----------------|----------------|
| 20 ... 2000 mm | Relay | Clamping space, 8 spring clamp terminals, cable gland, M16x1.5 | FT 88-IH-RAT-PM | 821-11012 |



Connection, relay

Adjustment t_{off}, t_{poFF}

Adjustment t_{on}

Relay N.O. BK
Relay N.C. WH
Relay center contact GY

12...240 V AC/DC BU
12...240 V AC/DC BN
BN

DIP-switch

ON 1 2 3 4
OFF

1 Dark = OFF / Light = ON
2 DON = ON Delay
3 DOFF = OFF Delay
4 POFF = ONE Shot

155-00640

Time functions

Switching type

Receiver exposed Receiver dark

no timer

t_{on}

t_{off}

t_{poFF}

Die Zeiten t_{on}, t_{off} und t_{poFF} sind von 0.1 ... 10 s einstellbar.
Times t_{on}, t_{off} and t_{poFF} are adjustable from 0.1 ... 10 s.
Les temps t_{on}, t_{off} et t_{poFF} sont réglables de 0.1 ... 10 s.

155-00641

Accessories

| | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



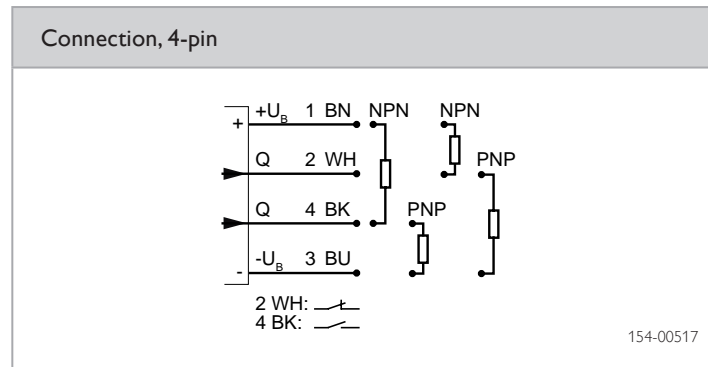
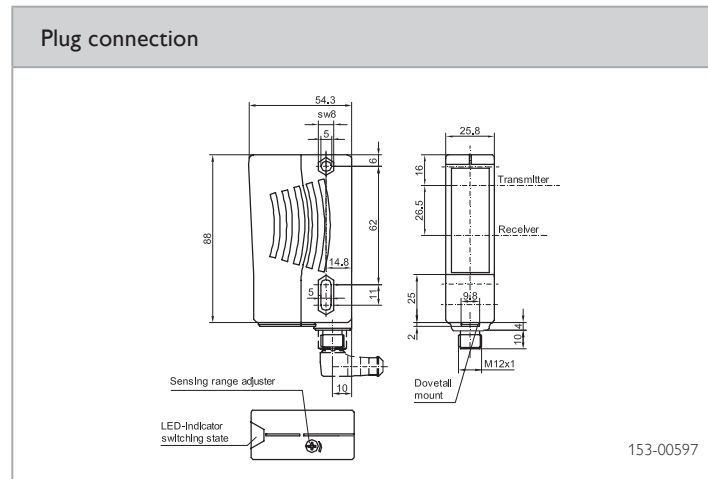
PRODUCT HIGHLIGHTS

- Push-pull output, antivalent
- Simple alignment thanks to easily visible light spot
- Precise sensitivity adjustment by means of potentiometer

| Optical data | | Functions | |
|------------------------------------|--|---------------------------------|----------------------------------|
| Scanning distance | 50 ... 2000 mm ¹ | Indicator LED, yellow | Switching output indicator |
| Type of light | LED, red, 660 nm | Sensitivity adjustment | Via potentiometer |
| Light spot size ² | Ø 50 mm | Default setting | Max. scanning distance |
| Hysteresis | < 12 % | | |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30V DC ³ | Dimensions | 88 x 54.3 x 25.8 mm ³ |
| No-load current, I ₀ | ≤ 40 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) |
| Standby time | 300 ms | Ambient temperature: operation | -25 ... +60 °C |
| Switching output, Q | PNP/NPN, push-pull, antivalent | Ambient temperature: storage | -40 ... +75 °C |
| Output function | N.O./N.C. | Weight (plug device) | 70 g |
| Switching frequency, f (ti/tp 1:1) | ≤ 125 Hz | Vibration and impact resistance | EN 60947-5-2 |
| Response time | 4 ms | | |
| Connection, BK | N.O. | | |
| Connection, WH | N.C. | | |

¹ Reference material, white, 90 % reflectivity ² At scanning distance of 2000 mm ³ Max. 10 % ripple, within U_B ⁴ With connected IP 67 plug

| Scanning distance | Switching output | Type of connection | Part number | Article number |
|-------------------|--------------------------------|--------------------|---------------|----------------|
| 50 ... 2000 mm | PNP/NPN, push-pull, antivalent | Plug, M12x1, 4-pin | FT 88-R-GA-L4 | 821-21009 |



Accessories

| | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



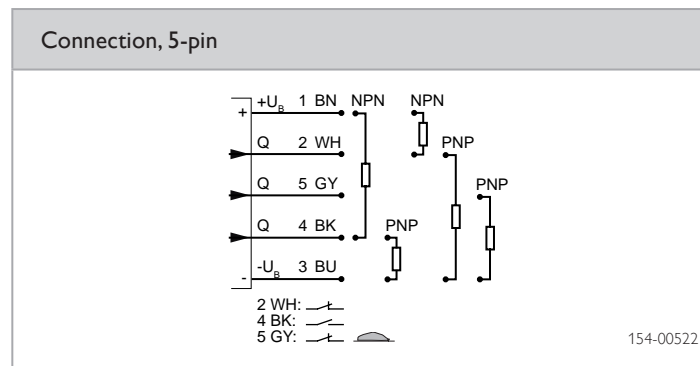
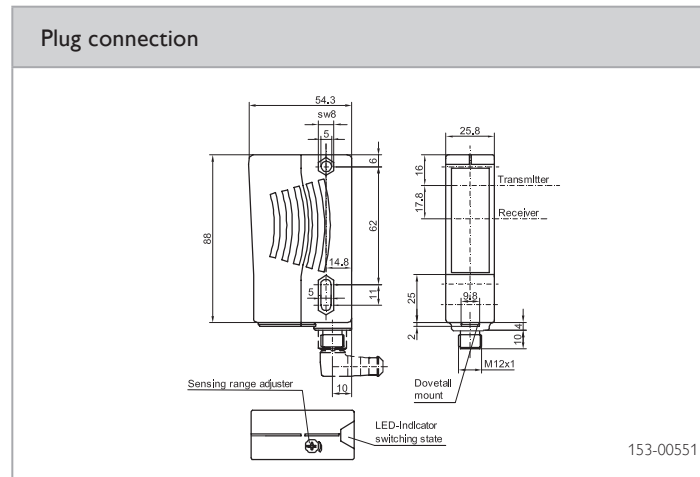
PRODUCT HIGHLIGHTS

- Antivalent switching output
- Simple alignment thanks to easily visible light spot
- Precise sensitivity adjustment by means of potentiometer

| Optical data | | Functions | |
|-------------------------------------|--|---------------------------------|----------------------------------|
| Operating range | 0.05 ... 12 m ¹ | Indicator LED, yellow | Switching output indicator |
| Type of light | LED, red, 660 nm | Sensitivity adjustment | Via potentiometer |
| Light spot size ² | Ø 200 mm | Default setting | Max. range |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30 V DC ³ | Dimensions | 88 x 54.3 x 25.8 mm ³ |
| No-load current, I ₀ | ≤ 40 mA | Enclosure rating | IP 67 ⁴ |
| Output current, I _e | ≤ 200 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) |
| Standby time | ≤ 300 ms | Ambient temperature: operation | -40 ... +60 °C |
| Switching output, Q | PNP/NPN antivalent (see Selection Table) | Ambient temperature: storage | -40 ... +75 °C |
| Output function | N.O./N.C. | Weight (plug device) | 70 g |
| Switching frequency, f (ti/tp 1:1) | ≤ 1000 Hz | Vibration and impact resistance | EN 60947-5-2 |
| Response time | 500 μs | | |
| Connection, BK | N.O. | | |
| Connection, WH | N.C. | | |
| Contamination output, Gy (optional) | N.C. | | |

¹ Reference material: R10 reflector ² At range of 12 m ³ Max. 10 % ripple, within U_B ⁴ With connected IP 67 plug

| Operating range | Switching output | Type of connection | Part number | Article number |
|-----------------|------------------|--------------------|----------------|----------------|
| 0.05 ... 12 m | PNP | Plug, M12x1, 5-pin | FR 88-R-PAV-L5 | 823-11010 |
| 0.05 ... 12 m | NPN | Plug, M12x1, 5-pin | FR 88-R-NAV-L5 | 823-11011 |



Accessories

| | |
|-------------------|---------------|
| Reflectors | From Page 654 |
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



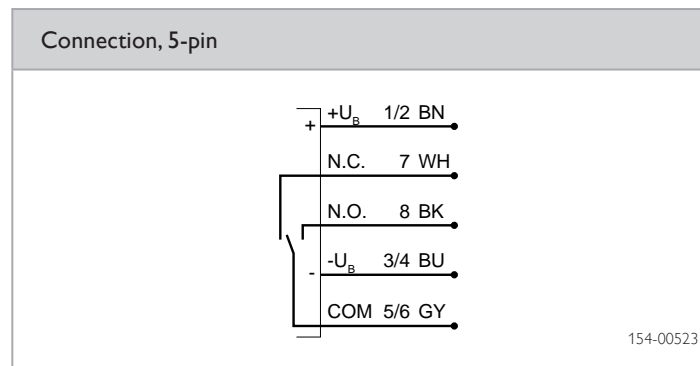
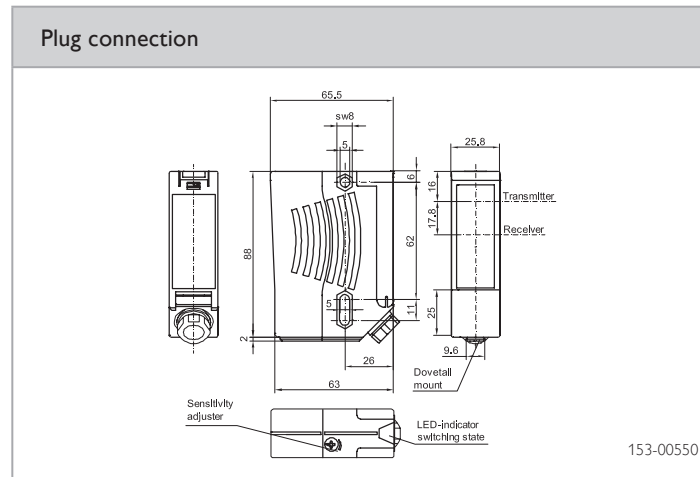
PRODUCT HIGHLIGHTS

- Relay output
- Simple alignment thanks to easily visible light spot
- Precise sensitivity adjustment by means of potentiometer
- Adjustable time function
- N.O./N.C. switchable

| Optical data | | Functions | |
|------------------------------------|---------------------------------|---------------------------------|---|
| Operating range | 0.05 ... 12 m ¹ | Indicator LED, yellow | Switching output indicator |
| Type of light | LED, red, 660 nm | Sensitivity adjustment | Via potentiometer |
| Light spot size ² | Ø 200 mm | Adjustment possibilities | Time and output function (N.O./N.C.) via operating elements in clamping space |
| | | Default setting | Max. range |
| Electrical data | | Mechanical data | |
| Operating voltage, ~U _B | 12 ... 240 V AC / DC | Dimensions | 88 x 65.5 x 25.8 mm ³ |
| Power consumption | ≤ 3.5 VA | Enclosure rating | IP 67 ⁴ |
| Output current, I _e | ≤ 2 A (≤ 250 V AC / DC) | Material, housing | ABS |
| Protection Class | 2 ³ | Material, front screen | PMMA |
| Standby time | ≤ 300 ms | Type of connection | (See Selection Table) |
| Switching output, Q | Relay | Ambient temperature: operation | -40 ... +60 °C |
| Output function | Change-over contact (N.O./N.C.) | Ambient temperature: storage | -40 ... +75 °C |
| Switching frequency, f (ti/tp 1:1) | ≤ 25 Hz | Weight (clamping space device) | 120 g |
| | | Vibration and impact resistance | EN 60947-5-2 |

¹ Reference material: R10 reflector ² At range of 12 m ³ With closed clamping space ⁴ With connected IP 67 plug

| Operating range | Switching output | Type of connection | Part number | Article number |
|-----------------|------------------|--|----------------|----------------|
| 0.05 ... 12 m | Relay | Clamping space, 8 spring clamp terminals, cable gland, M16x1.5 | FR 88-R-RAT-PM | 823-11009 |



Connection, relay

Adjustment t_{off} , t_{POFF}

Adjustment t_{on}

Relay N.O.
Relay N.C.
Relay center contact

12...240 V AC/DC
12...240 V AC/DC

DIP-switch

ON OFF

1 Dark = OFF / Light = ON
2 DON = ON Delay
3 DOFF = OFF Delay
4 POFF = ONE Shot

155-00640

Time functions

Die Zeiten t_{ON} , t_{OFF} und t_{POFF} sind von 0.1 ... 10 s einstellbar.
Times t_{ON} , t_{OFF} and t_{POFF} are adjustable from 0.1 ... 10 s.
Les temps t_{ON} , t_{OFF} et t_{POFF} sont réglables de 0.1 ... 10 s.

155-00641

Accessories

| | |
|-------------------|---------------|
| Reflectors | From Page 654 |
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



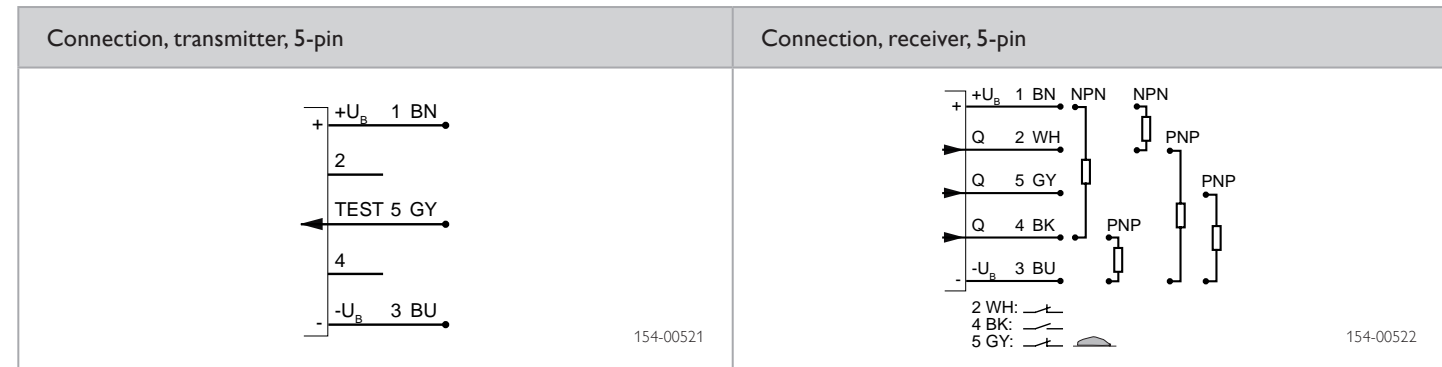
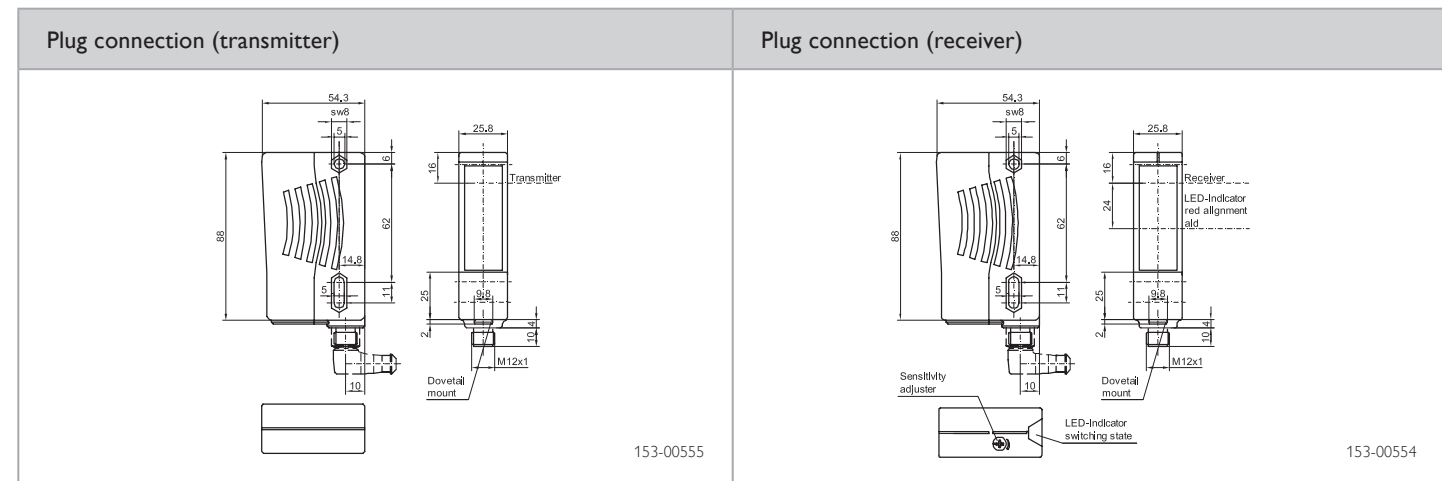
PRODUCT HIGHLIGHTS

- Antivalent switching output
- Simple alignment thanks to easily visible light spot
- Precise sensitivity adjustment by means of potentiometer
- Contamination output

| Optical data | | Functions | |
|--|--|-----------------------------------|----------------------------------|
| Operating range | 30 m | Indicator LED, yellow | Switching output indicator |
| Type of light | LED, red, 660 nm | Sensitivity adjustment (receiver) | Via potentiometer |
| Light spot size ¹ | Ø 600 mm | Default setting | Max. range |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30V DC ² | Dimensions | 88 x 54.3 x 25.8 mm ³ |
| No-load current, I ₀ (transmitter) | ≤ 50 mA | Enclosure rating | IP 67 ⁴ |
| No-load current, I ₀ (receiver) | ≤ 35 mA | Material, housing | ABS |
| Output current, I _e | ≤ 200 mA | Material, front screen | PMMA |
| Protective circuits | Reverse-polarity protection, U _B / short-circuit protection (Q) | Type of connection | (See Selection Table) |
| Protection Class | 2 | Ambient temperature: operation | -40 ... +60 °C |
| Standby time | ≤ 300 ms | Ambient temperature: storage | -40 ... +75 °C |
| Switching output, Q | PNP/NPN antivalent (see Selection Table) | Weight (plug device) ⁵ | 140 g |
| Output function | N.O./N.C. | Vibration and impact resistance | EN 60947-5-2 |
| Switching frequency, f (ti/tp 1:1) | ≤ 1000 Hz | | |
| Response time | 500 µs | | |
| Connection, BK | N.O. | | |
| Connection, WH | N.C. | | |
| Contamination output, Gy (receiver / optional) | N.C. | | |
| Control input, Test (transmitter) | +U _B = Test (transmitter off) ³ -U _B / Open = normal operation | | |

¹ At range of 30 m ² Max. 10 % ripple, within U_B ³ I_{max} < 3 mA at 30V DC ⁴ With connected IP 67 plug ⁵ Sensor pair

| Operating range | Switching output | Type of connection | Part number | Article number |
|-----------------|------------------|--------------------|----------------|----------------|
| 30 m | PNP | Plug, M12x1, 5-pin | FE 88-R-PAV-L5 | 822-21010 |
| 30 m | NPN | Plug, M12x1, 5-pin | FE 88-R-NAV-L5 | 822-21011 |
| 30 m | — | Plug, M12x1, 5-pin | FS 88-R-L5 | 822-11004 |



| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



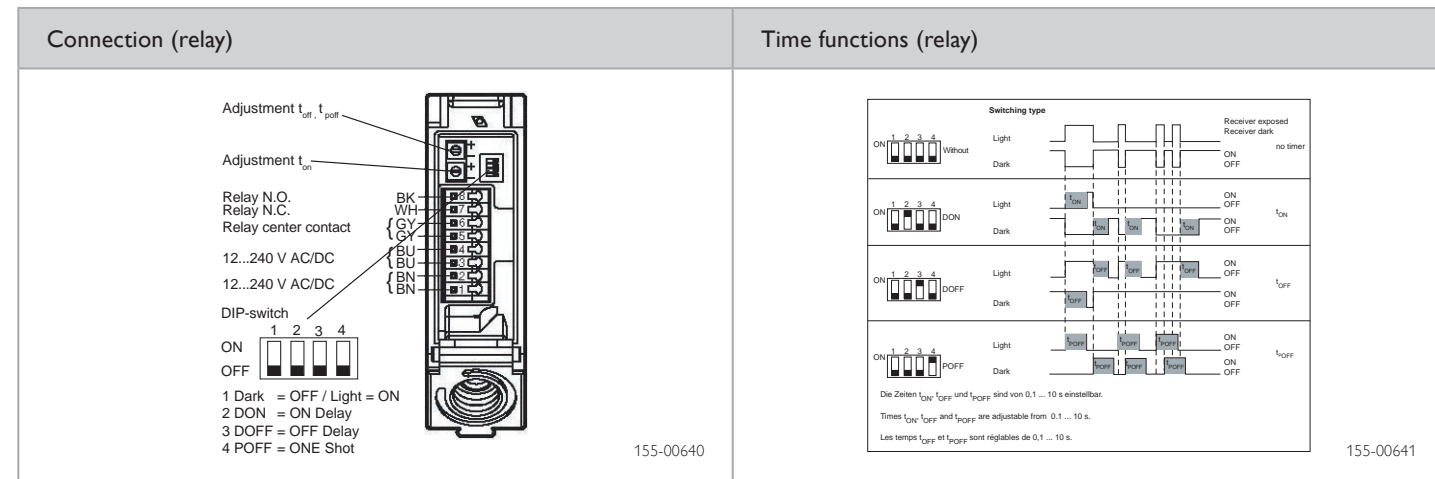
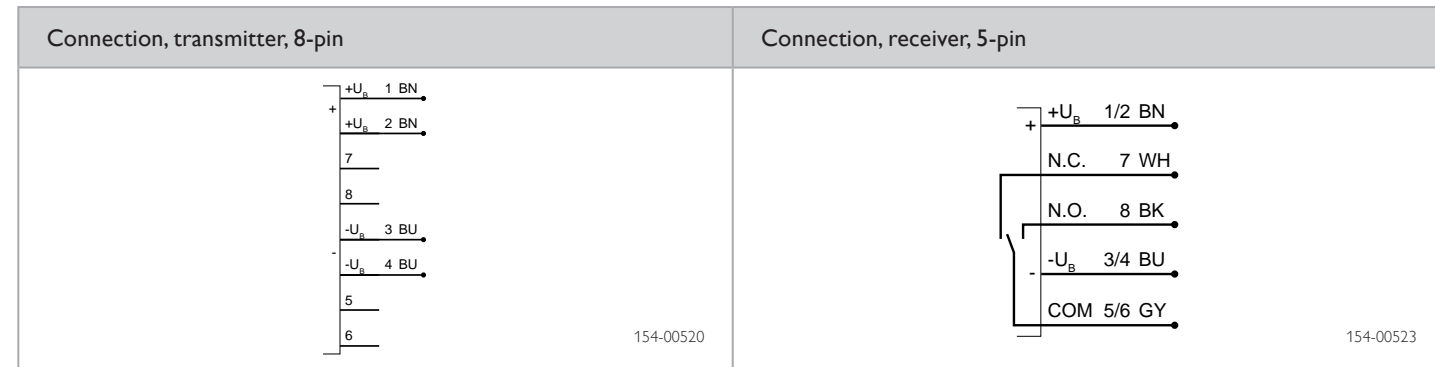
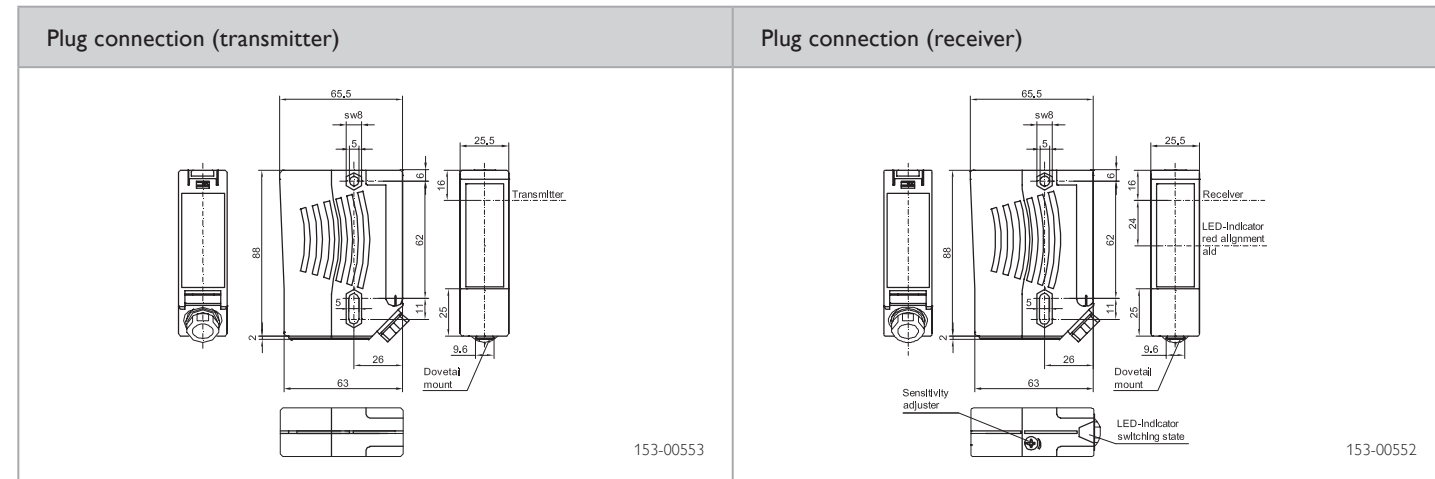
PRODUCT HIGHLIGHTS

- Long operating range of 65 m
- Simple alignment thanks to easily visible light spot
- Adjustable time function
- N.O./N.C. switchable

| Optical data | | Functions | |
|------------------------------------|-----------------------------------|---|---|
| Operating range | 65 m | Indicator LED, yellow | Switching output indicator |
| Type of light | LED, red, 660 nm | Sensitivity adjustment (receiver) | Via potentiometer |
| Light spot size ¹ | Ø 1.3 m | Adjustment possibilities | Time and output function (N.O./N.C.) via operating elements in clamping space |
| | | Default setting | Max. range |
| Electrical data | | Mechanical data | |
| Operating voltage, ~U _B | 12 ... 240 V AC / DC ² | Dimensions | 88 x 65.5 x 25.8 mm ³ |
| Power consumption | ≤ 3.5 VA | Enclosure rating | IP 67 ⁴ |
| Protection Class | 2 ³ | Material, housing | ABS |
| Standby time | ≤ 300 ms | Material, front screen | PMMA |
| Switching output, Q | Relay | Type of connection | (See Selection Table) |
| Output function | Change-over contact (N.O./N.C.) | Ambient temperature: operation | -40 ... +60 °C |
| Switching frequency, f (ti/tp 1:1) | ≤ 25 Hz | Ambient temperature: storage | -40 ... +75 °C |
| | | Weight (clamping space device) ⁵ | 200 g |
| | | Vibration and impact resistance | EN 60947-5-2 |

¹ At range of 65 m ² Max. 10 % ripple, within U_B ³ With closed clamping space ⁴ With connected IP 67 plug ⁵ Sensor pair

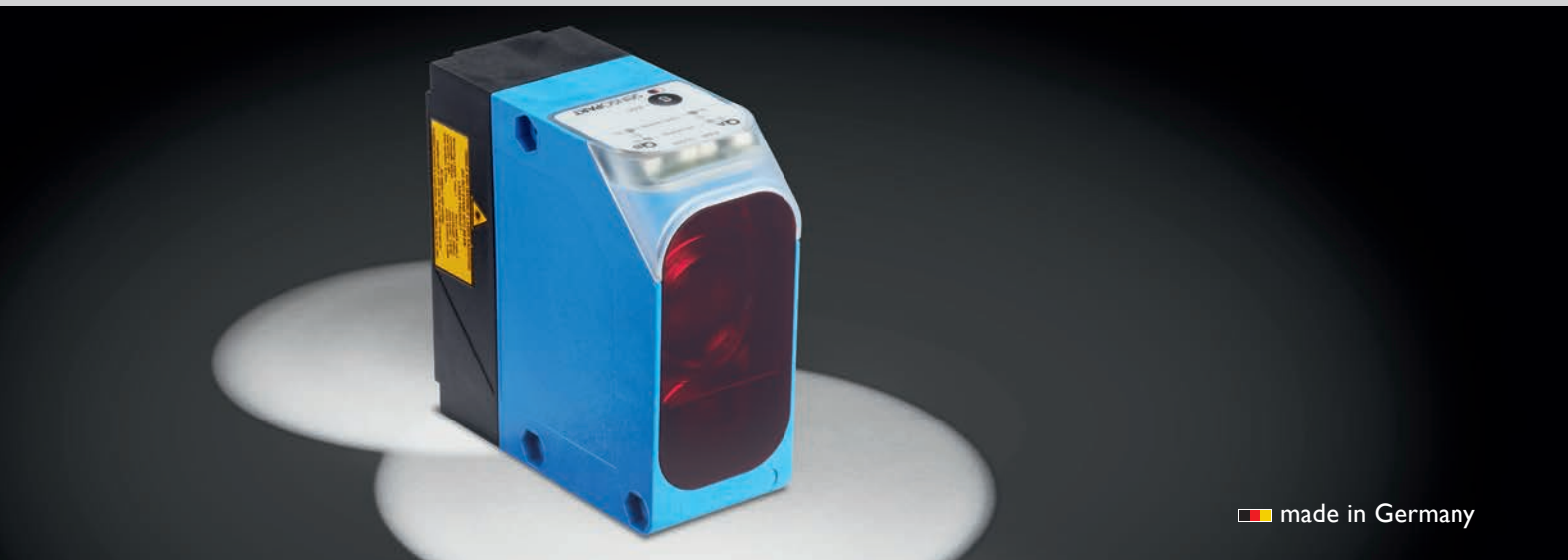
| Operating range | Switching output | Type of connection | Part number | Article number |
|-----------------|------------------|--|----------------|----------------|
| 65 m | Relay | Clamping space, 8 spring clamp terminals, cable gland, M16x1.5 | FE 88-R-RAT-PM | 822-21009 |
| 65 m | – | Clamping space, 8 spring clamp terminals, cable gland, M16x1.5 | FS 88-R-PM | 822-11003 |



| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |

FT 92 – proximity switch with long scanning distance

The far-sighted sensor with pulse time-of-flight measurement



TYPICAL FT 92



- Very long range
- Precise background suppression with time-of-flight technology
- User-friendly fine adjustment of sensor with pilot laser
- Rapid and easy adjustment via teach-in
- Safe operation thanks to Laser Class 1
- Robust housing/plug unit
- Well thought-out mounting accessories
- UL-certification

The FT 92 proximity switch has been specially designed for detection tasks with long distances to the process: the sensor, equipped with an infrared laser (Laser Class 1) reaches ranges of up to 6 m. Whereby its measurement principle of infrared pulse time-of-flight technology guarantees particularly precise background suppression, and thus reliable detection even against highly reflective or glossy backgrounds – as well as absolute immunity to ambient light.

Long distances not only require excellent optical performance, but also helpful functions for installation and commissioning. Thus a pilot laser that can be switched off simplifies fine adjustment of the sensor, and the wide variety of mounting options provides users with rapid and user-friendly installation.

The FT 92 is suitable for numerous applications in industrial automation, e.g. for small-part detection, for checking presence or for positioning tasks. The far-sighted sensor can therefore be found in many sectors: in the automotive industry and in mechanical engineering, in the wood-processing industry, in packaging machines or in the control of gates and doors. Its stable and robust design ensures smooth, trouble-free operation everywhere – as well as satisfied users!

F 92 – Product Overview

| | Type of light | Adjustment | Scanning distance / range | Special features | Page |
|---|--|--|---------------------------|------------------|------|
| Photoelectric proximity sensor with background suppression | | | | | |
| FT 92 IL | Infrared  | Teach-in  | 6 m | Long range | 348 |

Infrared photoelectric proximity sensor with background suppression



PRODUCT HIGHLIGHTS

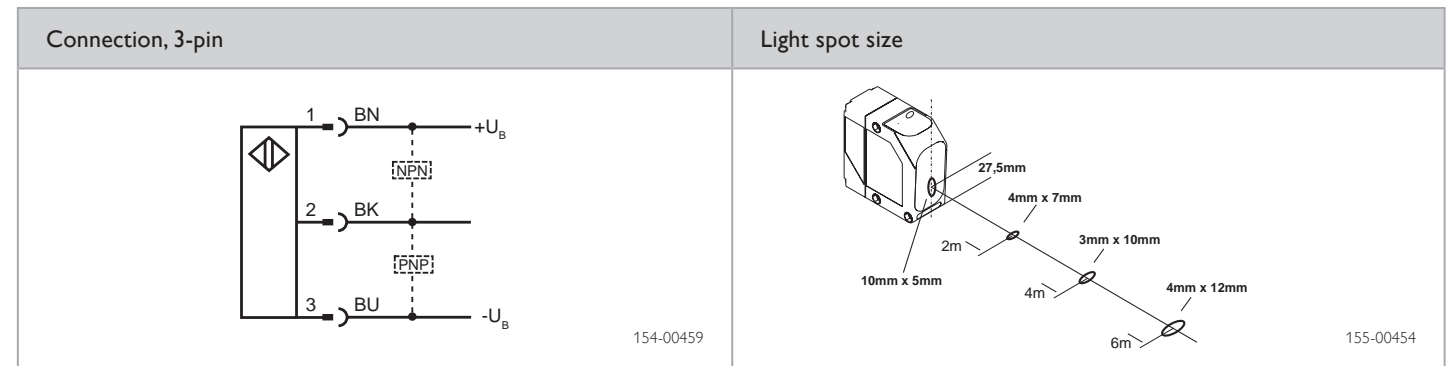
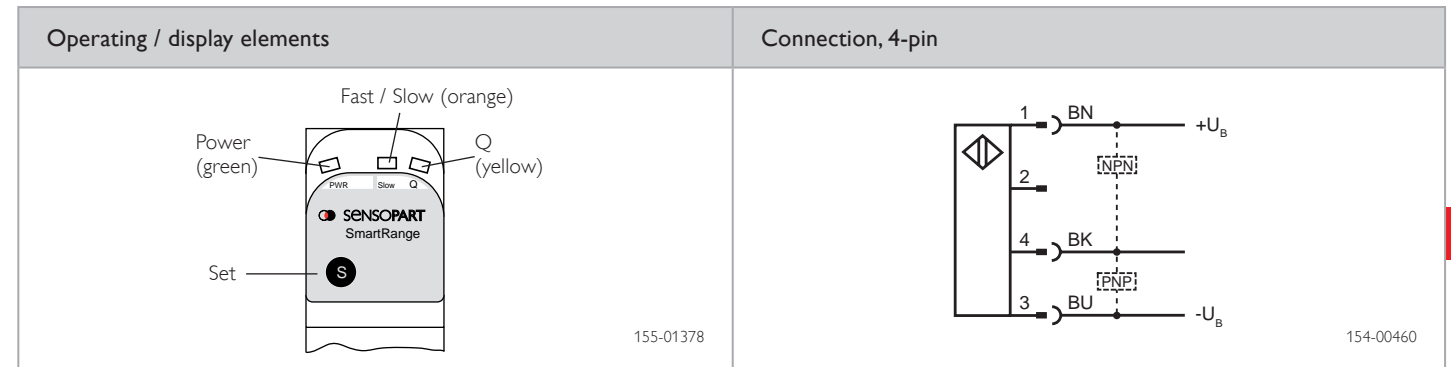
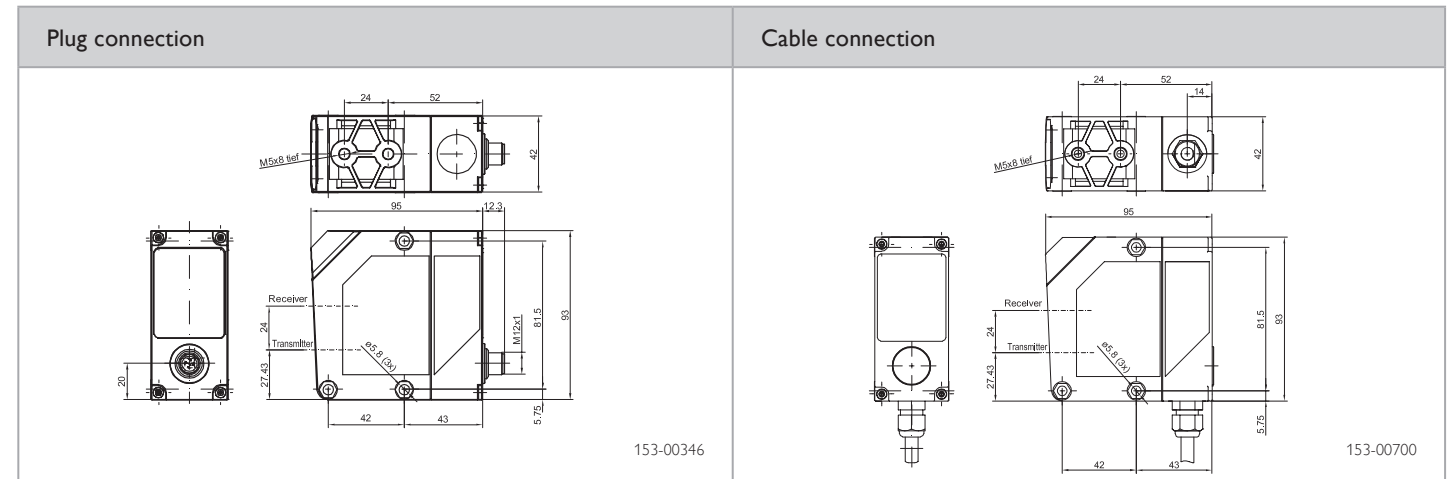
- Long range of 6 m
- Precise background suppression through time-of-flight technology
- Reliable operation even with highly reflective and glossy backgrounds
- Simple alignment via integrated pilot laser

| Optical data | | Functions | |
|--|--|---------------------------------|--|
| Scanning distance | 0.2 ... 6 m ¹ | Indicator LED, green | Operating voltage indicator |
| Type of light, measurement laser | Infrared, 905 nm | Indicator LED, yellow | Switching output indicator |
| Laser Class, measurement laser (DIN EN 60825-1:2008-5) | 1 | Indicator LED, orange | Operating mode indicator (Fast / Slow) |
| Type of light, pilot laser | Laser, red, 650 nm | Scanning distance adjustment | Via Teach-in button |
| Laser Class, pilot laser (DIN EN 60825-1:2008-5) | 2 | Adjustment possibilities | Switching point set via Teach-in button |
| Repeatability, Fast / Slow | ≤ ± 15 mm / 10 mm | Default settings | Switching window set via Teach-in button |
| | | | Slow / Fast mode via Teach-in button |
| | | | N.O./N.C. via Teach-in button |
| | | | Pilot laser via Teach-in button |
| | | | Sn = 5.8 m and N.O. |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 18 ... 30 V DC ² | Dimensions | 95 x 93 x 42 mm ³ |
| No-load current, I ₀ | ≤ 125 mA | Enclosure rating | IP 67 ³ |
| Output current, I _e | 100 mA | Material, housing | ABS |
| Voltage drop, U _D | ≤ 2.4 V | Material, front screen | PMMA |
| Protective circuits | Reverse-polarity protection, U _B / short-circuit protection (Q) | Type of connection | (See Selection Table) |
| Protection Class | 2 | Ambient temperature: operation | -20 ... +50 °C |
| Standby time | < 300 ms | Ambient temperature: storage | -40 ... +80 °C |
| Switching output, Q | PNP/NPN (see Selection Table) | Weight (plug device) | 200 g |
| Output function | N.O./N.C. | Weight (cable device) | 270 g |
| Response time, Fast / Slow | 13 / 80 ms | Vibration and impact resistance | EN 60947-5-2 |

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

| Scanning distance | Switching output | Type of connection | Part number | Article number |
|-------------------|------------------|---|-----------------|----------------|
| 0.2 ... 6 m | PNP | Plug, M12x1, 4-pin | FT 92 IL-PSL4 | 591-91007 |
| 0.2 ... 6 m | NPN | Plug, M12x1, 4-pin | FT 92 IL-NSL4 | 591-91009 |
| 0.2 ... 6 m | PNP | Cable, 3 m, 3-wire | FT 92 IL-PSK3 | 591-91011 |
| 0.2 ... 6 m | NPN | Cable, 3 m, 3-wire | FT 92 IL-NSK3 | 591-91010 |
| 0.2 ... 6 m | PNP | Pigtail, 300 mm, with M12x1 plug, 4-pin | FT 92 IL-PS-KL4 | 591-91012 |

| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



| Smallest detectable part | Reference material | Detection range |
|--------------------------|--|---|
| | White (90 %) Grey (18 %) Black (6 %) | 0.2 ... 6 m 0.2 ... 6 m 0.2 ... 2.5 m |
| 155-00207 | | |

F 04/05/12/18/30 – photoelectric sensors and proximity sensors in cylindrical housings

All-round performance








TYPICAL F 04/05/12/18/30

Sensors in cylindrical housings have several special aspects compared to those with cubic housings. They are not only particularly robust but also, thanks to their integrated thread, offer easy and space-saving installation. Special designs that can “see around corners” are also available: they are equipped with a special optical system that deflects the transmission and reception beams around the sensor axis by 90°, expanding the mounting options available.

The sensors of the F 04/05/12/18/30 series differ in the diameter of the integrated metal threaded sleeve (4, 5, 12, 18 or 30 mm). Each series offers the usual functional variants: through-beam and retroreflective photoelectric sensors, energetic scanners, and scanners with background suppression. The sensors are optionally available with red-light or infrared LED or with pulsed red-light laser. Variants with potentiometer or teach-in operation are also available.

- Robust housings
- Very easy installation
- Straight or angled optics options
- Metric threads in 5 sizes: 4, 5, 12, 18 or 30 mm
- Red-light / infrared LED or laser light options
- FMF 18 for detection of liquid limit levels

| F 04/05/12/18/30 – Product Overview | | | | | |
|--|---|--|---------------------------|--|------|
| | Type of light | Adjustment | Scanning distance / range | Special features | Page |
| Photoelectric proximity sensors with background suppression | | | | | |
| FT 12 RH | Red light | Teach-in  | 10 ... 60 mm | M12 housing, dynamic teach-in | 352 |
| FMH 18 | Red light | Potentiometer | 40 ... 120 mm | M18 housing, very precise detection | 354 |
| FT 12 RF | Red light | None | 24 mm | M12 housing | 356 |
| Photoelectric proximity sensors | | | | | |
| FM 04 | Infrared | None | 0 ... 50 mm | Very small housing, M4 | 358 |
| FM 05 | Infrared | None | 0 ... 50 mm | Very small housing, M5 | 360 |
| FT 12 R | Red light | Potentiometer | 1 ... 300 mm | | 362 |
| FT 18-2 | Red light / infrared light | Potentiometer | 0 ... 800 mm | M18 metal housing | 364 |
| FT 18-2 | Red light / infrared light | Potentiometer | 0 ... 800 mm | M18 plastic housing | 366 |
| FMS 18-34 B | Infrared | Potentiometer | 5 ... 400 mm | M18 housing | 368 |
| FMS 30-34 B | Infrared | Potentiometer | 5 ... 1000 mm | M30 housing, long operating range | 370 |
| Retroreflective photoelectric sensors | | | | | |
| FR 12 R | Red light | Potentiometer | 60 ... 1500 mm | M12 housing | 372 |
| FR 18-2 | Red light | Potentiometer | 3.0 mm | M18 metal housing | 374 |
| FR 18-2 | Infrared light | Potentiometer | 3.6 mm | M18 plastic housing | 376 |
| Through-beam photoelectric sensors | | | | | |
| FS/FE 12 RL | Laser  | Control line | 0 ... 5 mm | M12 housing | 378 |
| FSE 18-2 | Infrared light | | 10 mm | M18 housing | 380 |
| FS/FE 18 RL | Laser  | Control line | 0 ... 50 mm | M18 housing | 382 |
| FL 18 W | Laser  | Potentiometer | 0 ... 50 mm | M18 housing, adjustable transmission beam size | 384 |
| FL 18 | Laser  | Potentiometer | 0 ... 50 mm | M18 housing, adjustable transmission beam size | 386 |
| Filling level sensor | | | | | |
| FMF 18-34 | Infrared | Fixed | | M18 housing, detection of liquids | 388 |



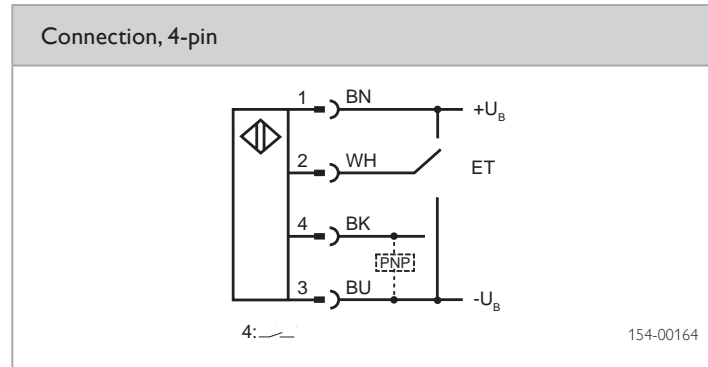
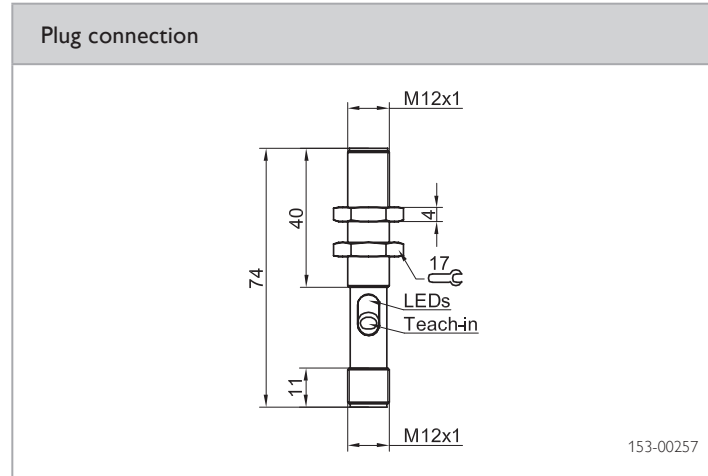
PRODUCT HIGHLIGHTS

- Adjustable background suppression
- Dynamic teach-in via button / control line without machine stoppage
- Lockable Teach-in button

| Optical data | | Functions | |
|---|--|--------------------------------|---------------------------------------|
| Scanning distance | 10 ... 60 mm ¹ | Indicator LED, green | Stability indicator |
| Type of light | Red, 660 nm | Indicator LED, yellow | Switching state indicator |
| Light spot size | 5 x 5 mm ² | Scanning distance adjustment | Via Teach-in button and control input |
| Grey value shift (90 % white / 18 % grey) | < 6 % | Adjustment possibilities | Control line for setting or locking |
| | | Default settings | N.O./N.C. selectable |
| | | | Max. scanning distance, PNP and N.O. |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30 V DC | Dimensions (cable devices) | M12 x 74 mm |
| No-load current, I ₀ | ≤ 25 mA | Enclosure rating | IP 67 ³ |
| Output current, I _e | ≤ 100 mA | Material, housing | Brass, nickel-plated |
| Protective circuits | Reverse-polarity protection, U _B / short-circuit protection | Material, front screen | PMMA |
| Protection Class | 2 | Type of connection | (See Selection Table) |
| Switching output, Q | PNP | Ambient temperature: operation | -20 ... +60 °C |
| Output function | N.O./N.C. | Ambient temperature: storage | -20 ... +80 °C |
| Switching frequency, f (ti/tp 1:1) | 1000 Hz | Weight (plug device) | 30 g |
| Response time | ≤ 500 μs | | |
| Control input, ET | +U _B = teach-in -U _B = button locked Open = normal operation | | |

¹ Reference material: Kodak white, 90 % reflectivity ² At scanning distance of 50 mm ³ With connected IP 67 plug

| Type of connection | Part number | Article number |
|--------------------|---------------|----------------|
| Plug, M12x1, 4-pin | FT 12 RH-PSL4 | 506-11000 |



Accessories

| | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



PRODUCT HIGHLIGHTS

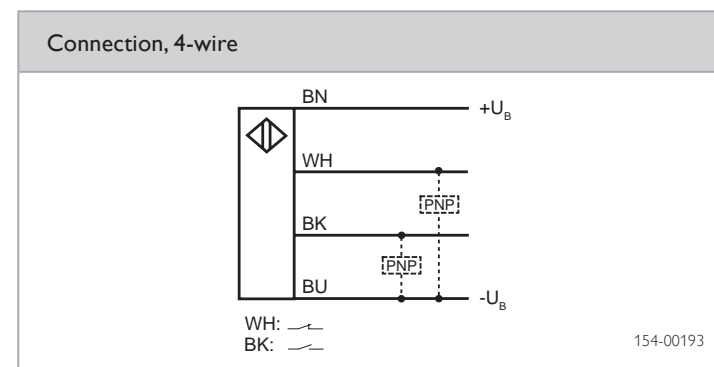
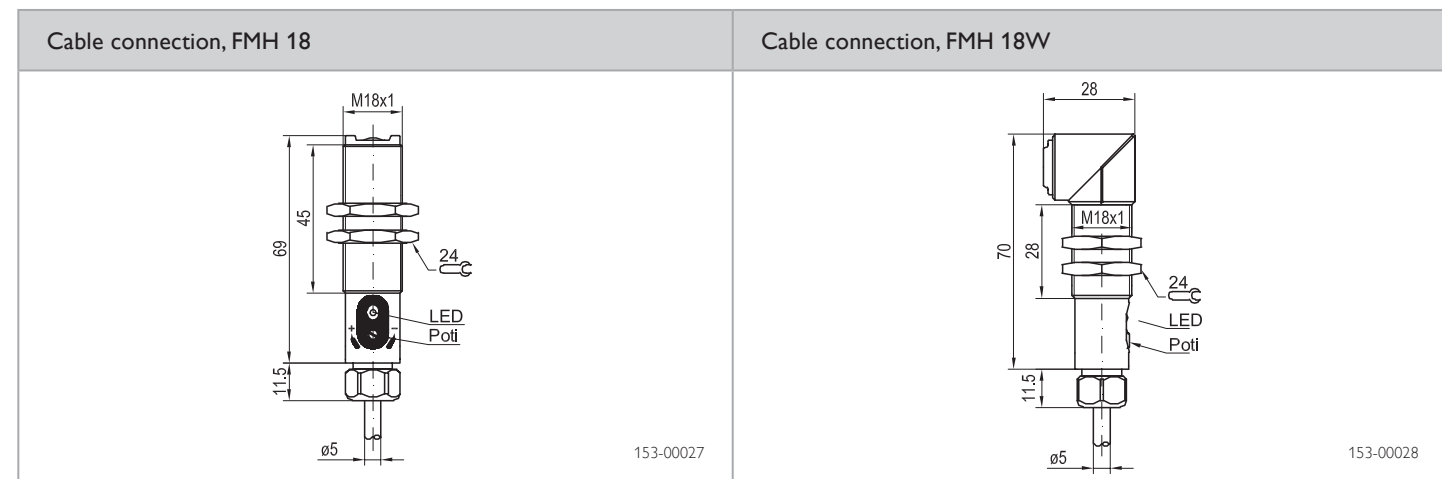
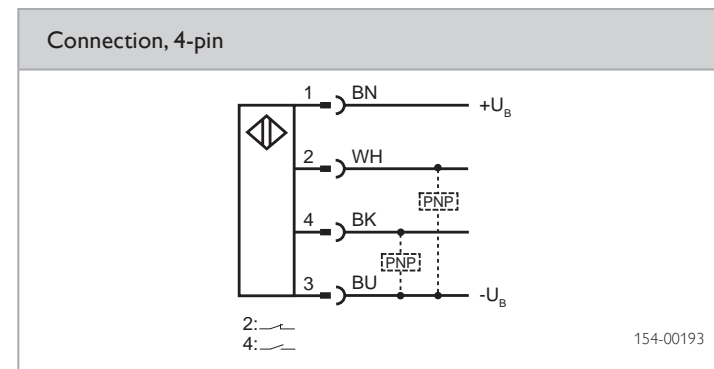
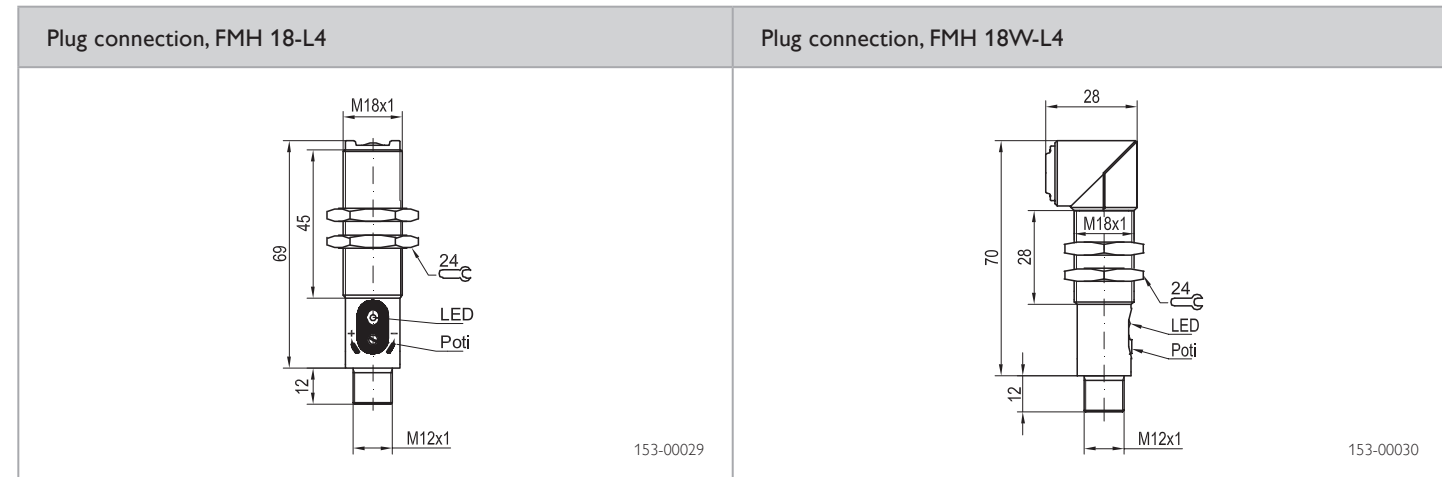
- Scanning distance: 40 ... 120 mm
- Red light, 660 nm
- Background suppression
- Robust metal housing
- Metal M18 threaded sleeve
- Antivalent switching outputs

| Optical data | | Functions | |
|------------------------------------|--|--------------------------------|---------------------------|
| Scanning distance | 40 ... 120 mm ¹ | Indicator LED, yellow | Switching state indicator |
| Type of light | Red, 660 nm | Scanning distance adjustment | Via 18-step potentiometer |
| Light spot size | 8 x 10 mm ² | | |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30 V DC ³ | Dimensions | M18 x 69 mm |
| No-load current, I ₀ | ≤ 30 mA | Dimensions (angled) | M18 x 70 mm |
| Output current, I _e | 200 mA | Enclosure rating | IP 67 ⁴ |
| Protective circuits | Reverse-polarity protection, U _B / short-circuit protection | Material, housing | Brass, nickel-plated |
| Protection Class | 2 | Material, front screen | Glass |
| Standby time | ≤ 300 ms | Type of connection | (See Selection Table) |
| Switching output, Q | PNP | Ambient temperature: operation | -20 ... +60 °C |
| Output function | N.O./N.C. | Ambient temperature: storage | -20 ... +80 °C |
| Switching frequency, f (ti/tp 1:1) | 600 Hz | Weight (plug device) | 60 g |
| Connection, BK | N.O. | Weight (cable device) | 160 g |
| Connection, WH | N.C. | | |

¹ Reference material: Kodak grey, 18 % reflectivity ² At scanning distance of 100 mm ³ 10 % ripple, within U_B ⁴ With connected IP 67 plug

| Scanning distance | Light exit | Switching output | Type of connection | Part number | Article number |
|-------------------|------------|------------------|--------------------|-------------|----------------|
| 40 ... 120 mm | Straight | PNP, antivalent | Plug, M12, 4-pin | FMH 18-L4 | 518-51505 |
| 40 ... 120 mm | 90° angle | PNP, antivalent | Plug, M12, 4-pin | FMH 18W-L4 | 518-51507 |
| 40 ... 120 mm | Straight | PNP, antivalent | Cable, 3 m, 4-wire | FMH 18 | 518-51504 |
| 40 ... 120 mm | 90° angle | PNP, antivalent | Cable, 3 m, 4-wire | FMH 18W | 518-51506 |

| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



Fixed focus photoelectric proximity sensor with background suppression



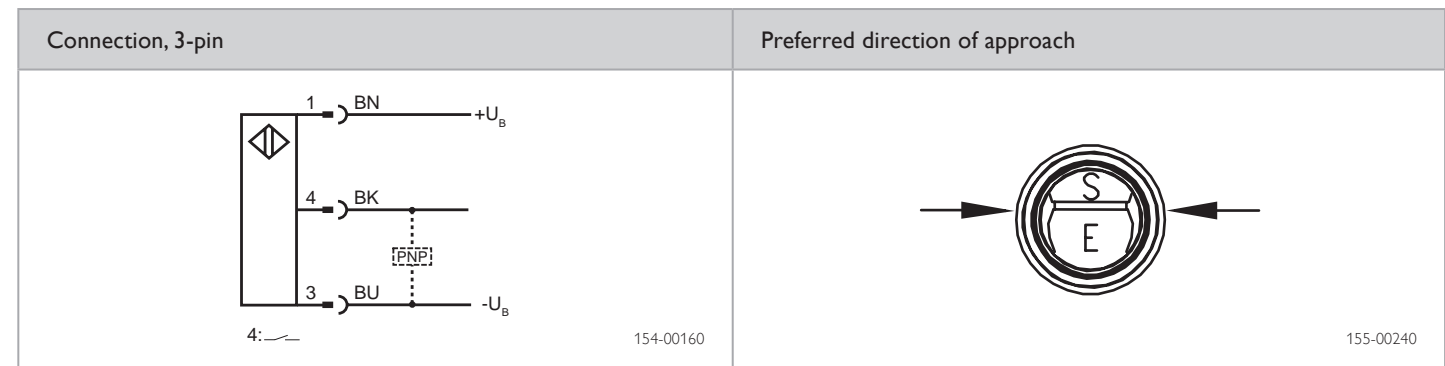
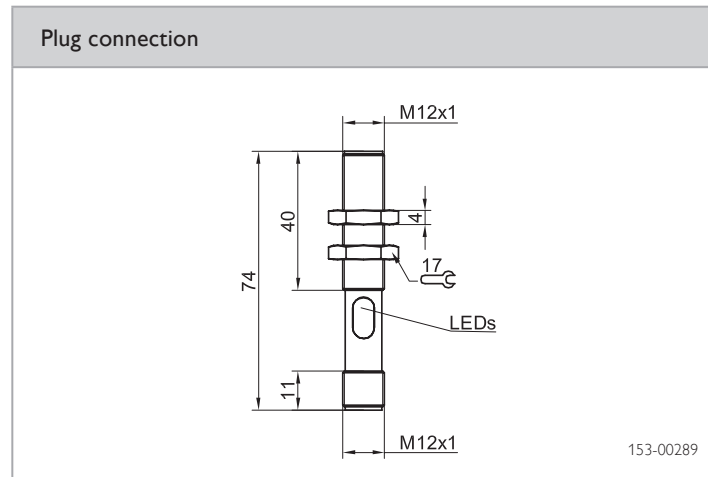
PRODUCT HIGHLIGHTS

- Simple installation thanks to standard M12 metal thread
- High immunity to dirt due to high signal reserves
- Indicator for detection stability

| Optical data | | Functions | |
|---|--|--------------------------------|-----------------------------|
| Scanning distance | 24 mm ¹ | Indicator LED, green | Operating voltage indicator |
| Type of light | Red, 660 nm | Indicator LED, yellow | Switching state indicator |
| Hysteresis (18 %) | < 5 % | Scanning distance adjustment | Fixed setting |
| Grey value shift (90 % white / 18 % grey) | < 5 % | Default settings | PNP N.O. |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30V DC | Dimensions | M12 x 74 mm |
| No-load current, I ₀ | ≤ 25 mA | Enclosure rating | IP 67 ² |
| Output current, I _e | ≤ 100 mA | Material, housing | Brass, nickel-plated |
| Protective circuits | Reverse-polarity protection, U _B / short-circuit protection | Material, front screen | PMMA |
| Protection Class | 2 | Type of connection | (See Selection Table) |
| Switching output, Q | PNP | Ambient temperature: operation | -20 ... +60 °C |
| Output function | N.O. | Ambient temperature: storage | -20 ... +80 °C |
| Switching frequency, f (ti/tp 1:1) | 1000 Hz | Weight (plug device) | 30 g |
| Response time | ≤ 500 μs | | |

¹ Reference material: Kodak white, 90 % reflectivity ² With connected IP 67 plug

| Type of connection | Part number | Article number |
|--------------------|---------------|----------------|
| Plug, M12x1, 4-pin | FT 12 RF-PSL4 | 506-11004 |



Accessories

| | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



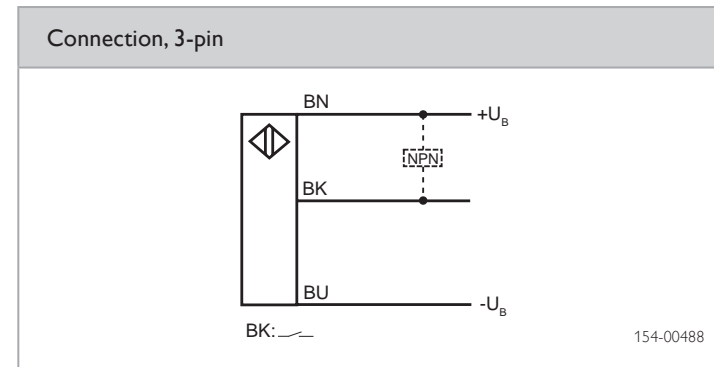
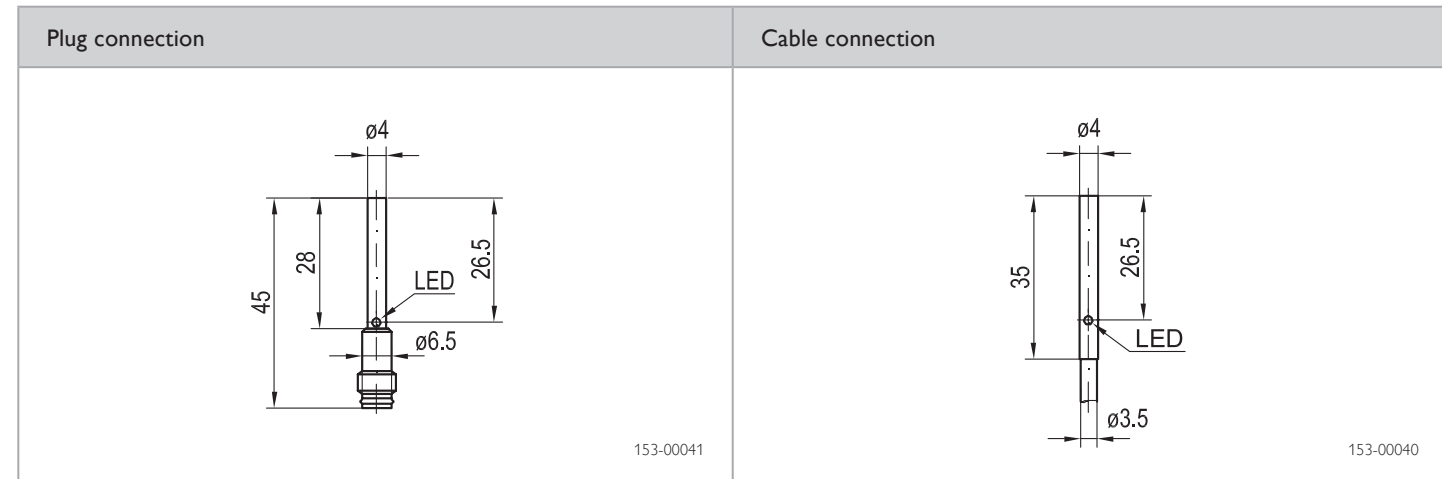
PRODUCT HIGHLIGHTS

- Very small housing diameter: 4 mm
- Long switching distance of 50 mm
- Glass optics for easy cleaning
- Fully sealed under vacuum, enclosure rating of IP 67

| Optical data | | Functions | |
|------------------------------------|--|---------------------------------|---------------------------|
| Scanning distance | 0 ... 50 mm ¹ | Indicator LED, yellow | Switching state indicator |
| Type of light | Infrared, 880 nm | | |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30 V DC | Dimensions (plug device) | Ø 4 x 45 mm |
| No-load current, I ₀ | ≤ 15 mA | Dimensions (cable device) | Ø 4 x 35 mm |
| Output current, I _e | ≤ 100 mA | Enclosure rating | IP 67 ² |
| Protective circuits | Reverse-polarity protection, U _B / short-circuit protection | Material, housing | Stainless steel, V2A |
| Standby time | 120 msec | Material, front screen | Glass |
| Switching output, Q | PNP/NPN / max. 100 mA | Type of connection | (See Selection Table) |
| Output function | N.O. | Ambient temperature: operation | 0 ... +55 °C |
| Switching frequency, f (ti/tp 1:1) | ≤ 250 Hz | Vibration and impact resistance | IEC 60947-5-2 |
| Response time | ≤ 2.5 ms | | |

¹ Reference material: Kodak white, 90 % reflectivity ² With connected IP 67 plug

| Switching output | Type of connection | Part number | Article number |
|------------------|--------------------------------------|-------------|----------------|
| PNP | Plug, M8, 3-pin | FM 04-163 | 718-51400 |
| NPN | Plug, M8, 3-pin | FM 04-153 | 718-51401 |
| PNP | Cable, PVC, 3 x 0.14 mm ² | FM 04-161 | 718-51398 |
| NPN | Cable, PVC, 3 x 0.14 mm ² | FM 04-151 | 718-51399 |



Accessories

| | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



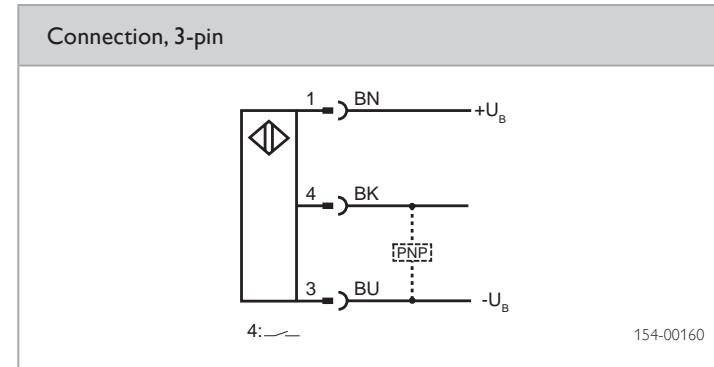
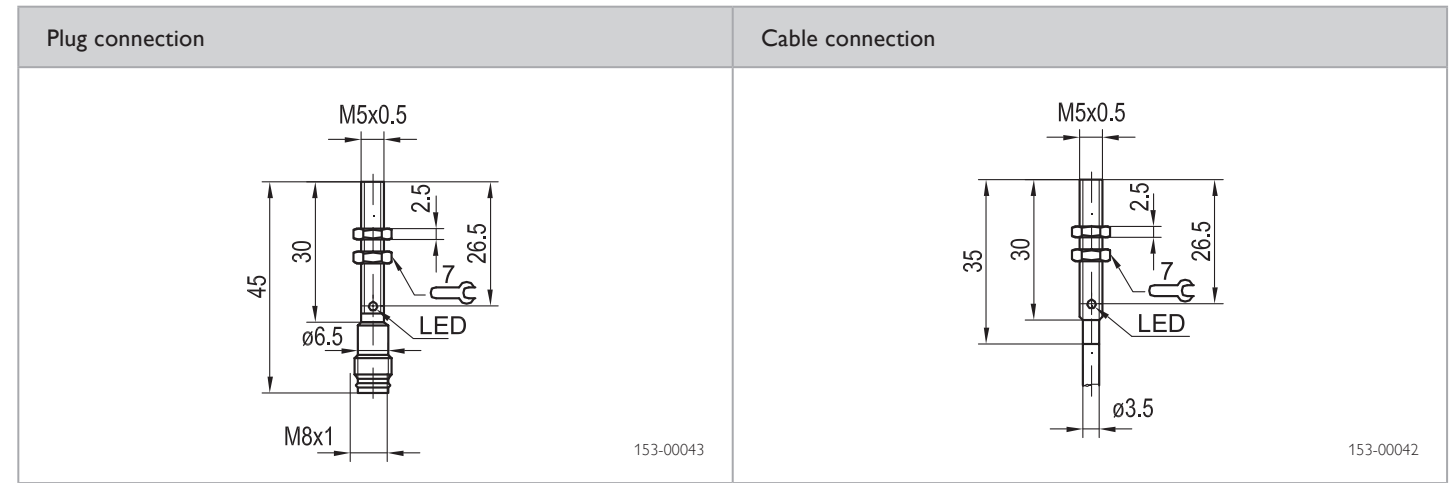
PRODUCT HIGHLIGHTS

- Very small housing: cylindrical, M5
- Simple installation due to standard thread
- Glass optics for easy cleaning
- Fully sealed under vacuum, enclosure rating of IP 67

| Optical data | | Functions | |
|------------------------------------|--|---------------------------------|---------------------------|
| Scanning distance | 0 ... 50 mm ¹ | Indicator LED, yellow | Switching state indicator |
| Type of light | Infrared, 880 nm | | |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30 V DC | Dimensions (cable device) | M5 x 45 mm |
| No-load current, I ₀ | ≤ 15 mA | Dimensions (plug device) | M5 x 35 mm |
| Output current, I _e | ≤ 100 mA | Enclosure rating | IP 67 ² |
| Protective circuits | Reverse-polarity protection, U _B / short-circuit protection | Material, housing | Stainless steel, V2A |
| Standby time | 120 ms | Material, front screen | Glass |
| Switching output, Q | PNP/NPN / max. 100 mA | Type of connection | (See Selection Table) |
| Output function | N.O. | Ambient temperature: operation | 0 ... +55 °C |
| Switching frequency, f (ti/tp 1:1) | ≤ 250 Hz | Vibration and impact resistance | IEC 60947-5-2 |
| Response time | ≤ 2.5 ms | | |

¹ Reference material: Kodak white, 90 % reflectivity ² With connected IP 67 plug

| Switching output | Type of connection | Part number | Article number |
|------------------|--------------------------------------|-------------|----------------|
| PNP | Plug, M8, 3-pin | FM 05-163 | 718-51404 |
| NPN | Plug, M8, 3-pin | FM 05-153 | 718-51405 |
| PNP | Cable, PVC, 3 x 0.14 mm ² | FM 05-161 | 718-51402 |
| NPN | Cable, PVC, 3 x 0.14 mm ² | FM 05-151 | 718-51403 |



| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



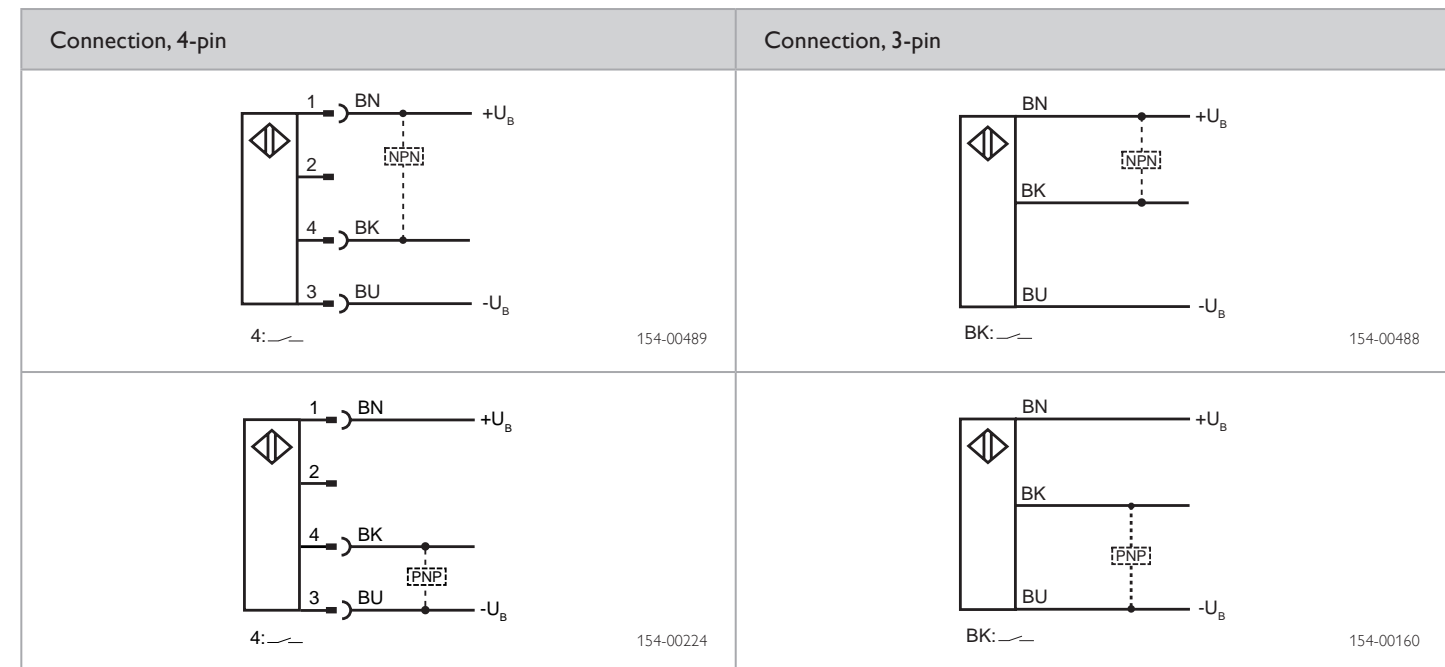
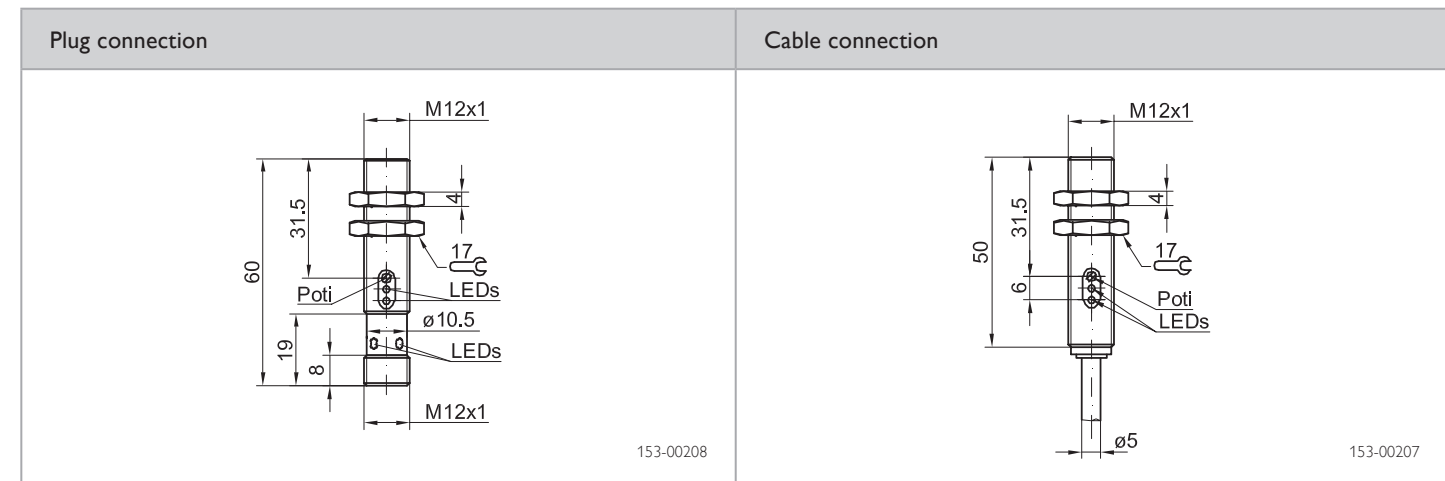
PRODUCT HIGHLIGHTS

- Scanning distance: 1 ... 300 mm, adjustable
- Red light, 660 nm
- Easy installation thanks to standard M12 metal thread
- Functional reserve indicator
- N.O./N.C. switchable

| Optical data | | Functions | |
|------------------------------------|--|---------------------------------|------------------------------|
| Scanning distance | 1 ... 300 mm ¹ | Indicator LED, green | Functional reserve indicator |
| Type of light | Red, 660 nm | Indicator LED, yellow | Switching state indicator |
| Light spot size | Ø 5 mm ² | Scanning distance adjustment | Via potentiometer |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 36 V DC | Dimensions (plug device) | M12 x 60 mm |
| No-load current, I ₀ | ≤ 15 mA | Dimensions (cable device) | M12 x 50 mm |
| Output current, I _e | ≤ 200 mA | Enclosure rating | IP 67 ³ |
| Protective circuits | Reverse-polarity protection, U _B / short-circuit protection | Material, housing | Brass, chromium-plated |
| Protection Class | 2 | Material, front screen | Glass |
| Standby time | 60 msec | Type of connection | (See Selection Table) |
| Switching output, Q | PNP/NPN / max. 200 mA | Ambient temperature: operation | -25 ... +55 °C |
| Output function | N.O. | Weight (plug device) | 20 g |
| Switching frequency, f (ti/tp 1:1) | ≤ 1000 Hz | Weight (cable device) | 100 g |
| Response time | ≤ 500 µs | Vibration and impact resistance | IEC 60947-5-2 |

¹ Reference material: Kodak white, 90 % reflectivity ² At scanning distance of 10 mm ³ With connected IP 67 plug

| Switching output | Type of connection | Part number | Article number |
|------------------|--|--------------|----------------|
| PNP | Plug, M12, 4-pin | FT 12 R-PSL4 | 701-21000 |
| NPN | Plug, M12, 4-pin | FT 12 R-NSL4 | 701-21001 |
| PNP | Cable, PVC, 3 x 0.34 mm ² , 2 m | FT 12 R-PSK3 | 701-21002 |
| NPN | Cable, PVC, 3 x 0.34 mm ² , 2 m | FT 12 R-NSK3 | 701-21003 |



| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



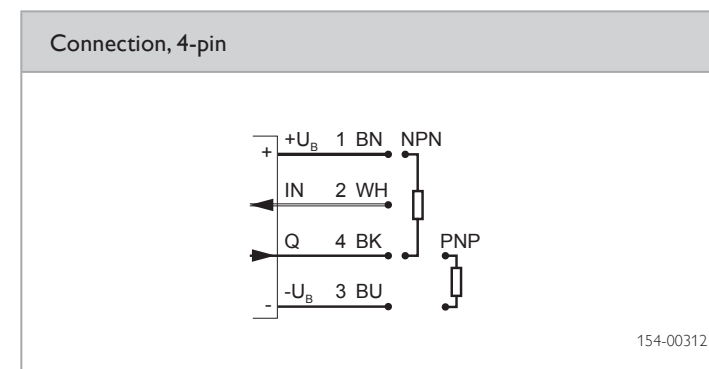
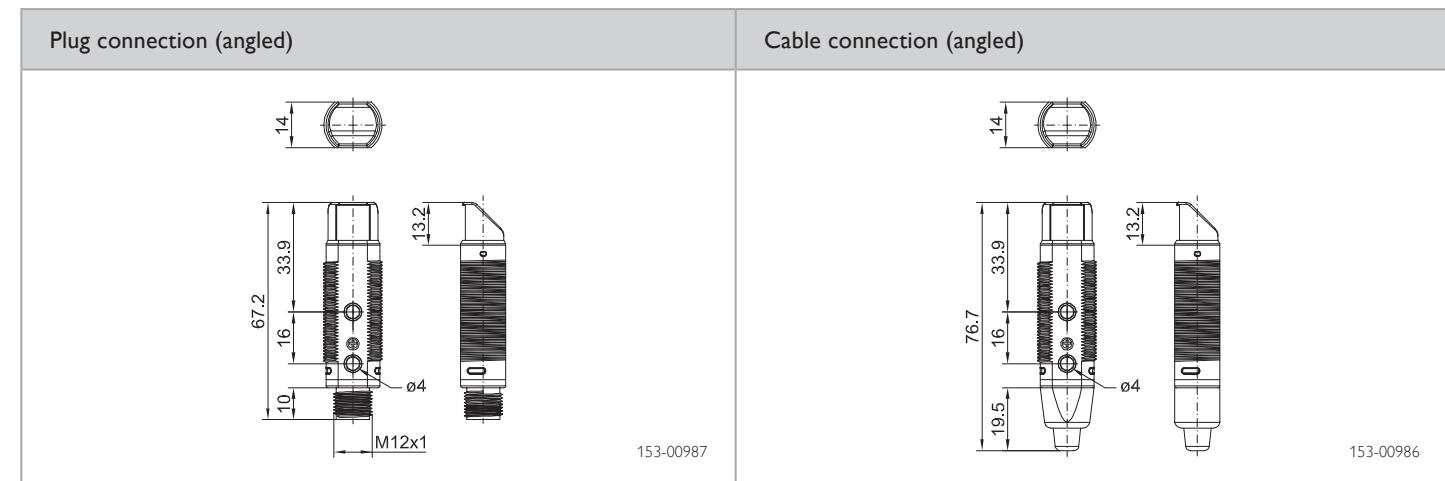
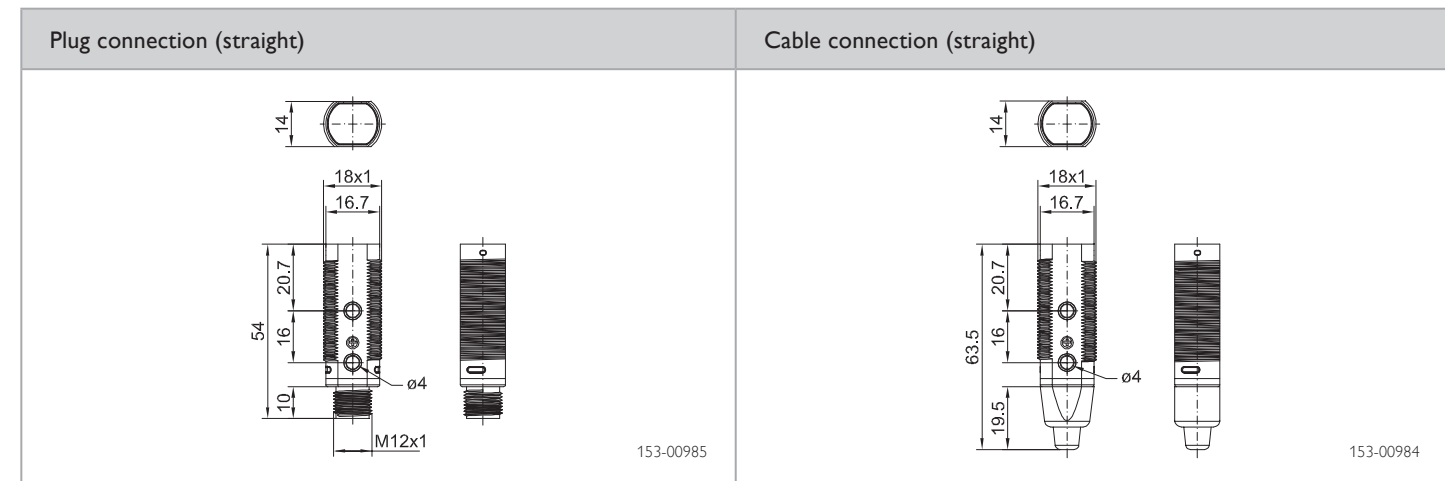
PRODUCT HIGHLIGHTS

- Economical solution for numerous applications
- Scanning distance of up to 800 mm, adjustable via potentiometer
- Red light or infrared
- Variants with angled light exit
- Robust metal housings (IP 67)
- Simple adjustment via potentiometer
- 2 through holes as additional mounting possibility

| Optical data | | Functions | |
|------------------------------------|--|--------------------------------|---------------------------------------|
| Scanning distance | (See Selection Table) | Indicator LED, green | Operating voltage indicator |
| Type of light | (See Selection Table) | Indicator LED, yellow | Switching output indicator |
| | | Sensitivity adjustment | Via potentiometer |
| | | Adjustment possibilities | N.O./N.C. via control input (IN) |
| | | Default settings | Max. scanning distance and N.O. |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30V DC | Dimensions | M18 x 44 mm |
| No-load current, I ₀ | ≤ 30 mA | Enclosure rating | IP 67 ¹ |
| Output current, I _e | ≤ 100 mA | Material, housing | Metal |
| Protective circuits | Reverse-polarity protection, U _B / short-circuit protection | Material, front screen | PMMA |
| Switching output, Q | PNP/NPN (see Selection Table) | Type of connection | (See Selection Table) |
| Output function | -U _B = N.O. / +U _B = N.C. | Ambient temperature: operation | -25 ... +55 °C |
| Switching frequency, f (ti/tp 1:1) | ≤ 1000 Hz | Weight (plug device) | 23 g ² / 25 g ³ |
| Response time | ≤ 1 ms | Weight (cable device) | 63 g ² / 65 g ³ |

¹With connected IP 67 plug ²Straight light exit variant ³Angled light exit variant

| Scanning distance | Type of light | Light exit | Switching output | Type of connection | Part number | Article number |
|-------------------|---------------|------------|------------------|------------------------|-------------------|----------------|
| 0 ... 400 mm | Red light | Straight | PNP | Metal plug, M12, 4-pin | FT 18-2 RM-PS-L4 | 740-21021 |
| 0 ... 400 mm | Red light | Straight | NPN | Metal plug, M12, 4-pin | FT 18-2 RM-NS-L4 | 740-21022 |
| 0 ... 400 mm | Red light | Straight | PNP | Cable, 2 m, 4-wire | FT 18-2 RM-PS-K4 | 740-21023 |
| 0 ... 400 mm | Red light | Straight | NPN | Cable, 2 m, 4-wire | FT 18-2 RM-NS-K4 | 740-21024 |
| 0 ... 320 mm | Red light | 90° angle | PNP | Metal plug, M12, 4-pin | FT 18-2 RWM-PS-L4 | 740-21025 |
| 0 ... 320 mm | Red light | 90° angle | NPN | Metal plug, M12, 4-pin | FT 18-2 RWM-NS-L4 | 740-21026 |
| 0 ... 320 mm | Red light | 90° angle | PNP | Cable, 2 m, 4-wire | FT 18-2 RWM-PS-K4 | 740-21027 |
| 0 ... 320 mm | Red light | 90° angle | NPN | Cable, 2 m, 4-wire | FT 18-2 RWM-NS-K4 | 740-21028 |
| 0 ... 800 mm | Infrared | Straight | PNP | Metal plug, M12, 4-pin | FT 18-2 IDM-PS-L4 | 740-21029 |
| 0 ... 800 mm | Infrared | Straight | NPN | Metal plug, M12, 4-pin | FT 18-2 IDM-NS-L4 | 740-21030 |
| 0 ... 800 mm | Infrared | Straight | PNP | Cable, 2 m, 4-wire | FT 18-2 IDM-PS-K4 | 740-21031 |
| 0 ... 800 mm | Infrared | Straight | NPN | Cable, 2 m, 4-wire | FT 18-2 IDM-NS-K4 | 740-21032 |



| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



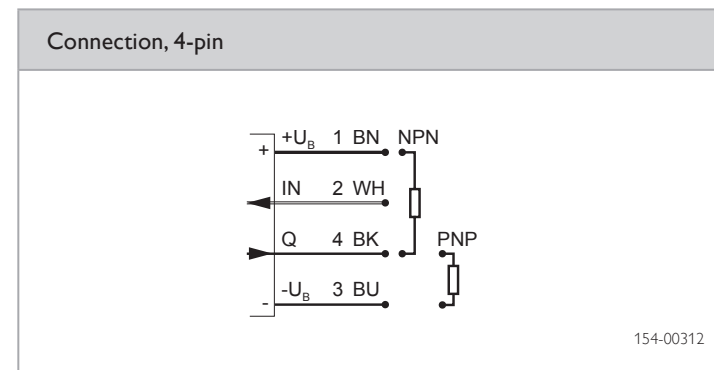
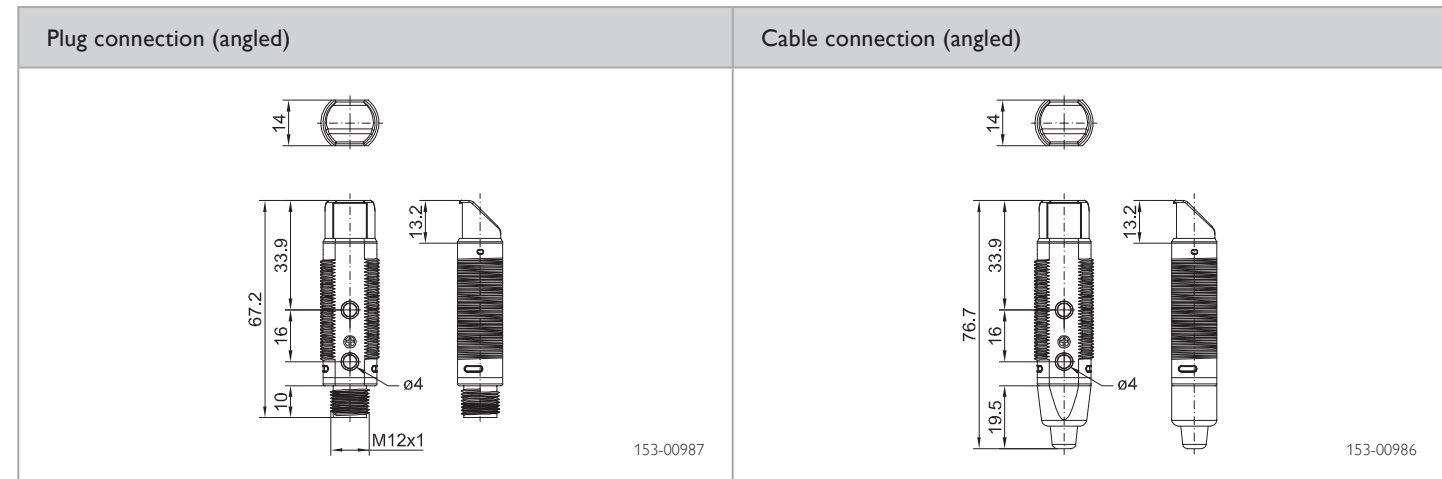
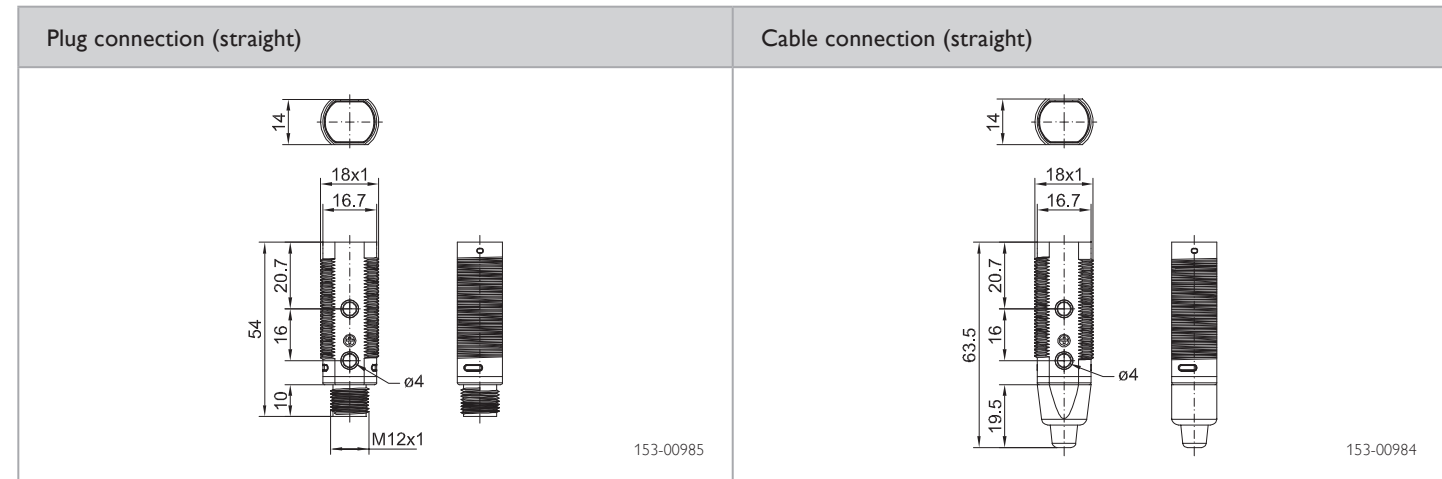
PRODUCT HIGHLIGHTS

- Economical solution for numerous applications
- Scanning distance of up to 800 mm, adjustable via potentiometer
- Red light or infrared
- Variants with angled light exit
- Robust plastic housings (IP 67)
- Simple adjustment via potentiometer
- 2 through holes as additional mounting possibility

| Optical data | | Functions | |
|------------------------------------|--|--------------------------------|---------------------------------------|
| Scanning distance | (See Selection Table) | Indicator LED, green | Operating voltage indicator |
| Type of light | (See Selection Table) | Indicator LED, yellow | Switching output indicator |
| | | Sensitivity adjustment | Via potentiometer |
| | | Adjustment possibilities | N.O./N.C. via control input (IN) |
| | | Default settings | Max. scanning distance and N.O. |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30V DC | Dimensions | M18 x 44 mm |
| No-load current, I ₀ | ≤ 30 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 | Material, front screen | PMMA |
| Switching output, Q | PNP/NPN (see Selection Table) | Type of connection | (See Selection Table) |
| Output function | N.O./N.C. / -U _B = N.O. / +U _B = N.C. | Ambient temperature: operation | -25 ... +55 °C |
| Switching frequency, f (ti/tp 1:1) | ≤ 1000 Hz | Weight (plug device) | 11 g ² / 13 g ³ |
| Response time | ≤ 1 ms | Weight (cable device) | 55 g ² / 57g ³ |

¹With connected IP 67 plug ²Straight light exit variant ³Angled light exit variant

| Scanning distance | Type of light | Light exit | Switching output | Type of connection | Part number | Article number |
|-------------------|---------------|------------|------------------|--------------------|------------------|----------------|
| 0 ... 400 mm | Red light | Straight | PNP | Plug, M12, 4-pin | FT 18-2 R-PS-L4 | 740-21033 |
| 0 ... 400 mm | Red light | Straight | NPN | Plug, M12, 4-pin | FT 18-2 R-NS-L4 | 740-21034 |
| 0 ... 400 mm | Red light | Straight | PNP | Cable, 2 m, 4-wire | FT 18-2 R-PS-K4 | 740-21020 |
| 0 ... 400 mm | Red light | Straight | NPN | Cable, 2 m, 4-wire | FT 18-2 R-NS-K4 | 740-21035 |
| 0 ... 320 mm | Red light | 90° angle | PNP | Plug, M12, 4-pin | FT 18-2 RW-PS-L4 | 740-21036 |
| 0 ... 320 mm | Red light | 90° angle | NPN | Plug, M12, 4-pin | FT 18-2 RW-NS-L4 | 740-21037 |
| 0 ... 320 mm | Red light | 90° angle | PNP | Cable, 2 m, 4-wire | FT 18-2 RW-PS-K4 | 740-21038 |
| 0 ... 320 mm | Red light | 90° angle | NPN | Cable, 2 m, 4-wire | FT 18-2 RW-NS-K4 | 740-21039 |
| 0 ... 800 mm | Infrared | Straight | PNP | Plug, M12, 4-pin | FT 18-2 ID-PS-L4 | 740-21040 |
| 0 ... 800 mm | Infrared | Straight | NPN | Plug, M12, 4-pin | FT 18-2 ID-NS-L4 | 740-21041 |
| 0 ... 800 mm | Infrared | Straight | PNP | Cable, 2 m, 4-wire | FT 18-2 ID-PS-K4 | 740-21042 |
| 0 ... 800 mm | Infrared | Straight | NPN | Cable, 2 m, 4-wire | FT 18-2 ID-NS-K4 | 740-21043 |



| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |

FMS 18-34 B

Photoelectric proximity sensor



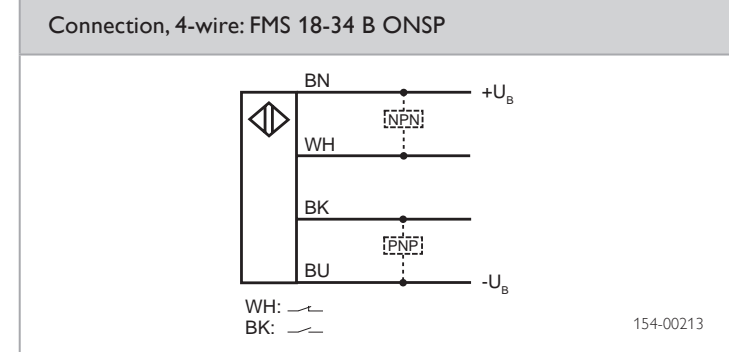
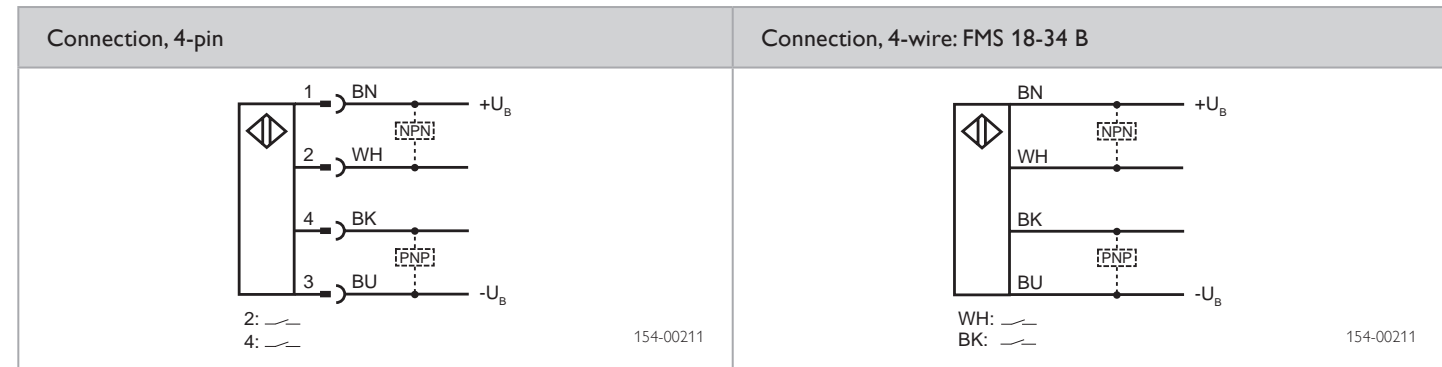
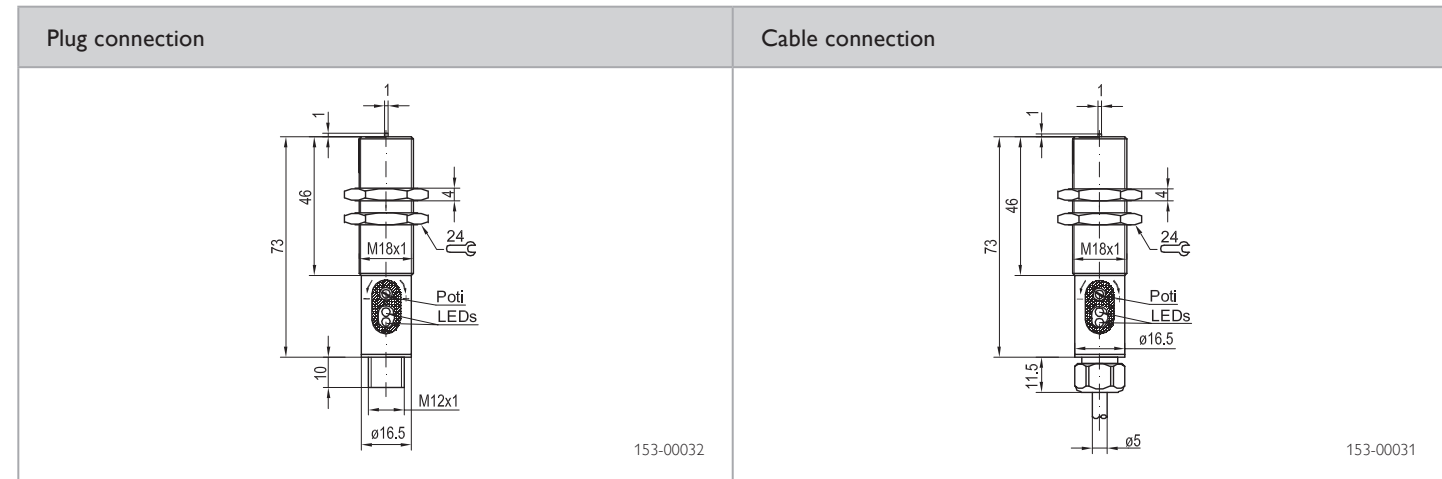
PRODUCT HIGHLIGHTS

- Scanning distance: 5 ... 400 mm, adjustable
- Wide beam (large aperture angle)
- Separating seam
- Metal M18 threaded sleeve
- Contamination indicator

| Optical data | | Functions | |
|------------------------------------|--|---------------------------------|-----------------------------|
| Scanning distance | 5 ... 400 mm ¹ | Indicator LED, green | Operating voltage indicator |
| Type of light | Infrared, 880 nm | Indicator LED, yellow | Switching output indicator |
| Distance hysteresis | ≤ 10 % of set scanning distance | Indicator LED, red | Contamination indicator |
| Aperture angle | 25° | Sensitivity adjustment | Via 18-step potentiometer |
| | | Default setting | Max. scanning distance |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30V DC ² | Dimensions | M18 x 73 mm |
| No-load current, I ₀ | ≤ 25 mA | Enclosure rating | IP 65 ³ |
| Output current, I _e | ≤ 200 mA | Material, housing | Brass, nickel-plated |
| Pull-up resistance | 22 kΩ | Type of connection | (See Selection Table) |
| Pull-down resistance | 22 kΩ | Ambient temperature: operation | -20 ... +60 °C |
| Protective circuits | Reverse-polarity protection, U _B / short-circuit protection (Q) | Ambient temperature: storage | -40 ... +80 °C |
| Protection Class | 2 | Weight (plug device) | 65 g |
| Standby time | ≤ 300 ms | Weight (receiver device) | 165 g |
| Switching output, Q | (See Selection Table) | Vibration and impact resistance | EN 60947-5-2 |
| Output function | (See Selection Table) | | |
| Switching frequency, f (ti/tp 1:1) | ≤ 1000 Hz | | |
| Response time | 500 μs | | |

¹ Reference material: Kodak white, 90 % reflectivity ² 10 % ripple, within U_B ³ With connected IP 65 plug

| Scanning distance | Switching output | Type of connection | Part number | Article number |
|-------------------|-------------------------|--------------------|------------------|----------------|
| 5 ... 400 mm | PNP (N.O.) / NPN (N.O.) | Plug, M12x1, 4-pin | FMS 18-34 B-L4 | 516-50781 |
| 5 ... 400 mm | PNP (N.O.) / NPN (N.O.) | Cable, 3 m, 4-wire | FMS 18-34 B | 516-50781 |
| 5 ... 400 mm | PNP (N.O.) / NPN (N.C.) | Cable, 3 m, 4-wire | FMS 18-34 B ONSP | 516-50783 |



| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |

FMS 30-34 B

Photoelectric proximity sensor



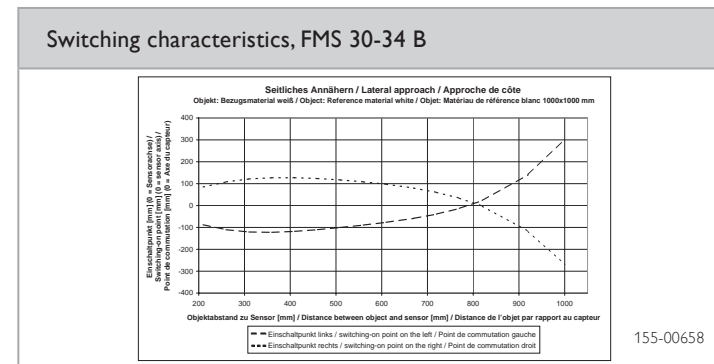
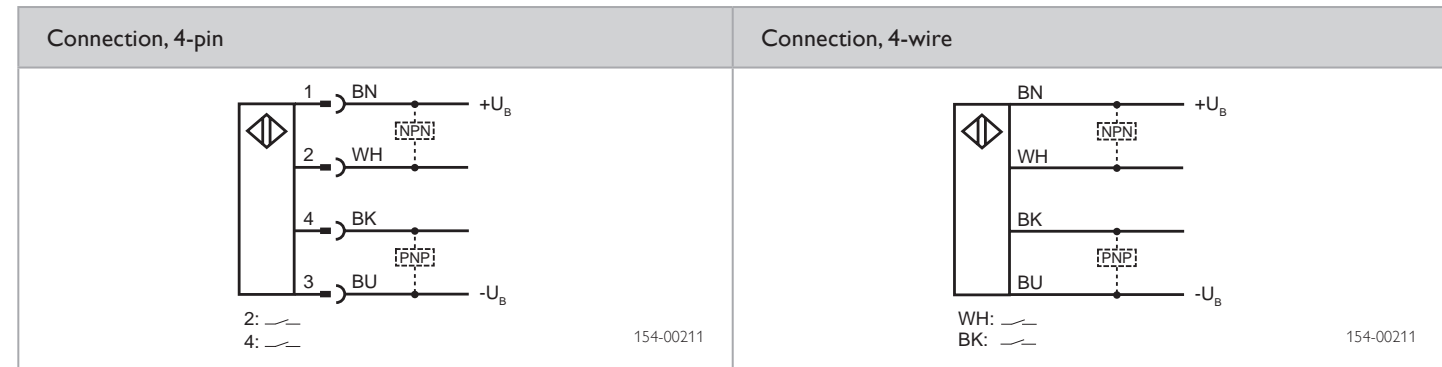
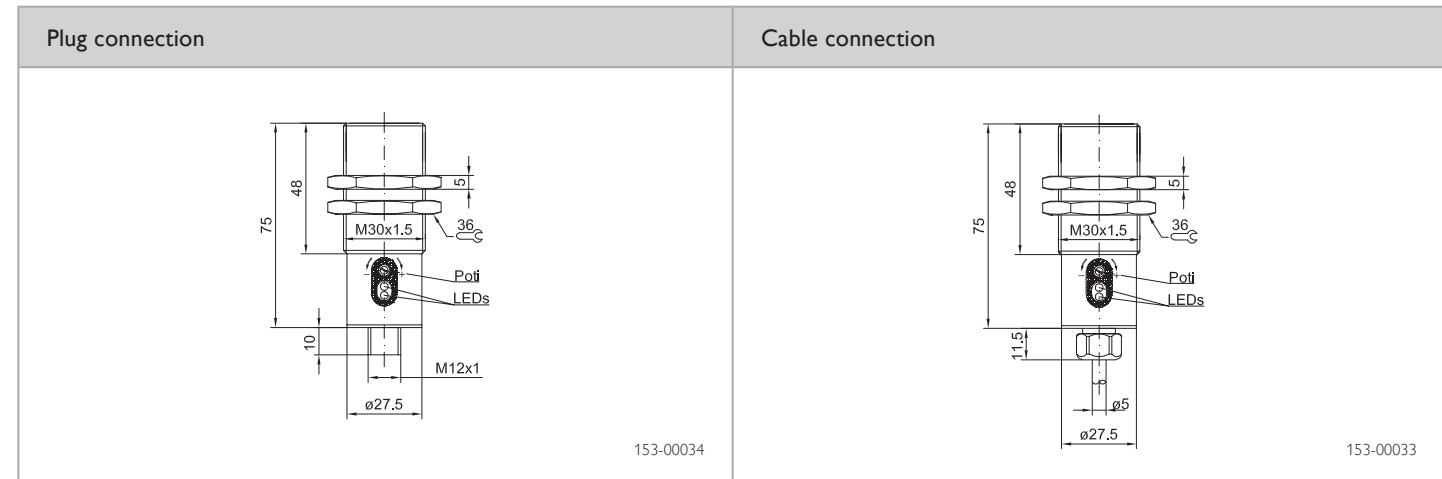
PRODUCT HIGHLIGHTS

- Scanning distance: 5 ... 1000 mm, adjustable
- Wide beam (large aperture angle)
- Separating seam
- Metal M30 threaded sleeve
- Contamination indicator

| Optical data | | Functions | |
|------------------------------------|--|---------------------------------|-----------------------------|
| Scanning distance | 5 ... 1000 mm ¹ | Indicator LED, green | Operating voltage indicator |
| Type of light | Infrared, 880 nm | Indicator LED, yellow | Switching output indicator |
| Distance hysteresis | ≤ 10 % of set scanning distance | Indicator LED, red | Contamination indicator |
| Aperture angle | 50° | Sensitivity adjustment | Via 18-step potentiometer |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30 V DC ² | Dimensions | M12 x 75 mm |
| No-load current, I ₀ | ≤ 40 mA | Enclosure rating | IP 65 ³ |
| Output current, I _e | ≤ 200 mA | Material, housing | Brass, nickel-plated |
| Pull-up resistance | 22 kΩ | Type of connection | (See Selection Table) |
| Pull-down resistance | 22 kΩ | Ambient temperature: operation | -20 ... +60 °C |
| Protective circuits | Reverse-polarity protection, U _B / short-circuit protection (Q) | Ambient temperature: storage | -40 ... +80 °C |
| Protection Class | 2 | Weight (plug device) | 170 g |
| Standby time | ≤ 300 ms | Weight (cable device) | 280 g |
| Switching output, Q | PNP/NPN | Vibration and impact resistance | 60947-5-2 |
| Output function | N.O. | | |
| Switching frequency, f (ti/tp 1:1) | 50 Hz | | |

¹ Reference material: white, 90 % reflectivity ² 10 % ripple, within U_B ³ With connected IP 65 plug

| Scanning distance | Type of connection | Part number | Article number |
|-------------------|--------------------|----------------|----------------|
| 5 ... 1000 mm | Plug, M12x1, 4-pin | FMS 30-34 B-L4 | 550-51596 |
| 5 ... 1000 mm | Cable, 3 m, 4-wire | FMS 30-34 B | 550-51595 |



| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



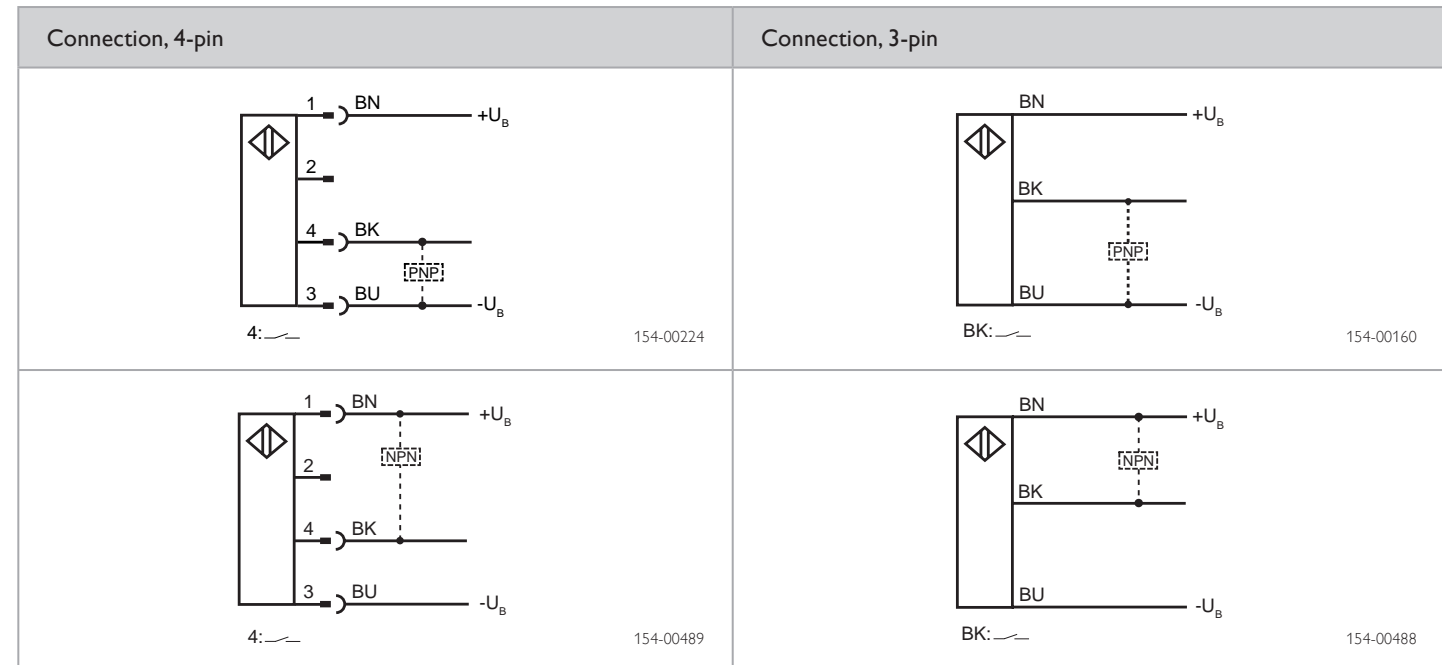
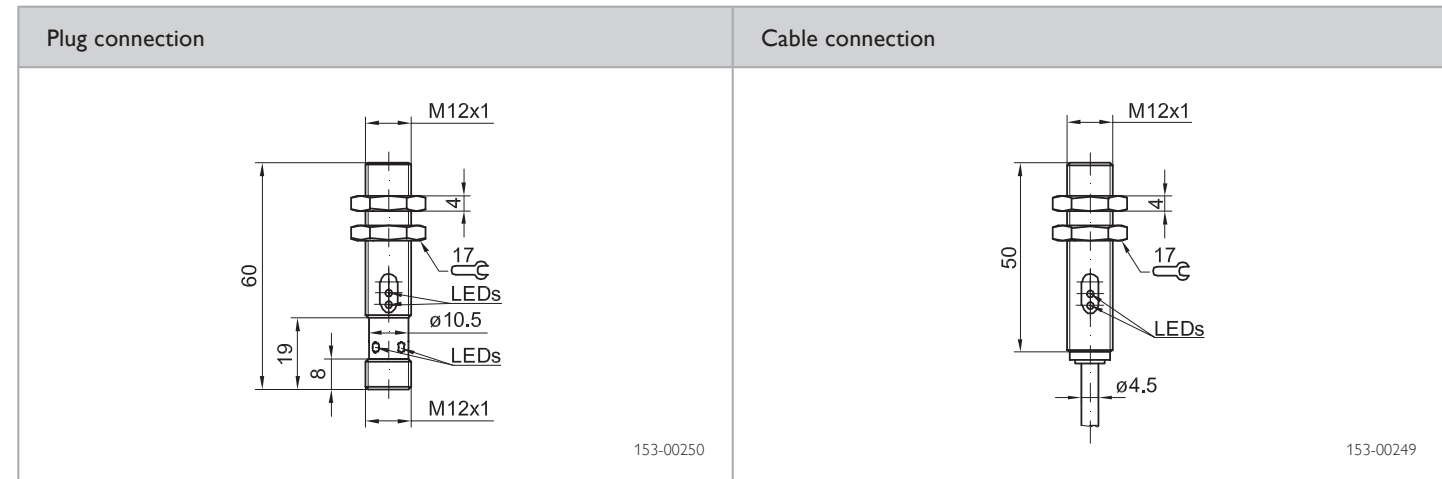
PRODUCT HIGHLIGHTS

- Robust M12 metal housings with short mounting lengths
- Operating range: 60 ... 1500 mm
- Red light, 660 nm
- Switching state and functional reserve indicators

| Optical data | | Functions | |
|------------------------------------|--|---------------------------------|------------------------------|
| Scanning distance | 60 ... 1500 mm ¹ | Indicator LED, green | Functional reserve indicator |
| Type of light | Red, 660 nm | Indicator LED, yellow | Switching state indicator |
| Light spot size | Ø 10 mm ² | Scanning distance adjustment | Fixed setting |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 36 V DC | Dimensions (plug device) | M12 x 60 mm |
| No-load current, I ₀ | ≤ 15 mA | Dimensions (cable device) | M12 x 50 mm |
| Output current, I _e | ≤ 200 mA | Enclosure rating | IP 67 ³ |
| Protective circuits | Reverse-polarity protection, U _B / short-circuit protection | Material, housing | Brass, chromium-plated |
| Protection Class | 2 | Material, front screen | Glass |
| Standby time | 20 msec | Type of connection | (See Selection Table) |
| Switching output, Q | PNP/NPN / max 200 mA | Ambient temperature: operation | -25 ... +55 °C |
| Output function | N.O. | Weight (plug device) | 20 g |
| Switching frequency, f (ti/tp 1:1) | ≤ 1000 Hz | Weight (cable device) | 100 g |
| Response time | ≤ 500 µs | Vibration and impact resistance | IEC 60947-5-2 |

¹ Reference material: RD8 reflector; Ø 84 mm ² At scanning distance of 50 mm ³ With connected IP 67 plug

| Switching output | Type of connection | Part number | Article number |
|------------------|--|--------------|----------------|
| PNP | Plug, M12, 4-pin | FR 12 R-PSL4 | 703-11000 |
| NPN | Plug, M12, 4-pin | FR 12 R-NSL4 | 703-11001 |
| PNP | Cable, PVC, 3 x 0.34 mm ² , 2 m | FR 12 R-PSK3 | 703-11002 |
| NPN | Cable, PVC, 3 x 0.34 mm ² , 2 m | FR 12 R-NSK3 | 703-11003 |



| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



PRODUCT HIGHLIGHTS

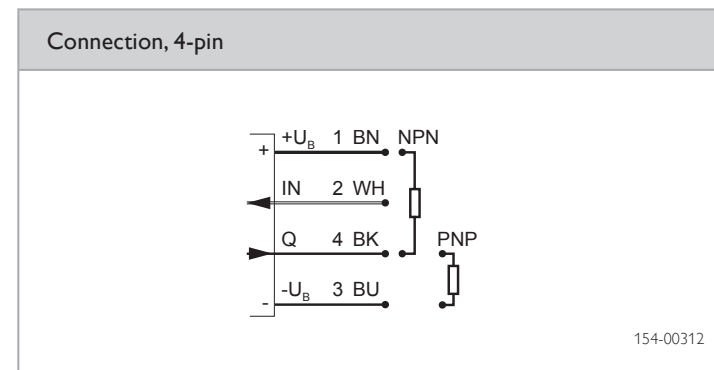
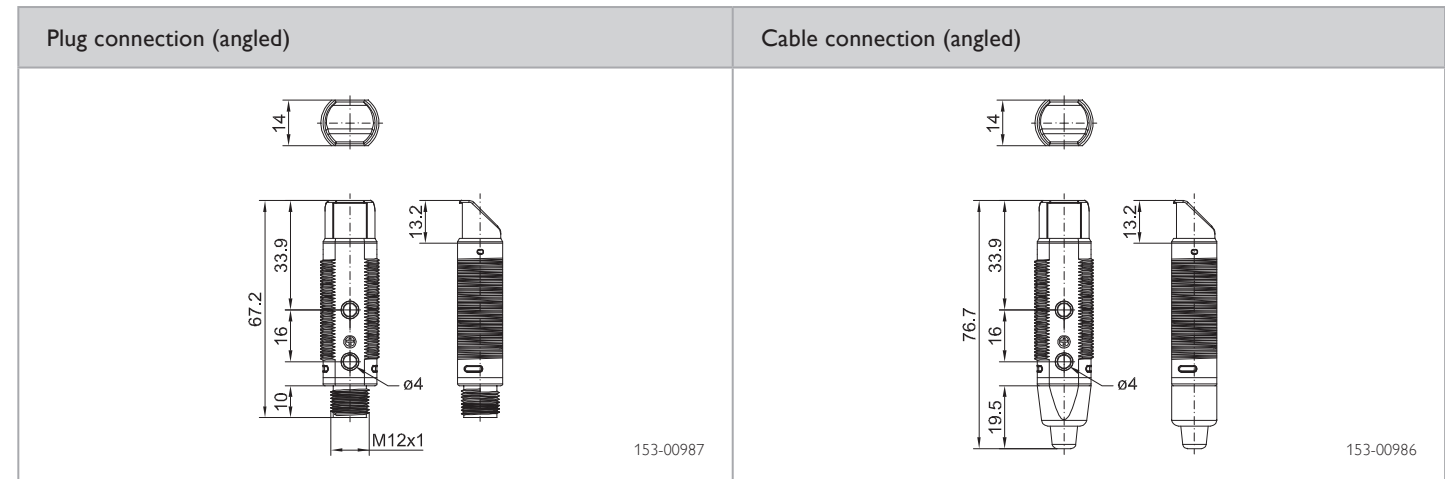
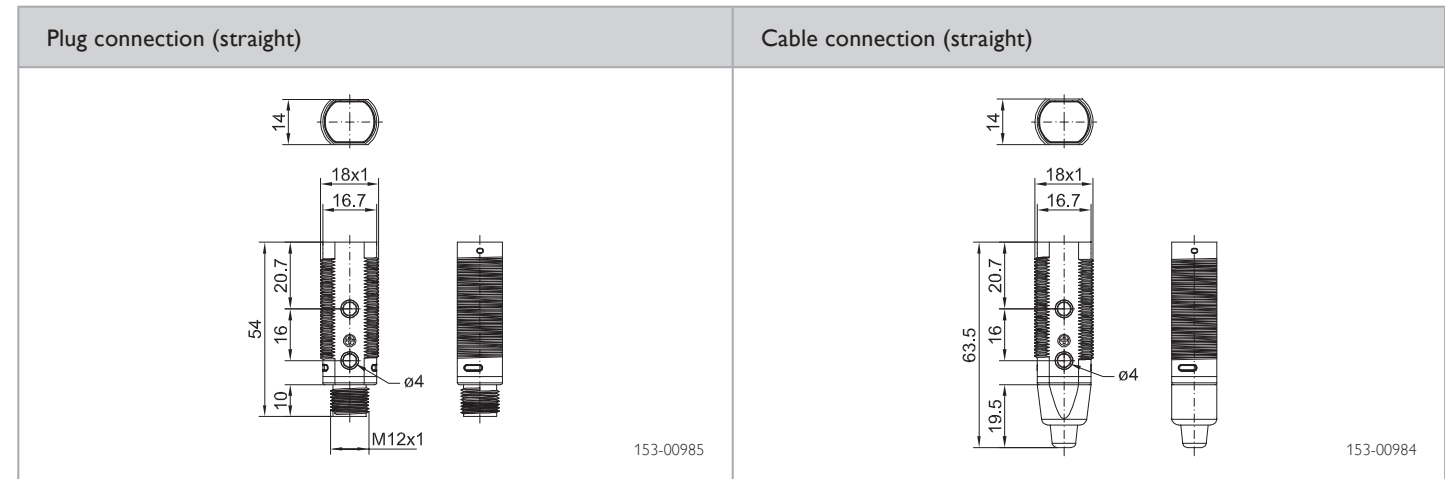
- Economical solution for numerous applications
- Range of up to 3.0 m
- Variants with angled light exit
- Robust metal housings (IP 67)
- Polarisation filter for reliable detection of highly reflective surfaces
- Simple adjustment via potentiometer
- 2 through holes as additional mounting possibility

| Optical data | | Functions | |
|------------------------------------|--|--------------------------------|---------------------------------------|
| Operating range | (See Selection Table) ¹ | Indicator LED, green | Operating voltage indicator |
| Type of light | (See Selection Table) | Indicator LED, yellow | Switching output indicator |
| Polarising filter | Yes | Sensitivity adjustment | Via potentiometer |
| | | Adjustment possibilities | N.O./N.C. via control input (IN) |
| | | Default settings | Max. scanning distance and N.O. |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30V DC | Dimensions | M18 x 44 mm |
| No-load current, I ₀ | ≤ 30 mA | Enclosure rating | IP 67 ² |
| Output current, I _e | ≤ 100 mA | Material, housing | Metal |
| Protective circuits | Reverse-polarity protection, U _B / short-circuit protection | Material, front screen | PMMA |
| Switching output, Q | PNP/NPN (see Selection Table) | Type of connection | (See Selection Table) |
| Output function | N.O./N.C. | Ambient temperature: operation | -25 ... +55 °C |
| Switching frequency, f (ti/tp 1:1) | ≤ 1000 Hz | Weight (plug device) | 34 g ³ / 36 g ⁴ |
| Response time | ≤ 1 ms | Weight (cable device) | 74 g ³ / 76 g ⁴ |

¹ Reference material: R5 reflector ² With connected IP 67 plug ³ Straight light exit variant ⁴ Angled light exit variant

| Operating range | Type of light | Light exit | Switching output | Type of connection | Part number | Article number |
|-----------------|---------------|------------|------------------|------------------------|-------------------|----------------|
| 3.0 m | Red light | Straight | PNP | Metal plug, M12, 4-pin | FR 18-2 RM-PS-L4 | 741-11014 |
| 3.0 m | Red light | Straight | NPN | Metal plug, M12, 4-pin | FR 18-2 RM-NS-L4 | 741-11015 |
| 3.0 m | Red light | Straight | PNP | Cable, 2 m, 4-wire | FR 18-2 RM-PS-K4 | 741-11016 |
| 3.0 m | Red light | Straight | NPN | Cable, 2 m, 4-wire | FR 18-2 RM-NS-K4 | 741-11017 |
| 2.4 m | Red light | 90° angle | PNP | Metal plug, M12, 4-pin | FR 18-2 RWM-PS-L4 | 741-11018 |
| 2.4 m | Red light | 90° angle | NPN | Metal plug, M12, 4-pin | FR 18-2 RWM-NS-L4 | 741-11019 |
| 2.4 m | Red light | 90° angle | PNP | Cable, 2 m, 4-wire | FR 18-2 RWM-PS-K4 | 741-11020 |
| 2.4 m | Red light | 90° angle | NPN | Cable, 2 m, 4-wire | FR 18-2 RWM-NS-K4 | 741-11021 |

| Scope of delivery |
|--|
| Reflector: 53.4 x 53.4 mm ² |
| 2 x securing nuts |



| Accessories | |
|-------------------|---------------|
| Reflectors | From Page 654 |
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



PRODUCT HIGHLIGHTS

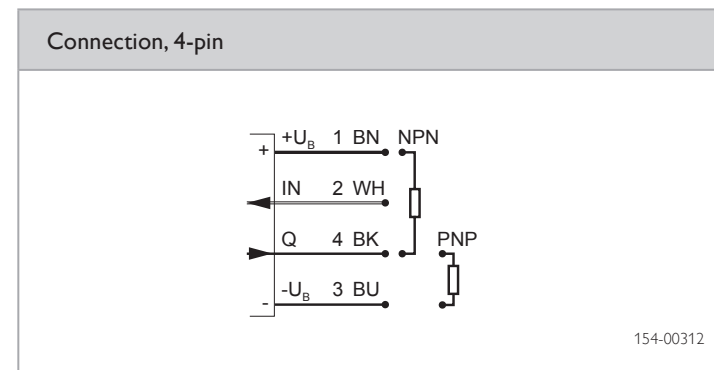
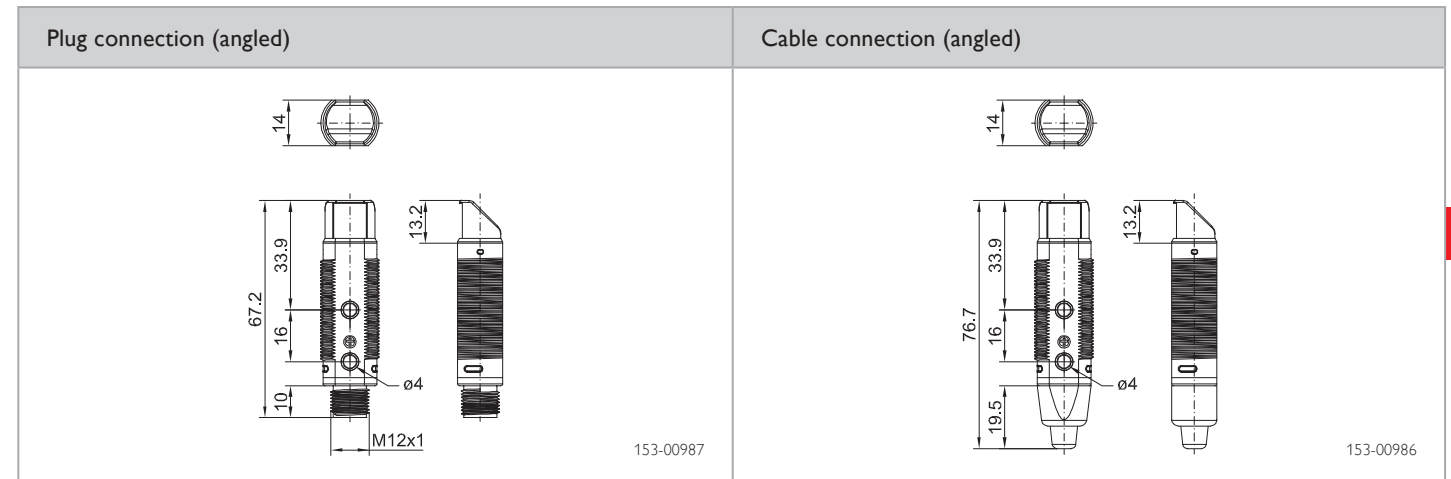
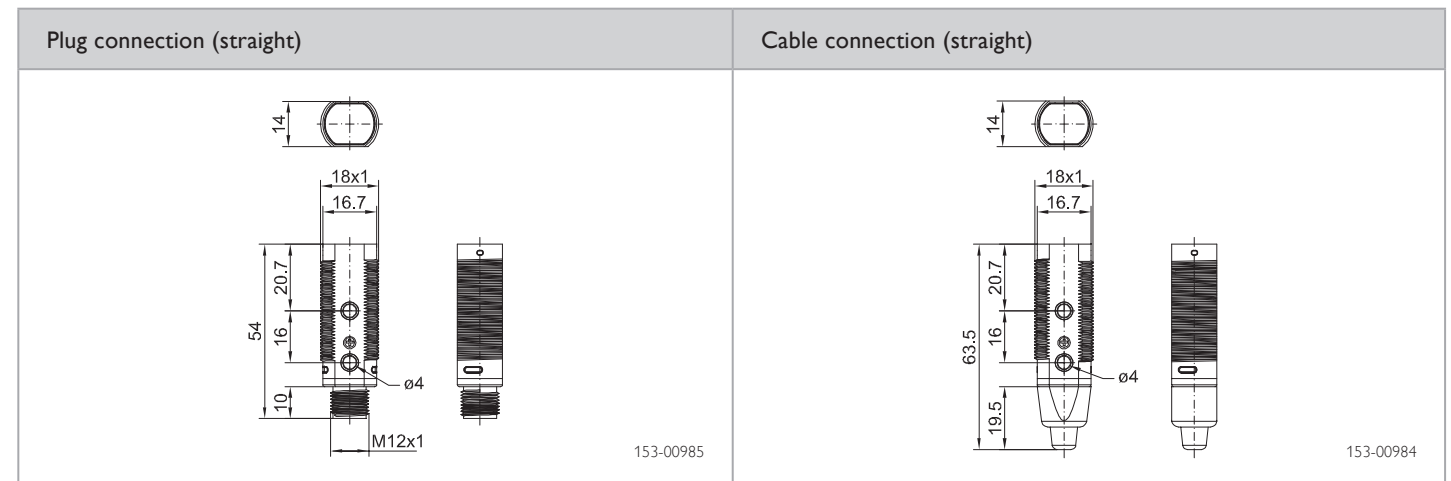
- Economical solution for numerous applications
- Range of up to 3.60 m
- Variants with angled light exit
- Robust plastic housings (IP 67)
- Simple adjustment via potentiometer
- 2 through holes as additional mounting possibility

| Optical data | | Functions | |
|------------------------------------|--|--------------------------------|---------------------------------------|
| Operating range | (See Selection Table) ¹ | Indicator LED, yellow | Switching output indicator |
| Type of light | (See Selection Table) | Sensitivity adjustment | Via potentiometer |
| Polarising filter | No | Adjustment possibilities | N.O./N.C. via control input (IN) |
| | | Default settings | Max. scanning distance and N.O. |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30V DC | Dimensions | M18 x 44 mm |
| No-load current, I ₀ | ≤ 30 mA | Enclosure rating | IP 67 ² |
| Output current, I _e | ≤ 100 mA | Material, housing | ABS |
| Protective circuits | Reverse-polarity protection, U _B / short-circuit protection | Material, front screen | PMMA |
| Switching output, Q | PNP/NPN (see Selection Table) | Type of connection | (See Selection Table) |
| Output function | N.O./N.C. | Ambient temperature: operation | -25 ... +55 °C |
| Switching frequency, f (ti/tp 1:1) | ≤ 1000 Hz | Weight (plug device) | 11 g ³ / 13 g ⁴ |
| Response time | ≤ 1 ms | Weight (cable device) | 55 g ³ / 57 g ⁴ |

¹ Reference material: R5 reflector ² With connected IP 67 plug ³ Straight light exit variant ⁴ Angled light exit variant

| Operating range | Type of light | Light exit | Switching output | Type of connection | Part number | Article number |
|-----------------|---------------|------------|------------------|--------------------|------------------|----------------|
| 3.6 m | Infrared | Straight | PNP | Plug, M12, 4-pin | FR 18-2 I-PS-L4 | 741-11022 |
| 3.6 m | Infrared | Straight | NPN | Plug, M12, 4-pin | FR 18-2 I-NS-L4 | 741-11023 |
| 3.6 m | Infrared | Straight | PNP | Cable, 2 m, 4-wire | FR 18-2 I-PS-K4 | 741-11024 |
| 3.6 m | Infrared | Straight | NPN | Cable, 2 m, 4-wire | FR 18-2 I-NS-K4 | 741-11025 |
| 2.5 m | Infrared | 90° angle | PNP | Plug, M12, 4-pin | FR 18-2 IW-PS-L4 | 741-11026 |
| 2.5 m | Infrared | 90° angle | NPN | Plug, M12, 4-pin | FR 18-2 IW-NS-L4 | 741-11027 |
| 2.5 m | Infrared | 90° angle | PNP | Cable, 2 m, 4-wire | FR 18-2 IW-PS-K4 | 741-11028 |
| 2.5 m | Infrared | 90° angle | NPN | Cable, 2 m, 4-wire | FR 18-2 IW-NS-K4 | 741-11029 |

| Scope of delivery |
|--|
| Reflector: 53.4 x 53.4 mm ² |
| 2 x securing nuts |



| Accessories | |
|-------------------|---------------|
| Reflectors | From Page 654 |
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



PRODUCT HIGHLIGHTS

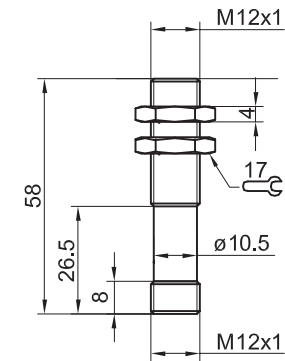
- Fine, parallel light beam
- Small part detection to 0.2 mm at a max. distance of 1 m
- Simple installation thanks to standard M 12 metal thread
- Control line for setting of 3 sensitivity levels
- Test input

| Optical data | | Functions | |
|--|--|---------------------------------|---------------------------|
| Range | 0 ... 5 m | Indicator LED, yellow | Switching state indicator |
| Type of light | Laser, red, 650 nm | Sensitivity adjustment | Via control line |
| Laser Class (DIN EN 60825-1:2008-5) | 2 | | |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30V DC | Dimensions | M12 x 58 mm |
| No-load current, I ₀ | ≤ 30 mA | Enclosure rating | IP 67 ² |
| Output current, I _e | ≤ 100 mA | Material, housing | Brass, nickel-plated |
| Protective circuits | Reverse-polarity protection, U _B / short-circuit protection | Material, front screen | PMMA |
| Protection Class | 2 | Type of connection | (See Selection Table) |
| Standby time | ≤ 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 (transmitter / receiver) | 30 g |
| Switching frequency, f (ti/tp 1:1) | 10 kHz | | |
| Control input, Test, transmitter | -U _B : transmitter = off +U _B or Open: transmitter = on | | |
| Control input, Gain, receiver ¹ | 1 Open = medium sensitivity 2 -U _B = high sensitivity 3 +U _B = low sensitivity | | |

¹Change in Gain setting is only effective after renewed switch on / switch off ²With connected IP 67 plug

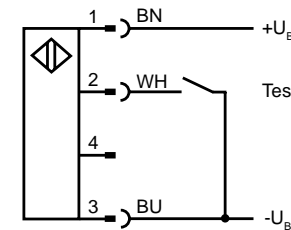
| Transmitter / receiver | Switching output | Type of connection | Part number | Article number |
|------------------------|------------------|--------------------|----------------|----------------|
| Receiver | PNP N.O. | Plug, M12, 4-pin | FE 12 RL-PS-L4 | 580-51402 |
| Receiver | PNP N.C. | Plug, M12, 4-pin | FE 12 RL-PO-L4 | 580-51403 |
| Receiver | NPN N.C. | Plug, M12, 4-pin | FE 12 RL-NS-L4 | 580-51405 |
| Transmitter | — | Plug, M12, 4-pin | FS 12 RL-L4 | 580-51401 |

Plug connection (transmitter / receiver)



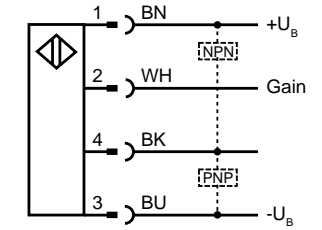
153-00345

Connection, transmitter, 4-pin



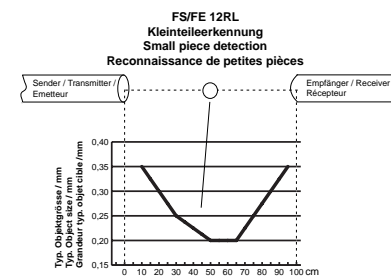
154-00171

Connection, receiver, 4-pin: PNP/NPN



154-00265

Small part detection



155-00215

Accessories

| | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



PRODUCT HIGHLIGHTS

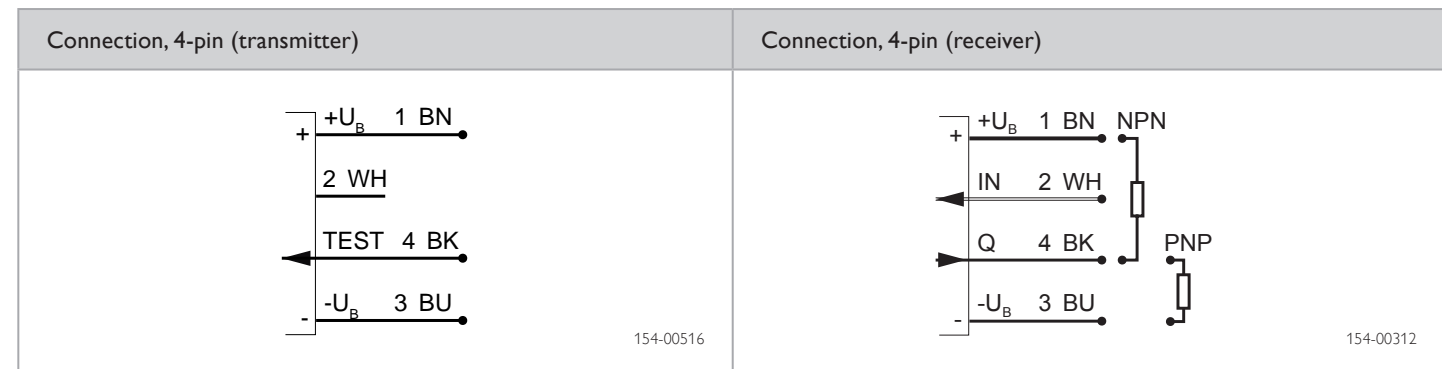
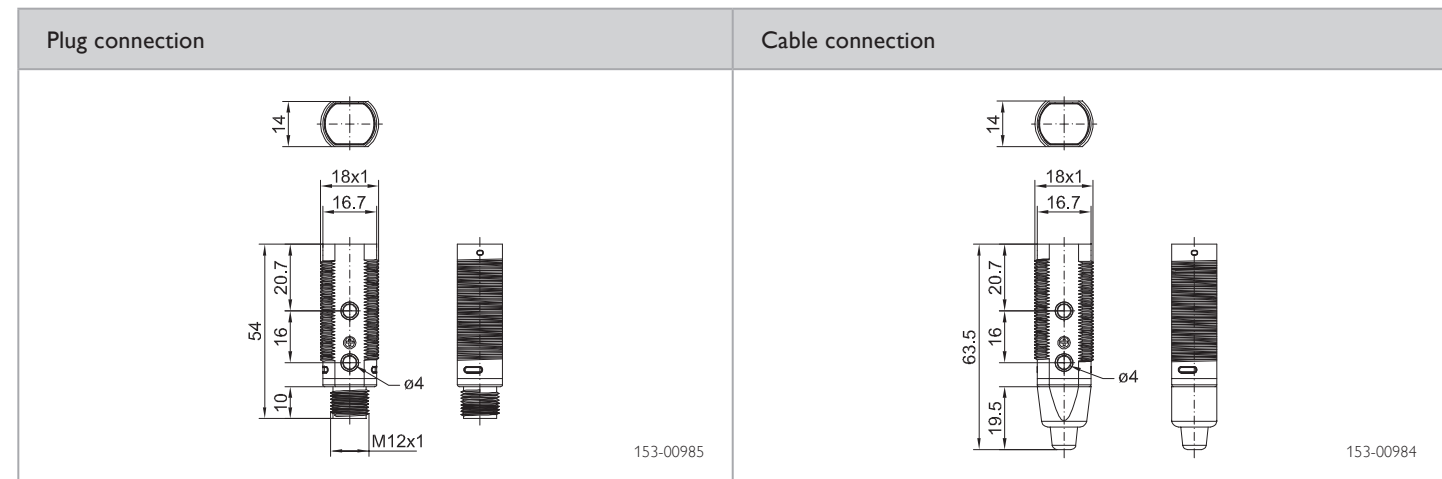
- Economical solution for numerous applications
- Long range of up to 10 m
- Robust metal housings (IP 67)
- Simple adjustment via potentiometer
- 2 through holes as additional mounting possibility

| Optical data | | Functions | |
|------------------------------------|--|--------------------------------|----------------------------------|
| Operating range | 10 m | Indicator LED, green | Operating voltage indicator |
| Type of light | (See Selection Table) | Indicator LED, yellow | Switching output indicator |
| | | Sensitivity adjustment | Via potentiometer |
| | | Adjustment possibilities | N.O./N.C. via control input (IN) |
| | | Default settings | Max. scanning distance and N.O. |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30V DC | Dimensions | M18 x 44 mm |
| No-load current, I ₀ | ≤ 30 mA | Enclosure rating | IP 67 ¹ |
| Output current, I _e | ≤ 100 mA | Material, housing | Metal |
| Protective circuits | Reverse-polarity protection, U _B / short-circuit protection | Material, front screen | PMMA |
| Switching output, Q | PNP/NPN (see Selection Table) | Type of connection | (See Selection Table) |
| Output function | N.O./N.C. | Ambient temperature: operation | -25 ... +55 °C |
| Switching frequency, f (ti/tp 1:1) | ≤ 400 Hz | Weight (plug device) | 46 g |
| Response time | ≤ 2.5 ms | Weight (cable device) | 130 g |

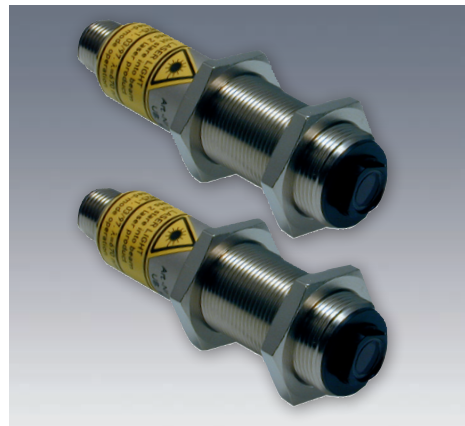
¹With connected IP 67 plug

| Transmitter / receiver | Type of light | Light exit | Switching output | Type of connection | Part number | Article number |
|------------------------|---------------|------------|------------------|------------------------|-------------------|----------------|
| Transmitter / receiver | Infrared | Straight | PNP | Metal plug, M12, 4-pin | FSE 18-2 IM-PS-L4 | 742-51004 |
| Transmitter / receiver | Infrared | Straight | NPN | Metal plug, M12, 4-pin | FSE 18-2 IM-NS-L4 | 742-51005 |
| Transmitter / receiver | Infrared | Straight | PNP | Cable, 2 m, 4-wire | FSE 18-2 IM-PS-K4 | 742-51006 |
| Transmitter / receiver | Infrared | Straight | NPN | Cable, 2 m, 4-wire | FSE 18-2 IM-NS-K4 | 742-51007 |

| Scope of delivery |
|------------------------|
| Transmitter & receiver |
| 2 x securing nuts |



| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



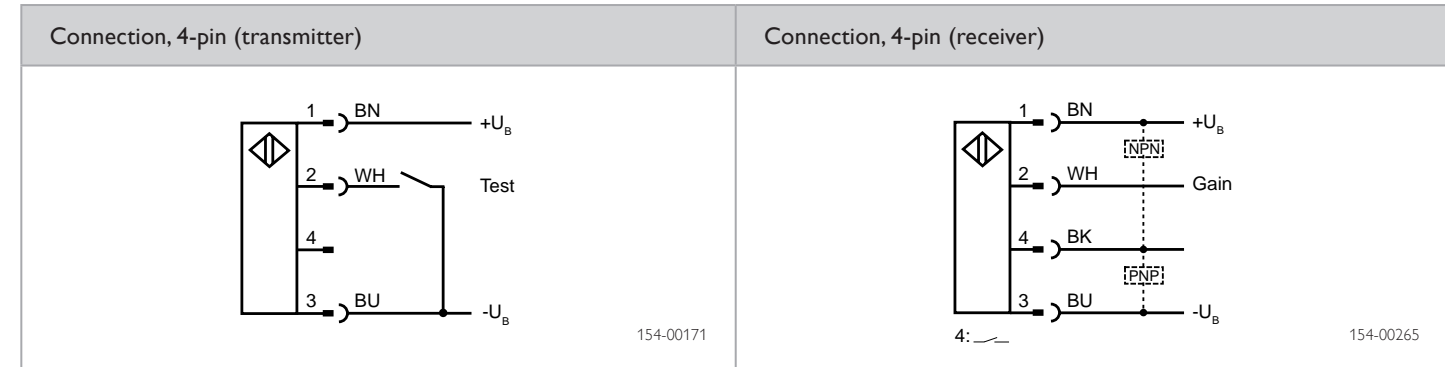
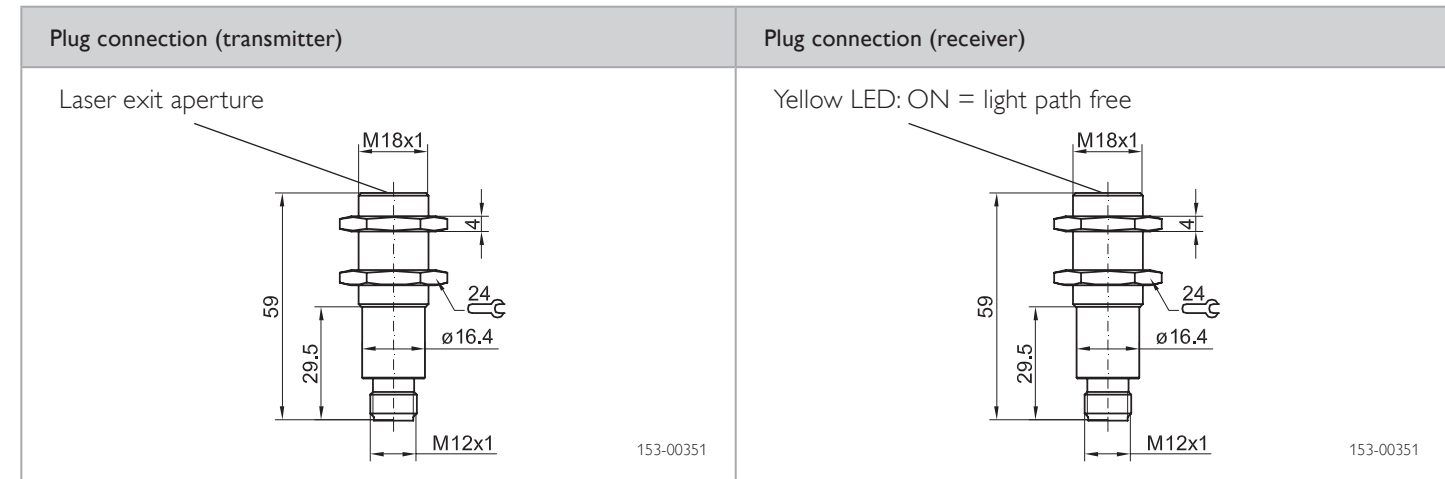
PRODUCT HIGHLIGHTS

- Operating range: 50 m
- Small housings
- Red light laser, 650 nm
- Control line for setting of 3 sensitivity levels
- Test input

| Optical data | | Functions | |
|-------------------------------------|--|---------------------------------|----------------------------|
| Operating range | 0 ... 50 m | Indicator LED, yellow | Switching output indicator |
| Type of light | Laser, pulsed, red, 650 nm | Sensitivity adjustment | Via control line |
| Laser Class (DIN EN 60825-1:2008-5) | 2 | | |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30 V DC | Dimensions (plug device) | M18x1 x 59 mm |
| No-load current, I ₀ | ≤ 30 mA | Enclosure rating | IP 67 ² |
| Output current, I _e | ≤ 100 mA | Material, housing | Brass, nickel-plated |
| Protective circuits | Reverse-polarity protection, U _B / short-circuit protection (Q) | Type of connection | (See Selection Table) |
| Protection Class | 2 | Ambient temperature: operation | -20 ... +60 °C |
| Standby time | ≤ 300 ms | Ambient temperature: storage | -20 ... +80 °C |
| Switching output, Q | PNP/NPN (see Selection Table) | Weight (transmitter / receiver) | 70 g |
| Output function | N.O. | | |
| Switching frequency, f (ti/tp 1:1) | ≤ 10000 Hz | | |
| Response time | 50 μs | | |
| Control input, Test | Test input (transmitter) -U _B : transmitter = off +U _B or Open: transmitter = on | | |
| Control input, Gain | Open: medium sensitivity – medium distance ¹ -U _B : high sensitivity – high distance ¹ +U _B : low sensitivity – low distance | | |

¹ Change in Gain setting is only effective after renewed switch on / switch off ² With connected IP 67 plug

| Transmitter / receiver | Switching output | Type of connection | Part number | Article number |
|------------------------|------------------|--------------------|----------------|----------------|
| Receiver | PNP | Plug, M12x1, 4-pin | FE 18 RL-PS-L4 | 580-51400 |
| Receiver | NPN | Plug, M12x1, 4-pin | FE 18 RL-NS-L4 | 580-51399 |
| Transmitter | – | Plug, M12x1, 4-pin | FS 18 RL-L4 | 580-51398 |



| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |



PRODUCT HIGHLIGHTS

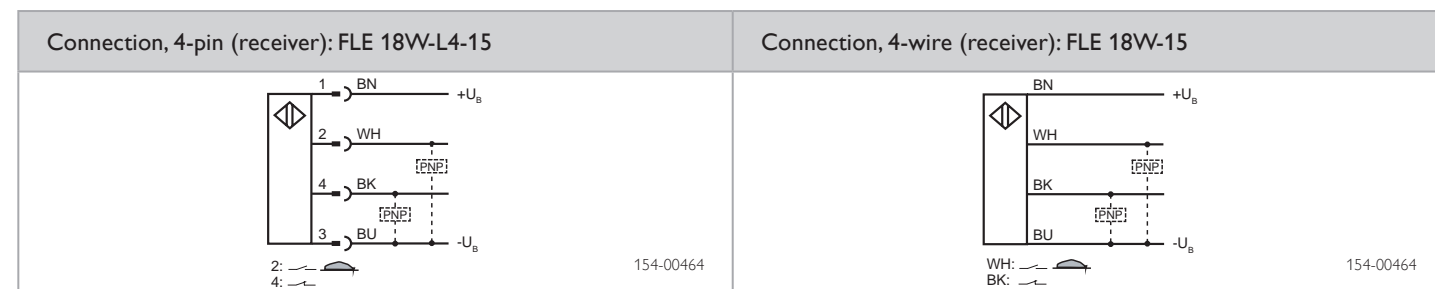
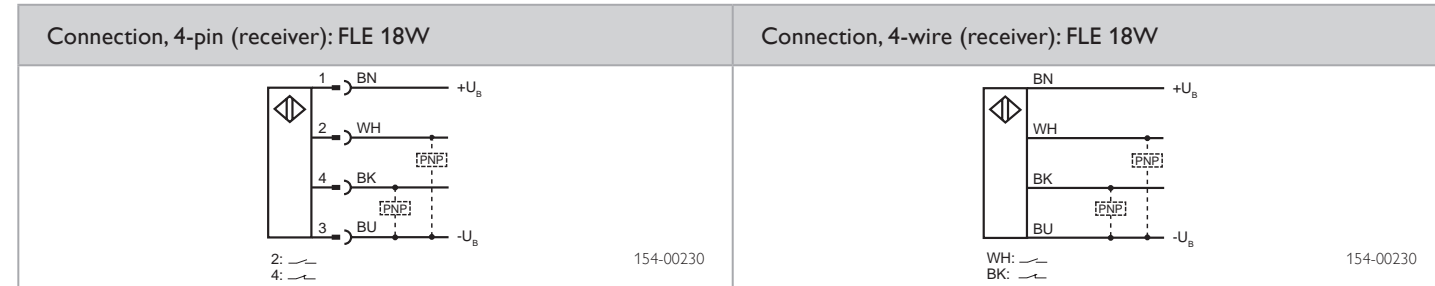
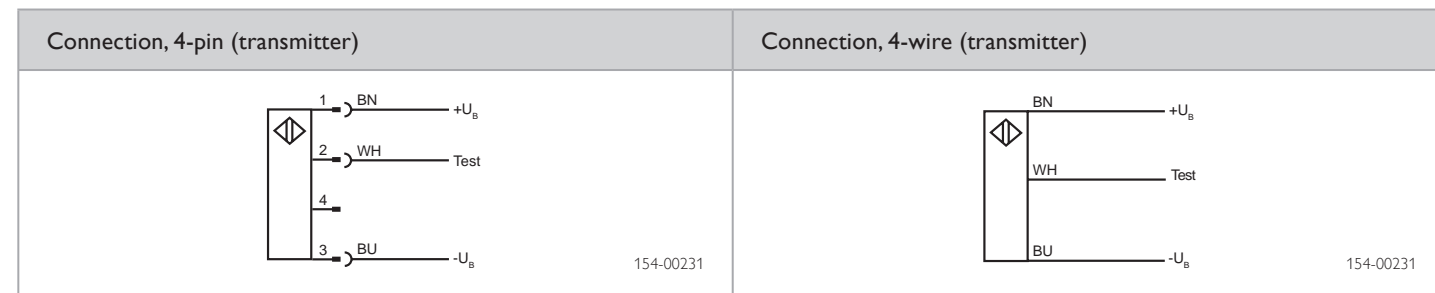
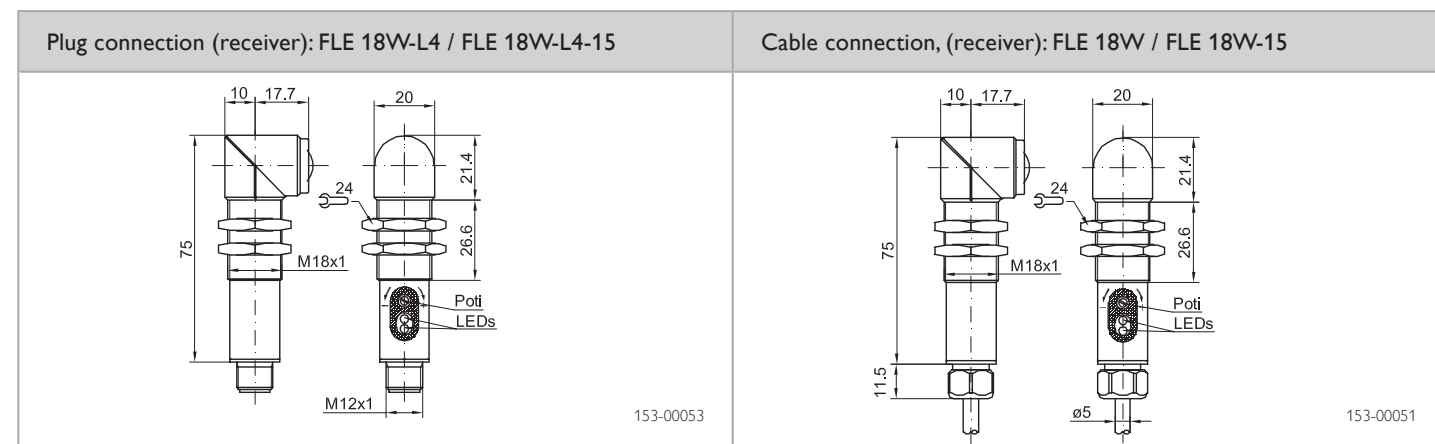
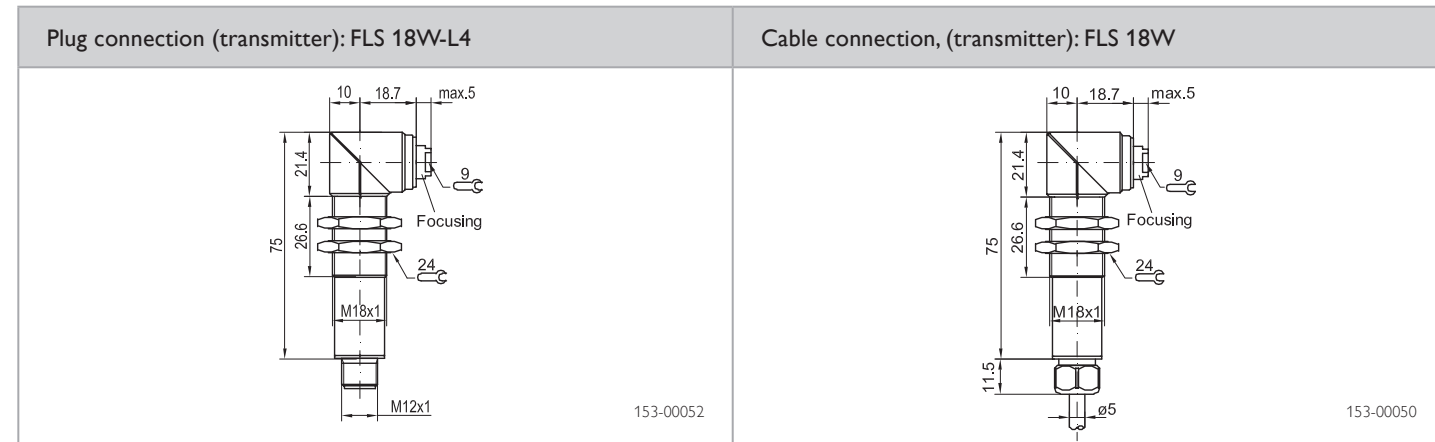
- Operating range: 50 m
- Red light laser, 650 nm
- Transmitter beam can be focused according to application
- Accuracy adjustable via beam spot size
- Smallest detectable part: 0.03 mm
- Switching frequency, 6000 Hz
- Metal M18 threaded sleeve

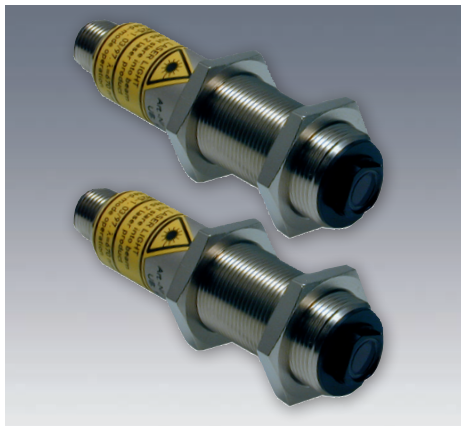
| Optical data | | Functions | |
|-------------------------------------|--|--------------------------------|-----------------------------|
| Operating range | 0 ... 50 m | Indicator LED, green | Operating voltage indicator |
| Type of light | Laser, red, 650 nm | Indicator LED, yellow | Switching output indicator |
| Laser Class (DIN EN 60825-1:2008-5) | 2 | Indicator LED, red | Contamination indicator |
| | | Sensitivity adjustment | Via 18-step potentiometer |
| | | Default settings | Max. operating range |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30V DC ¹ | Dimensions | (See dimensional drawings) |
| No-load current, I ₀ | ≤ 25 mA | Enclosure rating | IP 65 ² |
| Output current, I _e | ≤ 200 mA | Material, housing | Brass, nickel-plated |
| Protective circuits | Reverse-polarity protection, U _B / short-circuit protection (Q) | Type of connection | (See Selection Table) |
| Protection Class | 2 | Ambient temperature: operation | -10 ... +50 °C |
| Standby time | ≤ 300 ms | Ambient temperature: storage | -20 ... +80 °C |
| Switching output, Q | PNP | Weight (plug device) | 85 g |
| Output function | N.O./N.C. (see Selection Table) | Weight (receiver device) | 190 g |
| Switching frequency, f (ti/tp 1:1) | ≤ 6000 Hz | | |
| Response time | 83 μs | | |
| Control input, Test | < 2V: transmitter off > 10V or Open: transmitter on | | |

¹ 10 % ripple, within U_B ² With connected IP 65 plug

| Transmitter / receiver | Switching output | Type of connection | Part number | Article number |
|------------------------|------------------|--------------------|---------------|----------------|
| Transmitter | - | Plug, M12x1, 4-pin | FLS 18W-L4 | 580-51408 |
| Receiver | PNP (N.O./N.C.) | Plug, M12x1, 4-pin | FLE 18W-L4 | 580-51414 |
| Receiver | PNP (N.C.) | Plug, M12x1, 4-pin | FLE 18W-L4-15 | 580-51415 |
| Transmitter | - | Cable, 3 m, 4-wire | FLS 18W | 580-51407 |
| Receiver | PNP (N.O./N.C.) | Cable, 3 m, 4-wire | FLE 18W | 580-51416 |
| Receiver | PNP (N.C.) | Cable, 3 m, 4-wire | FLE 18W-15 | 580-51417 |

| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |





PRODUCT HIGHLIGHTS

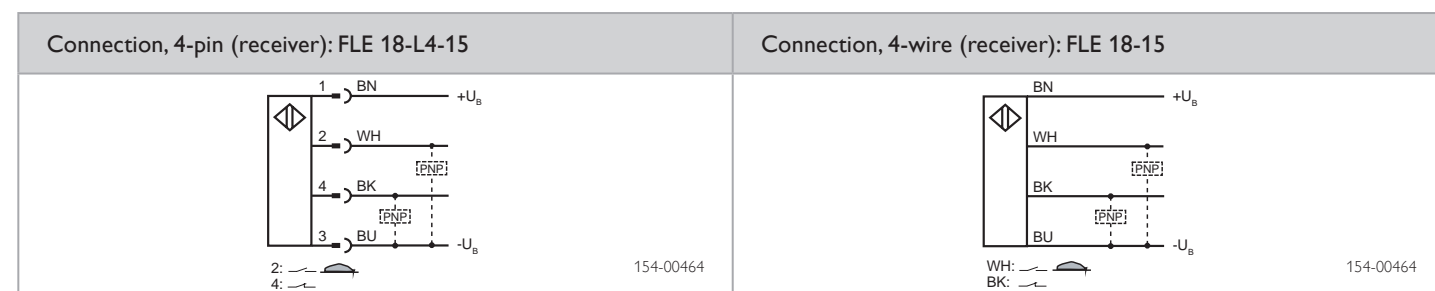
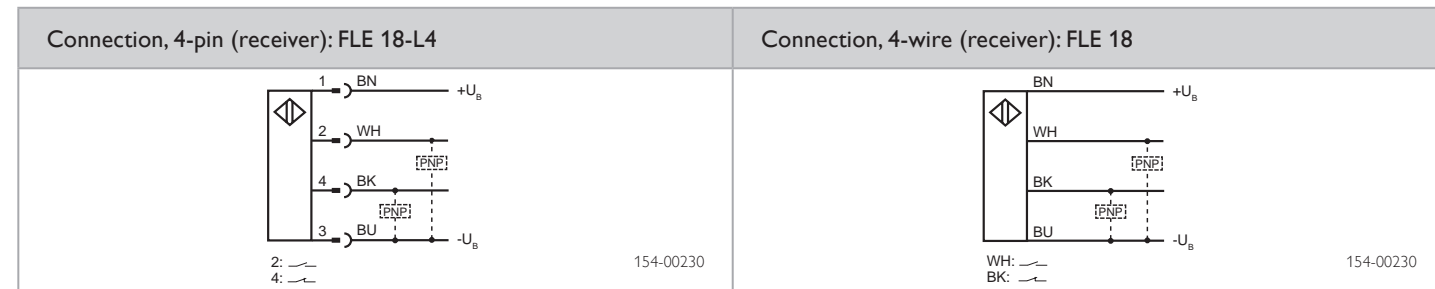
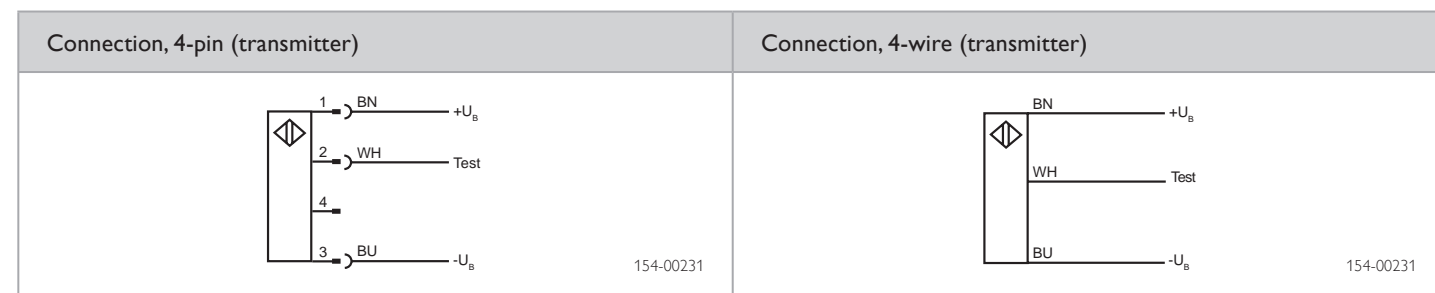
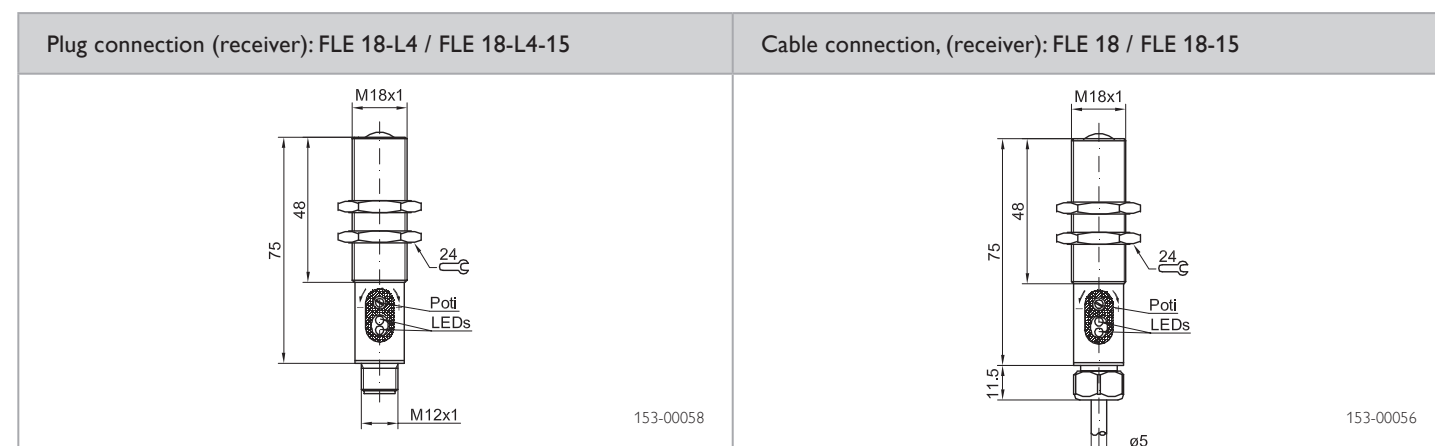
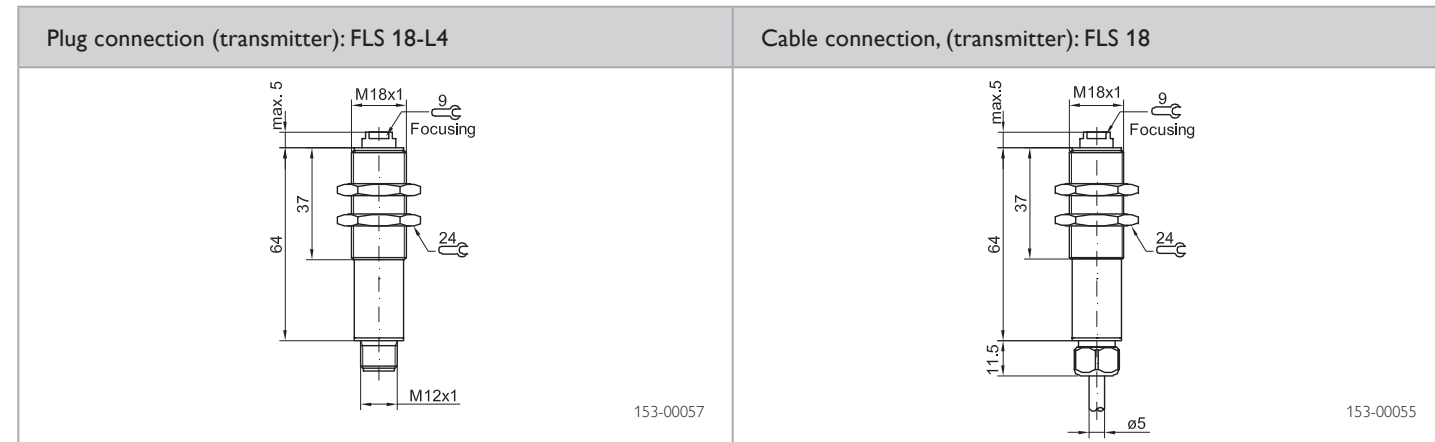
- Operating range: 50 m
- Red light laser, 650 nm
- Transmitter beam can be focused according to application
- Accuracy adjustable via beam spot size
- Smallest detectable part: 0.03 mm
- Switching frequency, 6000 Hz
- Metal M18 threaded sleeve

| Optical data | | Functions | |
|-------------------------------------|--|--------------------------------|-----------------------------|
| Operating range | 0 ... 50 m | Indicator LED, green | Operating voltage indicator |
| Type of light | Laser, red, 650 nm | Indicator LED, yellow | Switching output indicator |
| Laser Class (DIN EN 60825-1:2008-5) | 2 | Indicator LED, red | Contamination indicator |
| | | Sensitivity adjustment | Via 18-step potentiometer |
| | | Default settings | Max. operating range |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _b | 10 ... 30V DC ¹ | Dimensions | (See dimensional drawings) |
| No-load current, I ₀ | ≤ 25 mA | Enclosure rating | IP 65 ² |
| Output current, I _e | ≤ 200 mA | Material, housing | Brass, nickel-plated |
| Protective circuits | Reverse-polarity protection, U _b / short-circuit protection (Q) | Type of connection | (See Selection Table) |
| Protection Class | 2 | Ambient temperature: operation | -10 ... +50 °C |
| Standby time | ≤ 300 ms | Ambient temperature: storage | -20 ... +80 °C |
| Switching output, Q | PNP | Weight (plug device) | 85 g |
| Output function | N.O./N.C. (see Selection Table) | Weight (receiver device) | 190 g |
| Switching frequency, f (ti/tp 1:1) | ≤ 6000 Hz | | |
| Response time | 83 μs | | |
| Control input, Test | < 2V: transmitter off > 10V or Open: transmitter on | | |

¹ 10 % ripple, within U_b ² With connected IP 65 plug

| Transmitter / receiver | Switching output | Type of connection | Part number | Article number |
|------------------------|------------------|--------------------|--------------|----------------|
| Transmitter | - | Plug, M12x1, 4-pin | FLS 18-L4 | 580-51406 |
| Receiver | PNP (N.O./N.C.) | Plug, M12x1, 4-pin | FLE 18-L4 | 580-51410 |
| Receiver | PNP (N.C.) | Plug, M12x1, 4-pin | FLE 18-L4-15 | 580-51411 |
| Transmitter | - | Cable, 3 m, 4-wire | FLS 18 | 580-51407 |
| Receiver | PNP (N.O./N.C.) | Cable, 3 m, 4-wire | FLE 18 | 580-51412 |
| Receiver | PNP (N.C.) | Cable, 3 m, 4-wire | FLE 18-15 | 580-51413 |

| Accessories | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |





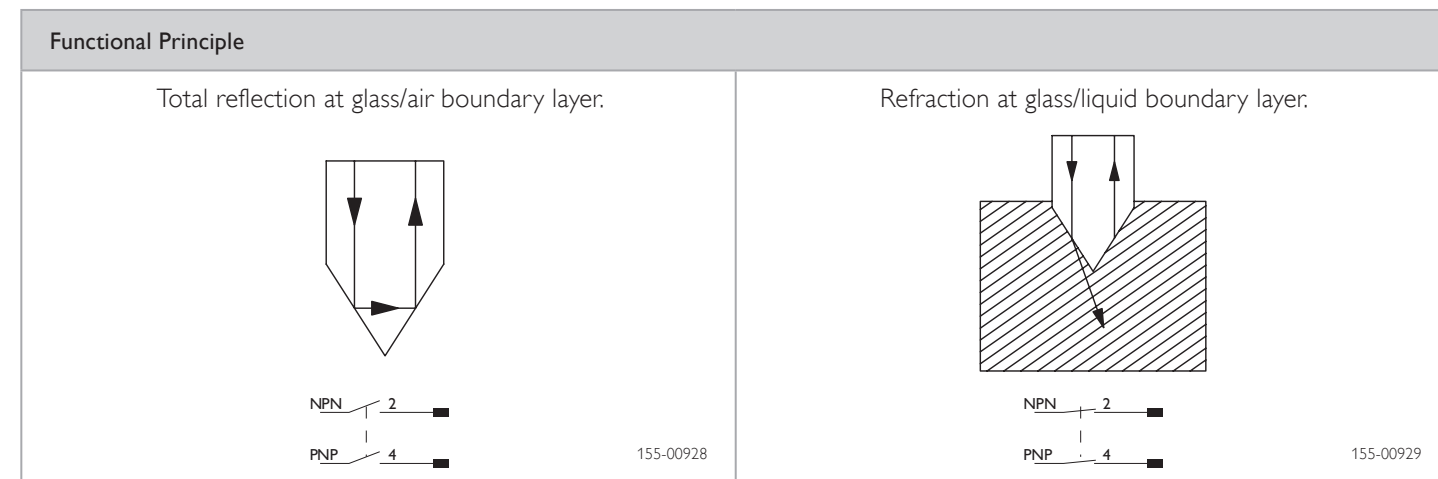
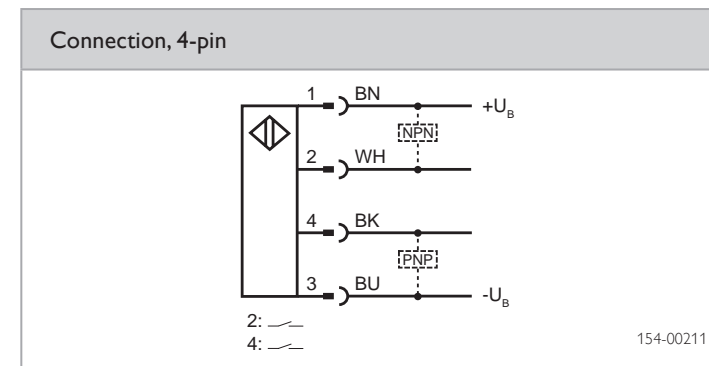
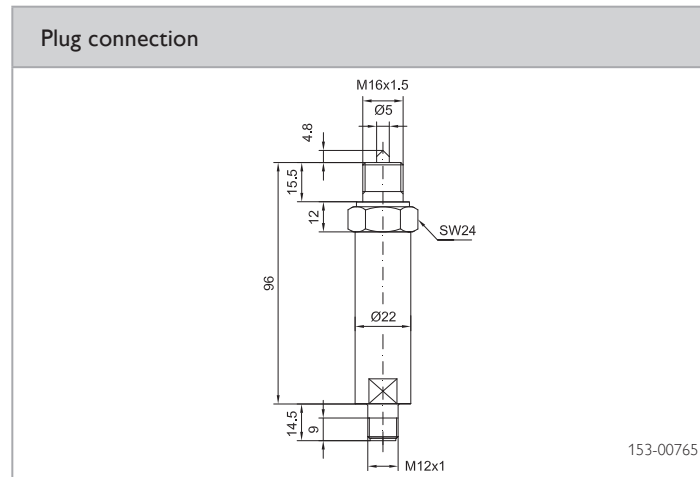
PRODUCT HIGHLIGHTS

- Sensor with glass rod prism for detecting liquids
- M16 x 1.5 thread for screwing into containers and pipes
- Reliable differentiation between liquids and foam
- Stainless steel

| Optical data | | Functions | |
|------------------------------------|--|--------------------------------|---|
| Scanning distance | (See Functional Principle) | Default settings | Switching process on submersion in a medium |
| Type of light | Infrared, pulsed, 880 nm | Condition | The refractive index of a liquid must be at least 1.20 Examples: reference air = 880 nm air = ca. 1.00 water = ca. 1.33 benzene = ca. 1.50 alcohol = ca. 1.32 |
| Ambient light limit | 1200 Lux | | |
| Electrical data | | Mechanical data | |
| Operating voltage, +U _B | 10 ... 30V DC ¹ | Dimensions | M16 x 96 mm |
| No-load current, I ₀ | ≤ 25 mA | Enclosure rating | IP 65 ² |
| Output current, I _e | ≤ 200 mA | Material, housing | Stainless steel, V2A |
| Pull-up resistance | 22 kΩ | Material, front screen | Glass |
| Pull-down resistance | 22 kΩ | Type of connection | (See Selection Table) |
| Protective circuits | Reverse-polarity protection, U _B / short-circuit protection | Pressure resistance | 10 bar |
| Protection Class | 2 | Impact resistance | EN 60947-5-2 |
| Switching output, Q | PNP/NPN, antivalent | Ambient temperature: operation | -20 ... +60 °C |
| Output function | N.O. | Ambient temperature: storage | -40 ... +80 °C |
| Switching frequency, f (ti/tp 1:1) | ≤ 1000 Hz | Weight (plug device) | 140 g |
| Response time | 500 μs | | |

¹ 10 % ripple, within U_B ² With connected IP 65 plug

| Scanning distance | Type of connection | Part number | Article number |
|----------------------------|--------------------|-----------------|----------------|
| (See Functional Principle) | Plug, M12x1, 4-pin | FMF 18-34 L4-SP | 504-50929 |



Accessories

| | |
|-------------------|---------------|
| Connection cables | From Page 670 |
| Brackets | From Page 642 |