

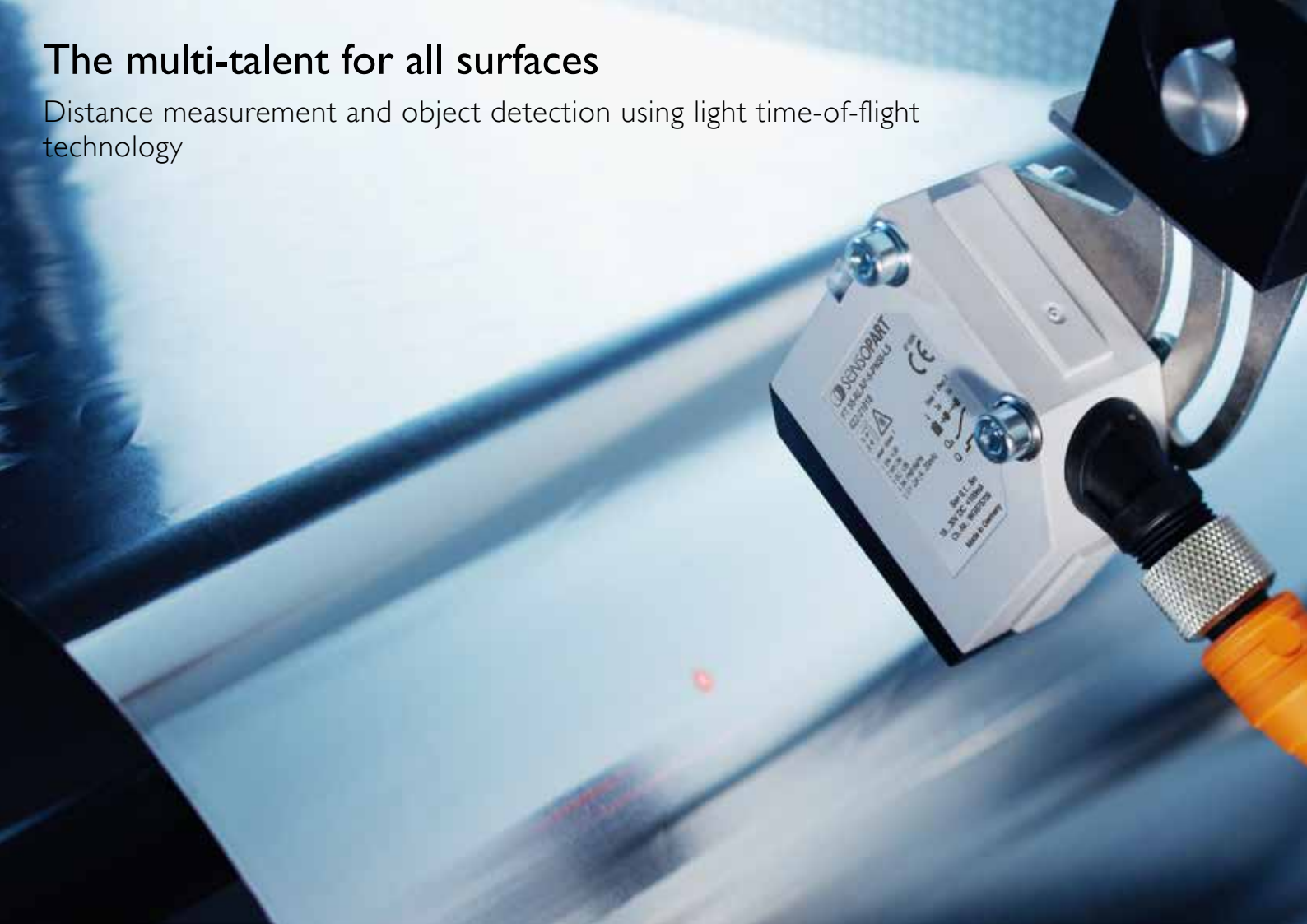
A finger on the pulse of time

F 55 – long-range compact time-of-flight sensors



The multi-talent for all surfaces

Distance measurement and object detection using light time-of-flight technology



Precise measurement and reliable detection of any objects at longer distances, with ambient light or against highly reflective backgrounds – these are typical requirements in factory automation. Conventional proximity sensors rapidly come up against their limits under these conditions, particularly when distances of well over a metre are involved.

Light time-of-flight measurement is the solution for such demanding automation tasks. SensoPart was one of the pioneers of this sensor principle, now improved in sensors of the FT55 series. In a very compact housing (50 x 50 x 23 mm) these light time-of-flight sensors offer excellent performance data that has previously only been available in considerably larger sizes: long ranges and scanning distances of up to 5 m on light objects or 3 m on very dark objects, measurement accuracy in the millimetre range, and cycle frequencies of up to 500 Hz for rapid processes.

High switching reliability under all light conditions

At the same time, the light time-of-flight measurement principle offers perfect background suppression. Any materials and surfaces, from deepest black to highly reflective can thus be reliably detected with light time-of-flight sensors, even with interfering backgrounds such as reflector jackets, signalling lamps, reflective metal beams or shiny wet floors.

Users stay on the safe side with the compact light time-of-flight sensors of the FT 55 series. Whether for inspecting the diameter of coils, positioning robot arms, checking the occupancy of shelves in high-bay warehouses, positioning logs, or measuring stack heights and filling levels – the sensors' reliable and repeatable results never fail to impress.

Time-of-flight sensors – offering universal use in numerous sectors and applications

For the most varied of materials and surfaces:

- Metal (reflective, structured)
- Plastics and rubber (black, coloured)
- Wood (rough sawn, grainy)
- Liquids (non-transparent)



Typical applications:

- Checking the presence of parts and assemblies
- Positioning robots in car production
- Checking the diameter of coils
- Measuring stack heights and the filling levels of non-transparent media
- Positioning tasks in palletising plants
- Collision prevention and monitoring the surroundings on AGVs



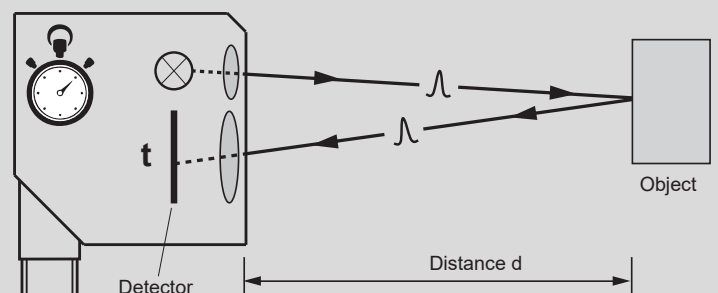
In front of problematic backgrounds:

- Ambient light (signalling lamps)
- Reflective objects (shelving beams, wet floors)
- Reflections (hi-vis clothing)



Time-of-flight principle:

SensoPart uses the measurement principle of time-of-flight technology for determining longer distances. Whereby a pulsed laser beam is emitted by the sensor and reflected by the target object. The distance to the object is measured using the time difference between emission of the light and reception of the reflection. This detection principle offers reliable background suppression and very high immunity to ambient light.



FT 55 – Time-of-flight sensors with long scanning range

Compact sensors for precision measuring tasks and reliable object detection



 made in Germany



Reliable object detection:

Even objects with highly reflective metal surfaces and at critical measurement angles are reliably detected.



Precise fine adjustment:

The clever mounting and adjustment concept has been specially developed for FT 55 distance sensors. Small changes in angle allow precise alignment of the light spot, even at long distances.

TYPICAL FT 55

- Long ranges and scanning distances (up to 5 m on light objects and 3 m on dark ones)
- Reliable object detection against any backgrounds thanks to light time-of-flight process
- High switching frequency (500/250 Hz) for rapid processes
- High repeatability in the mm range
- Laser class 1 – for optimum security
- Glass-fibre reinforced, hermetically-sealed plastic housing (IP67/IP69K)
- Simple mounting and use (dovetail, teach-in)
- IO-Link with 2 switching outputs, smart functions and measured value output (distance sensors F55-RLAP)



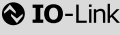


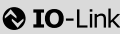



Measuring or switching – the right variant for every application

Measuring distances: laser distance sensors with analogue output

The distance sensors that function according to the time-of-flight principle measure distances ranging from 60 mm to 5 m with utmost precision. They provide a signal that is proportional to the distance via the integrated analogue output (4...20 mA/0...10V, invertible characteristics) and also have a switching output with switching window function that is adjustable independently of the analogue measurement range. The measuring distance sensor with analogue output is used, for example, for inspecting the diameter of coils, positioning robots or measuring filling levels and stack heights.

Object detection: laser proximity sensor with background suppression

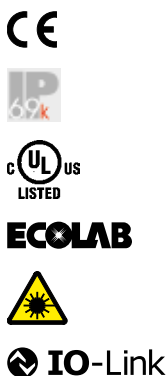
The proximity sensor variants of type FT 55-RLHP2 are available with one or two digital switching outputs and offer reliable object detection at long distances (up to 5 m on white objects and 3 m on black objects). Dependable detection of the target object is also guaranteed in front of interfering backgrounds regardless of the color, shape, structure and alignment of the object. The light time-of-flight scanners are used, for example, for inspecting the mounting of rubber and plastic components during car production, for checking the occupancy of shelves in high-bay warehouses, or for inspecting the position of logs.

FT 55 – product overview					
	Type of light	Adjustment	Scanning distance/Range ¹	Special features	Page
Laser distance sensors (pointing at object)					
FT 55-RLAP	Laser 	Teach-in  (key and control cable) 	0.1 to 5 m	<ul style="list-style-type: none"> • Long-range measurement up to 5 m on white, 3 m on black • Analogue output 4 to 20 mA and 0 to 10V (changeable via IO-Link), output of measured value via IO-Link • Switching output with automatic detection PNP/NPN with switching point, window and hysteresis function (window taught by teach-in, switching point and hysteresis via IO-Link) • Extensive setting options via IO-Link • Laser class 1 	6
FT 55-RLAP2	Laser 	Teach-in  (key and control cable) 	0,06 to 5 m	<ul style="list-style-type: none"> • Long-range measurement • Output of measured value via IO-Link • Switching output with automatic detection PNP/NPN with switching point, window and hysteresis function (window taught by teach-in, switching point and hysteresis via IO-Link) • Extensive setting options via IO-Link • Laser class 1 	8
Photoelectric proximity sensor with background suppression (BGS)					
FT 55-RLHP2	Laser 	Teach-in  (key and control cable) 	0 to 5 m	<ul style="list-style-type: none"> • Precise object detection at long ranges, up to 5 m on white and 3 m on black • Extensive setting options via IO-Link • 1 or 2 physical switching outputs (IO-Link always 2 virtual switching outputs) • Laser class 1 	10

¹ Reference material white, 90 % reflectivity

FT 55-RLAP

Distance sensor for large distances – Time-of-flight technology



PRODUCT HIGHLIGHTS

- For measurement and control tasks with all object surfaces at long scanning distances
- Stable and precise distance measurement even with tilted objects and with bright, highly reflective or shiny backgrounds
- Compact design for an easy integration
- High flexibility thanks to invertible analogue characteristic (Q_A) and window mode (Q)
- Easy installation and operation via external teach-in
- Clearly visible laser light spot (laser class 1) for an easy alignment and full eye safety

Optical data		Functions	
Measurement range	0.1 ... 5 m (see Selection Table) ¹	Indicator LED 2, green	Operating voltage indicator
Resolution	< 5 mm (12-bit)	Indicator LED 2, yellow	Status indicator analogue output
Linearity	± 30 mm ^{1,2}	Indicator LED 1 yellow	Switching output indicator
Repeatability	1.2 mm ^{1,2,3}	Measurement range adjustment	Via Teach-in button or control input
Hysteresis	20 mm	Adjustment possibilities	Analogue measurement range Q_A
Type of light	Laser, red 655 nm		Invertible analogue characteristic
Laser class (IEC 60825-1)	1		Switching output Q (window mode)
			N.O. / N.C. and Auto-Detect / NPN / PNP via teach-in and control line
		Default settings	See Selection Table
Electrical data			
Operating voltage $+U_B$	18 ... 30V DC	Response time Q	2 ms
No-load current I	≤ 60 mA	Load	≤ 500 Ohm (4 ... 20 mA) ≥ 4 k Ohm (0 ... 10 V)
Output current $I_e Q$	≤ 100 mA	Analogue output Q_A	4 ... 20 mA / 0 ... 10 V
Protection circuits	Reverse polarity protection U_B / short-circuit protection (Q)	Update rate Q_A	2 ms
Protection class	2	Temperature drift	< 2 mm / K
Power On Delay	< 5 s	Warm-up time	20 min.
Switching output Q	Auto-Detect (PNP/NPN) ⁴	Control input I_N	$+U_B$ = Teach-in / $-U_B$ = button locked Open = normal operation
Output function	N.O. / N.C.		
Switching frequency f (ti/tp 1:1) Q	≤ 250 Hz		
Mechanical data		IO-Link	
Dimensions	50 x 50.1 x 23 mm	Communication mode	COM 2
Enclosure rating	IP 67 & IP 69K ⁵	Min. cycle time	2.3 ms
Material, housing	ABS	SIO mode	compatible
Material, front screen	PMMA	Process bit length	24 Bit
Type of connection	See Selection Table	Specification	1.1
Ambient temperature: operation	-40 ... +60 °C ^{6,7}		
Ambient temperature: storage	-40 ... +80 °C		
Weight (plug device)	42 g		
Resistance to vibration and impacts	EN 60947-5-2		

¹ Reference material 90 % reflectivity

² At 50 Hz

³ For 1 σ , see diagram for further values

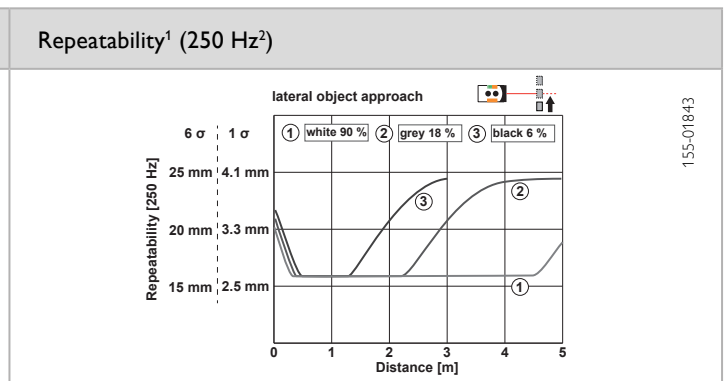
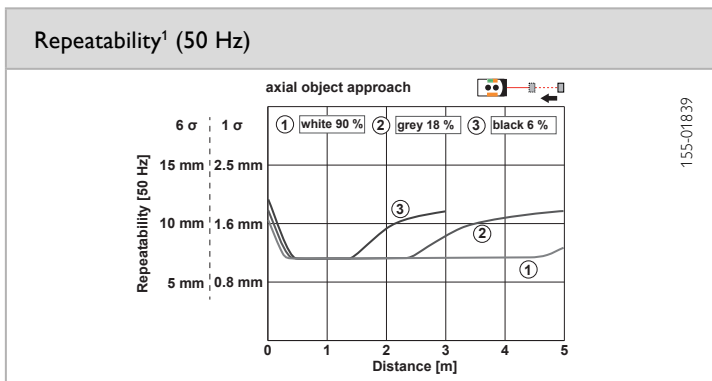
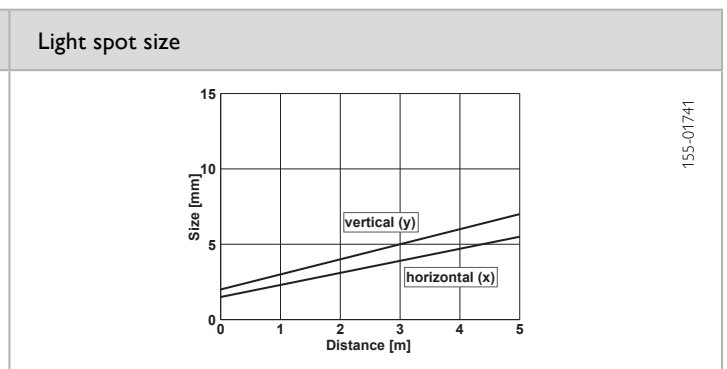
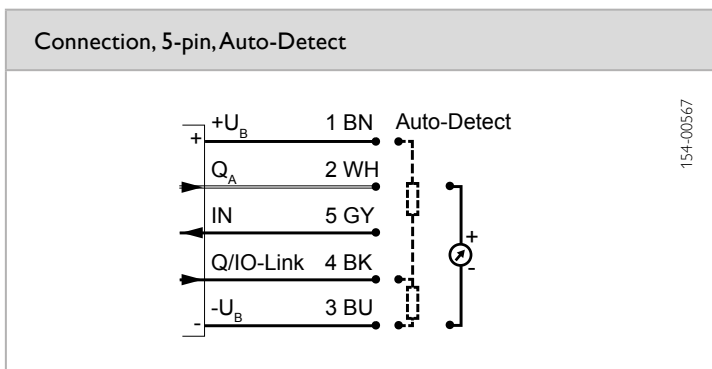
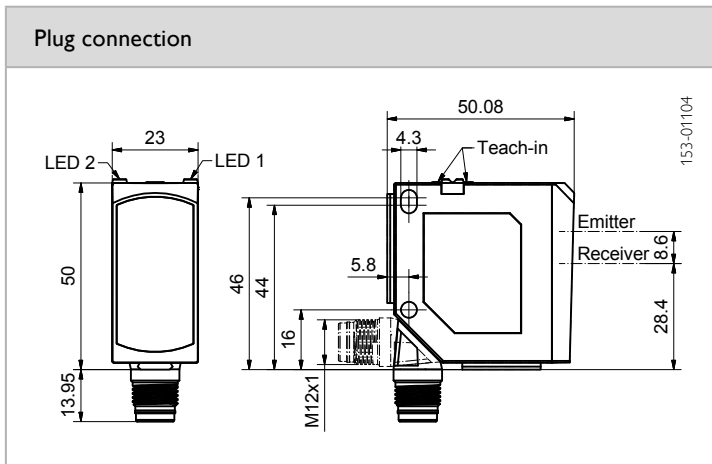
⁴ Auto-Detect: Automatic selection of PNP or NPN by the sensor; PNP or NPN can be fixed

⁵ With connected IP 67 / IP 69K plug

⁶ Up to +50 °C with current output 4 ... 20 mA

⁷ UL: max. +45 °C

Measurement range ¹	Analogue output	Switching output	Type of connection	Part Number	Article number
0.1 ... 5 m	4 ... 20 mA	Auto-Detect	Plug, M12x1, 5-pin, IO-Link	FT 55-RLAP-5-PNSIL-L5	622-21023
0.1 ... 5 m	0 ... 10V	Auto-Detect	Plug, M12x1, 5-pin, IO-Link	FT 55-RLAP-5-PNSUL-L5	622-21024



¹ At constant ambient conditions ² Automatic adjustment to 50 Hz at constant distance

Characteristic analogue curve	Reference material	Measurement range
	White (90 %)	0.1 ... 5 m
	Grey (18 %)	0.1 ... 5 m
	Black (6 %)	0.1 ... 3 m
	Default setting³	
	Analogue output Q_A (4...20 mA / 0,09 ... 10V)	0.3 ... 3 m
	Switching output Q (A_1 ... A_2), N.O., Auto-Detect	0.3 ... 3 m
	Accessories	
	Connection cables	See product catalog/ accessories
	Brackets	

³The specified precision is achieved by teaching the distances

FT 55-RLAP2

Distance sensor with IO-Link measurement value output



PRODUCT HIGHLIGHTS

- Measurement value output via IO-Link
- For detection tasks with all object surfaces at high scanning distances
- Reliable object detection even with tilted objects and with bright, highly reflective or shiny backgrounds
- Compact housing for an easy integration
- Simple teach-in
- Clearly visible laser light spot (laser class 1) for an easy alignment and full eye safety

Optical data		Functions	
Scanning distance	0 ... 5 m (see Selection Table) ¹	Indicator LED 2 green	Operating voltage indicator
Hysteresis	20 mm	Indicator LED 1 yellow	Switching output indicator Q
Black/white shift (6% / 90%)	≤ ± 40 mm	Scanning distance adjustment	Via Teach-in Button and IO-Link
Grey value shift (18% / 90%)	≤ ± 40 mm	Adjustment possibilities	N.O. / N.C. via Teach-in Button and IO-Link, wide variety of adjustment possibilities for service and process data via IO-Link
Type of light	Laser, red 655 nm	Default settings	3 m, N.O.
Laser class (IEC 60825-1)	1		
Resolution	< 5 mm		
Linearity	± 30 mm		
Repeatability	1.2 mm		
Electrical data		Mechanical data	
Operating voltage +U _b	18 ... 30V DC	Dimensions	50 x 50.1 x 23 mm
No-load current I ₀	≤ 60 mA	Enclosure rating	IP 67 & IP 69K ³
Output current I _{e Q}	≤ 100 mA	Material, housing	ABS
Protection circuits	Reverse polarity protection U _b / short-circuit protection (Q)	Material, front screen	PMMA
Protection class	2	Type of connection	See Selection table
Power On Delay	< 5 s	Ambient temperature: operation	-40 ... +60 °C ⁴
Switching output Q	1 x Auto-Detect (PNP/NPN) ²	Ambient temperature: storage	-40 ... +80 °C
Output function	N.O. / N.C.	Weight (plug device)	42 g
Switching frequency f (ti/tp 1:1) Q	≤ 250 Hz	Resistance to vibration and impacts	EN 60947-5-2
Response time Q	1 ms	IO-Link	
Temperature drift	< 2 mm / K	Communication mode	COM 2
Warm-up time	20 min.	Min. cycle time	2.3 ms
Control input IN	+U _b = Teach-in -U _b = button locked Open = normal operation	SIO mode	compatible
		Process bit length	24 Bit
		Specification	1.1

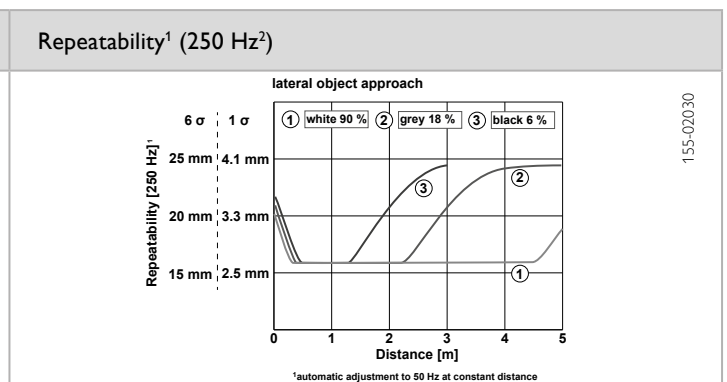
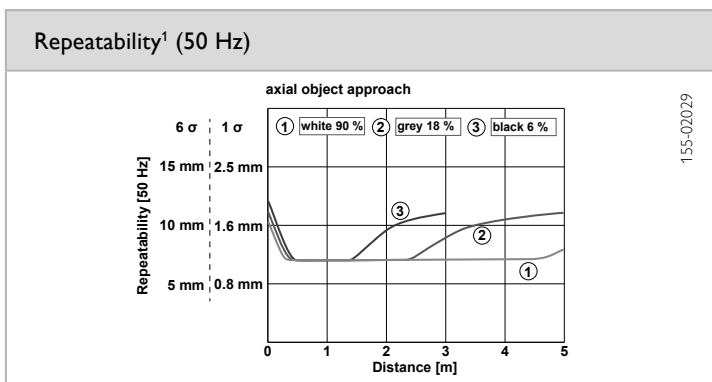
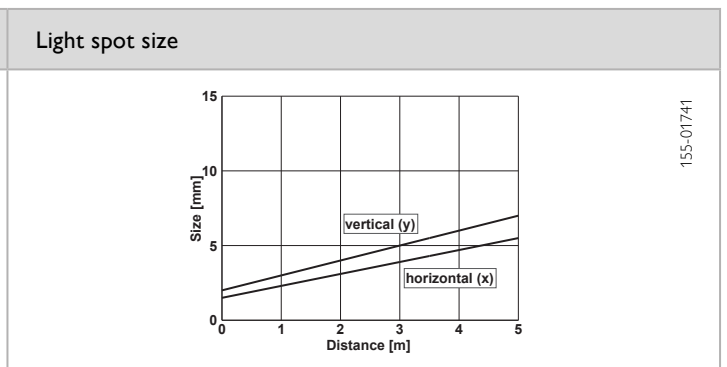
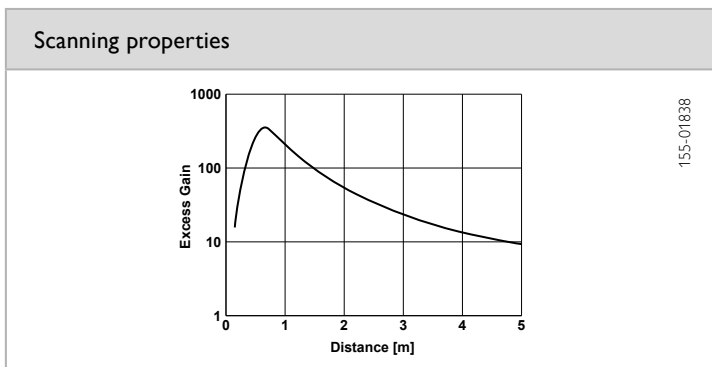
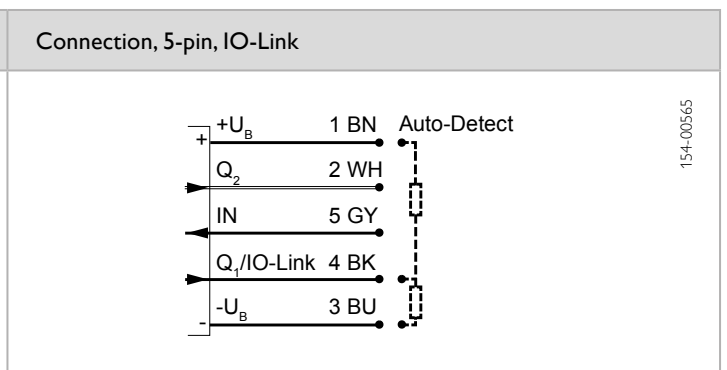
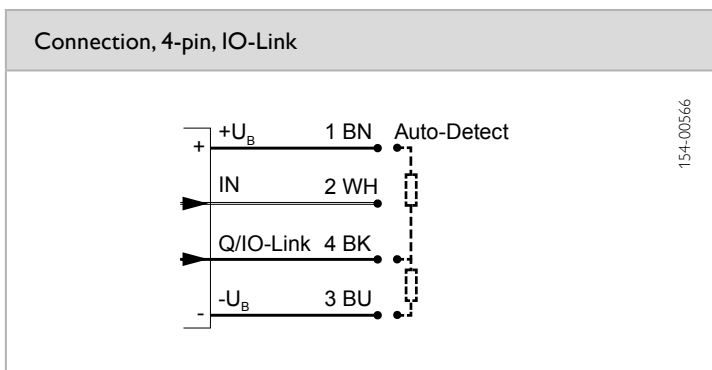
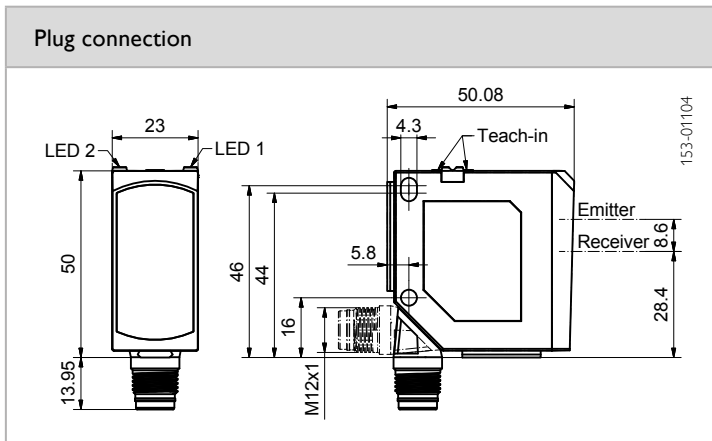
¹ Reference material 90 % reflectivity

² Auto-Detect: Automatic selection of PNP or NPN by the sensor, PNP or NPN can be fixed

³ With connected IP 67 / IP 69K plug

⁴ UL: max. +45 °C

Scanning distance	Switching output	Type of connection	Part Number	Article number
0.06 ... 5 m	1 x Auto-Detect	Plug, M12x1, 4-pin, IO-Link	FT 55-RLAP2-PNSL-L4	623-11035
0.06 ... 5 m	2 x Auto-Detect	Plug, M12x1, 5-pin, IO-Link	FT 55-RLAP2-2PNSL-L5	622-21022

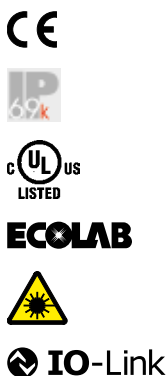


¹ At constant ambient conditions ² Automatic adjustment to 50 Hz at constant distance

Reference material	Scanning distance	Accessories	
White (90 %)	0.06 ... 5 m	Connection cables Brackets	See product catalog/ accessories
Grey (18 %)	0.06 ... 5 m		
Black (6 %)	0.06 ... 3 m		

FT 55-RLHP2

Laser photoelectric proximity sensor with background suppression – Time-of-flight technology



PRODUCT HIGHLIGHTS

- For detection tasks with all object surfaces at high scanning distances
- Reliable object detection even with tilted objects and with bright, highly reflective or shiny backgrounds
- Compact housing for an easy integration
- Simple teach-in (also external)
- Clearly visible laser light spot (laser class 1) for an easy alignment and full eye safety

Optical data		Functions	
Scanning distance	0 ... 5 m (see Selection Table) ¹	Indicator LED 2 green	Operating voltage indicator
Hysteresis	20 mm	Indicator LED 2 yellow ²	Switching output indicator Q ₂
Black/white shift (6% / 90%)	≤ ± 40 mm	Indicator LED 1 yellow	Switching output indicator Q resp. Q ₁
Grey value shift (18% / 90%)	≤ ± 40 mm	Scanning distance adjustment	Via Teach-in Button and control input
Type of light	Laser, red 655 nm	Adjustment possibilities	N.O. / N.C. / antivalent ² via Teach-in Button and control input
Laser class (IEC 60825-1)	1	Default settings	3 m, N.O.
Electrical data		Mechanical data	
Operating voltage +U _B	18 ... 30V DC	Dimensions	50 x 50,1 x 23 mm
No-load current I ₀	≤ 60 mA	Enclosure rating	IP 67 & IP 69K ⁴
Output current I _e Q	≤ 100 mA	Material, housing	ABS
Protection circuits	Reverse polarity protection U _B / short-circuit protection (Q)	Material, front screen	PMMA
Protection class	2	Type of connection	See Selection table
Power On Delay	< 5 s	Ambient temperature: operation	-40 ... +60 °C ⁵
Switching output Q	1 x Auto-Detect (PNP/NPN) ³ 2 x Auto-Detect (PNP/NPN) ³	Ambient temperature: storage	-40 ... +80 °C
Output function	N.O. / N.C. / antivalent ²	Weight (plug device)	42 g
Switching frequency f (ti/tp 1:1) Q	≤ 500 Hz	Resistance to vibration and impacts	EN 60947-5-2
Response time Q	1 ms	IO-Link	
Temperature drift	< 2 mm / K	Communication mode	COM 2
Warm-up time	20 min.	Min. cycle time	2.3 ms
Control input IN	+U _B = Teach-in -U _B = button locked Open = normal operation	SIO mode	compatible
		Process bit length	16 Bit
		Specification	1.1

¹ Reference material 90 % reflectivity

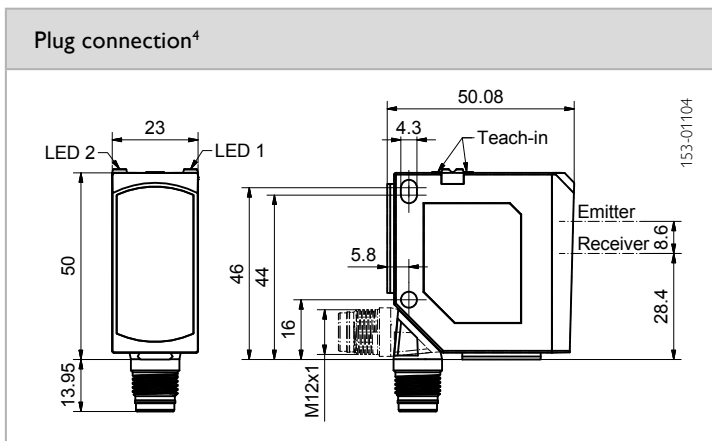
² For variant FT 55-RLHP2-2PNS-L5

³ Auto-Detect: Automatic selection of PNP or NPN by the sensor; PNP or NPN can be fixed

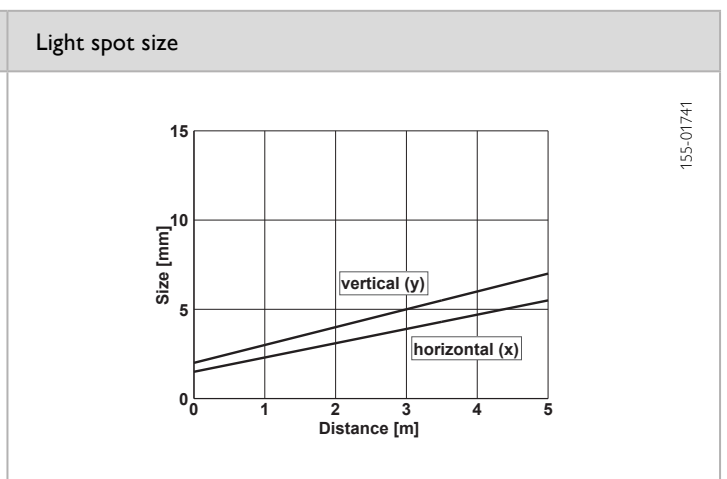
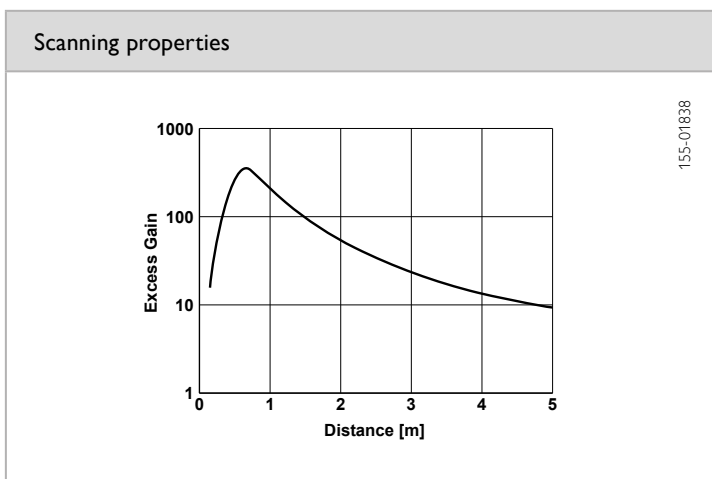
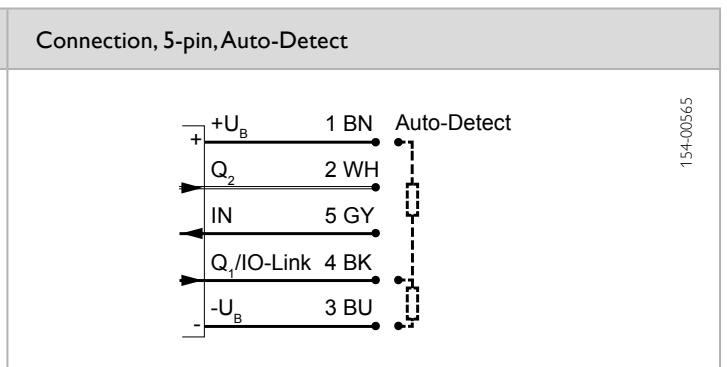
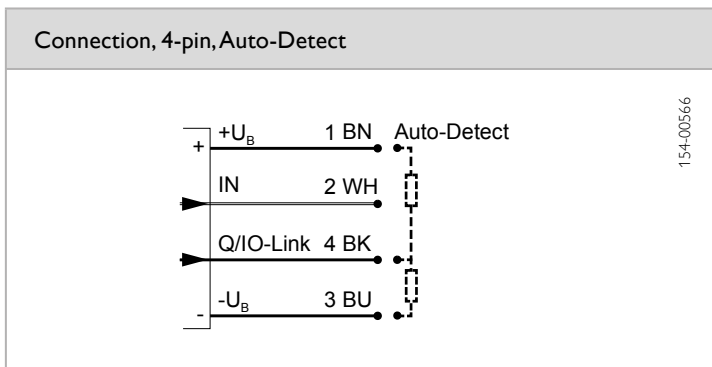
⁴ With connected IP 67 / IP 69K plug

⁵ UL: max. +45 °C

Scanning distance	Switching output	Type of connection	Part Number	Article number
0 ... 5 m	1 x Auto-Detect	Plug, M12x1, 4-pin, IO-Link	FT 55-RLHP2-PNSL-L4	623-11038
0 ... 5 m	2 x Auto-Detect	Plug, M12x1, 5-pin, IO-Link	FT 55-RLHP2-2PNSL-L5	623-11039



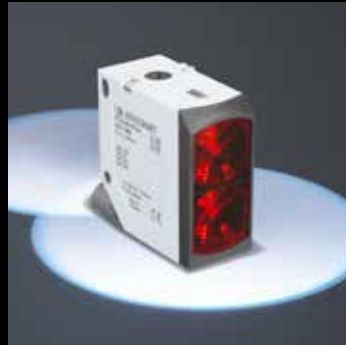
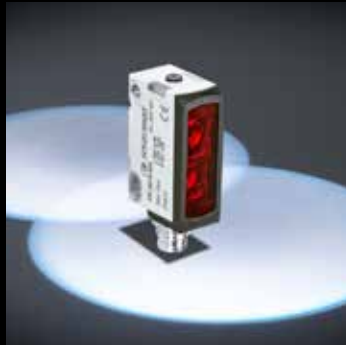
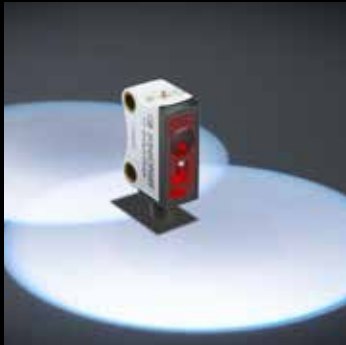
⁴ FT 55-RLHP2-PNS-L4 with a teach-in button



Reference material	Scanning distance
White (90 %)	0 ... 5 m
Grey (18 %)	0 ... 5 m
Black (6 %)	0.05... 3 m

Accessories

Connection cables	See product catalog/ accessories
Brackets	



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

True to our motto, we offer 'easy to integrate' VISOR® Vision sensors and a range of 'best in class' optical sensors – all made in Germany. We still have plenty of ideas for the future – watch this space.

SENSOR TECHNOLOGY

Light barriers
Proximity switches
Laser sensors
Miniature sensors
Distance sensors
Color sensors
Contrast sensors
Anti-collision sensors
Slot sensors
Fibre-optic amplifiers
Inductive sensors
Capacitive sensors
Ultrasonic sensors

Vision sensors
Smart cameras
Vision systems
Object detection
Object measurement
Color detection
Code reading
Lighting
Lenses

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