SENSO**PART**

Maximum precision

FR 25-RLO & FR 55-RLO – Autocollimation laser retroreflective
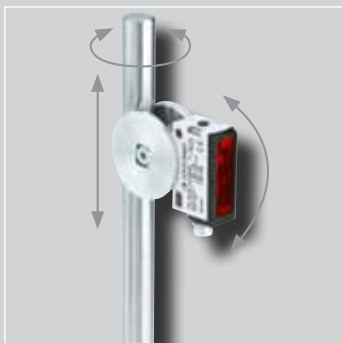photoelectric sensor

FR 25-RLO & FR 55-RLO

Autocollimation laser retroreflective photoelectric sensor

■■ made in Germany

F 25 with bracket MBD F 25ST.

Simple mounting, precise adjustment:
The robust mounting accessories toge-ther with the dovetail guide which is integrated in the housing permit fine retro-adjustment of the laser sensors.

F 25 with bracket MBD-S94.

TYPICAL RLO

- Safe operation due to laser class 1 ⚠

- Reliable small-part detection from a size of 0.2 mm

- High switching frequency of 10 kHz with miniature housing

- High positioning accuracy thanks to minimum response time and constant detetion position with lateral object approach

- Reliable object detection from a range of 0 mm thanks to autocollimation

- Dynamic, static or external teach-in

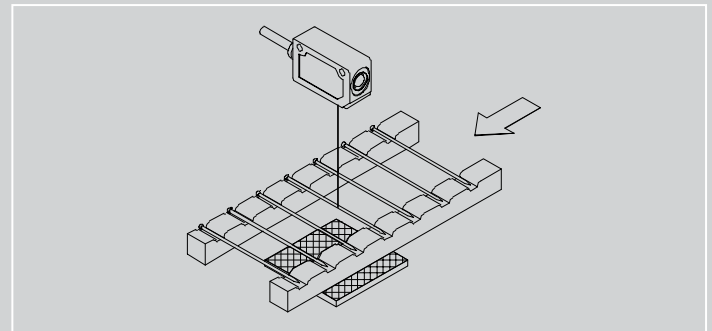## Precise object detection via autocollimation principle
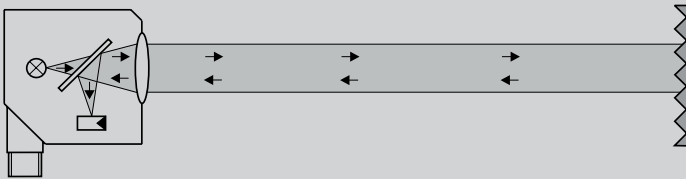
With retroreflective photoelectric sensors one speaks of the autocollimation principle when the light reflected from the reflector travels parallel to itself (i.e. within itself). The light emitted by the sensor hits a reflector and is reflected. The reflected light is then deflected to a receiver by a semi-transparent mirror and evaluated.
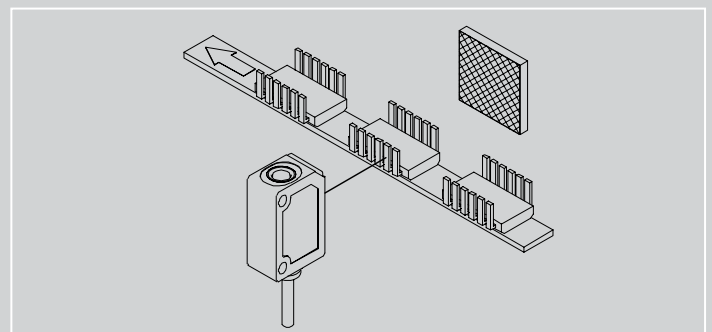
The FR 25-RLO and FR 55-RLO autocollimation laser retroreflective photoelectric sensors have a small homogeneous light spot over the entire detection range. As transmitter beam and receiver beam are on a single axis, it is possible to detect even the smallest of parts through small drilled holes and from a range of 0 mm. Adjustment takes place using teach-in – either via button or via external control line. In combination with the function ,,dynamic teach-in'', setting via control line is also possible when the sensor is placed in an inaccessible location.

The FR 25-RLO miniature retroreflective photoelectric sensor is particularly characterised by its excellent performance. The FR 25-RLO can detect small parts from an object size of 0.2 mm over the entire detection range. With its high switching frequency of 10 kHz and a minimum response time of 50 µs, the sensor masters even the fastest automation processes. It guarantees maximum precision in positioning tasks thanks to the constant detection position of objects with lateral approach over the entire operating range. With these features, the FR 25-RLO is unique in the market for sensors of this size when it comes to speed and precision.
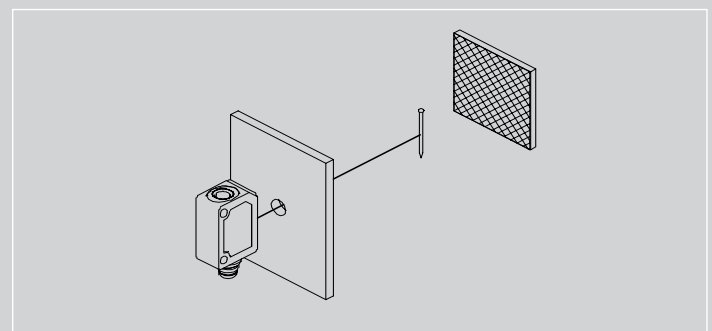
Typical applications

Detection of pins within a range of tenths of a millimetre.

Detection of IC-Pins.

Detection of small parts behind drilled holes.

Further applications:

- Precise front-edge detection
- Small part detection

FR 25-RLO

Autocollimation laser retroreflective photoelectric sensor
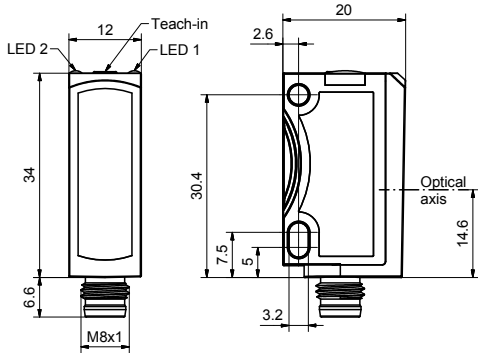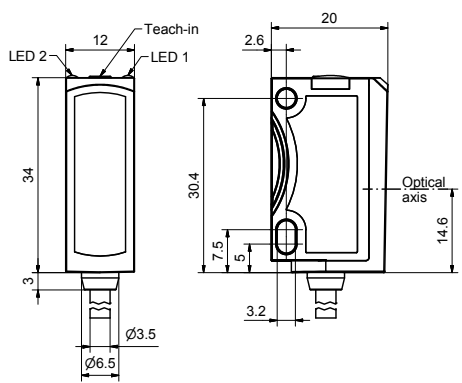
CE
IP 69k
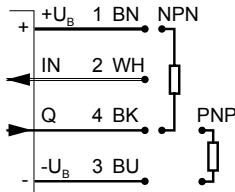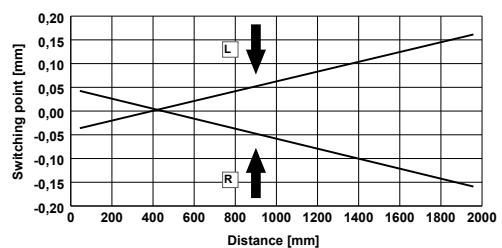c UL us LISTED
ECOLAB

PRODUCT HIGHLIGHTS

- Reliable small-part detection over the entire operating range from a size of 0.2 mm
- Precise front-edge detection even in fastest automation processes thanks to a high switching frequency of 10 kHz
- Constant detection position with lateral object approach over the entire operating range for maximum switching point and positioning accuracy
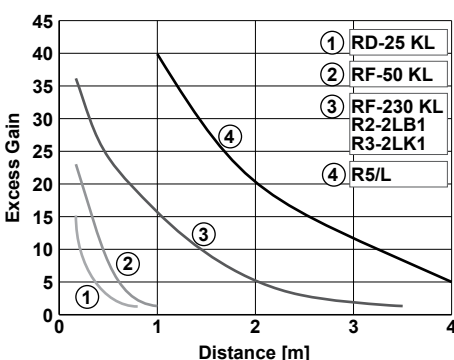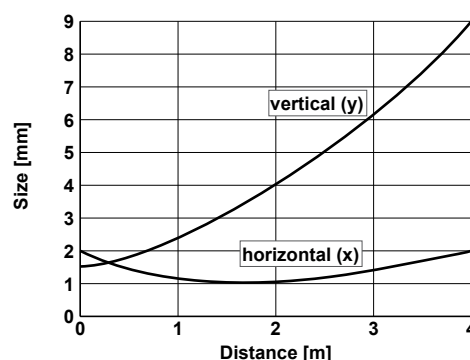
Optical data			
Limit range	0 … 5 m[1]		
Operating range	0 … 4 m[1]		
Type of light	Laser, red, 650 nm		
Light spot size	See diagram		
Laser Class (DIN EN 60825-1:2008-5)	1		
Polarising filter	Yes		

Functions	
Indicator LED, green	Operating voltage indicator
Indicator LED, yellow	Switching output indicator
Sensitivity adjustment	Via Teach-in button and control input
Teach-in modes	Mode 1: during running process Mode 2: during standing process
Adjustment possibilities	N.O./N.C. via Teach-in button and control input Button lock via control input
Default settings	Max. range and N.O.

Electrical data	
Operating voltage, $+U_B$	10 … 30 V DC[2]
No-load current, I_0	≤ 30 mA
Output current, Ie	≤ 100 mA
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection (Q)
Protection Class	2
Standby time	< 300 ms
Switching output, Q	PNP/NPN (see Selection Table)
Output function	N.O./N.C.
Switching frequency, f (ti/tp 1:1)	(see Selection Table)
Response time	(see Selection Table)
Control input, IN[3]	$+ U_B$ = teach-in $- U_B$ = button locked Open = normal operation

Mechanical data	
Dimensions	34 × 20 × 12 mm[3]
Enclosure rating	IP 69K & IP 67[3]
Material, housing	ABS
Material, front screen	PMMA
Type of connection	(see Selection Table)
Ambient temperature: operation	-20 … +60 °C[5]
Ambient temperature: storage	-20 … +80 °C
Weight (plug device)	10 g
Weight (metal plug device[5])	10 g
Weight (cable device)	40 g
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] With connected IP 67 / IP 69K plug   [4] UL: -20 °C... + 50 °C   [5] no Ecolab

Switching frequency, f (ti/tp 1:1)[2]	Response time	Switching output	Type of connection	Part number	Article number
≤ 10 kHz	50 µs	PNP	Metal plug, M8×1, 4-pin	FR 25-RLO1-PS-M4M	609-31003
≤ 10 kHz	50 µs	NPN	Metal plug, M8×1, 4-pin	FR 25-RLO1-NS-M4M	609-31004
≤ 10 kHz	50 µs	PNP	Cable, 2 m, 4-wire	FR 25-RLO1-PS-K4	609-31005
≤ 10 kHz	50 µs	NPN	Cable, 2 m, 4-wire	FR 25-RLO1-NS-K4	609-31006
≤ 4 kHz	125 µs	PNP	Plug, M8×1, 4-pin	FR 25-RLO2-PS-M4	609-31007
≤ 4 kHz	125 µs	NPN	Plug, M8×1, 4-pin	FR 25-RLO2-NS-M4	609-31008
≤ 4 kHz	125 µs	PNP	Cable, 2 m, 4-wire	FR 25-RLO2-PS-K4	609-31009
≤ 4 kHz	125 µs	NPN	Cable, 2 m, 4-wire	FR 25-RLO2-NS-K4	609-31010

Version: 04/2013. Subject to changes; diagrams similar

Plug connection

153-01088

Cable connection

153-01089

Connection, 4-pin

154-00312

Lateral object approach

Reference material: RF-230 KL reflector

1155-01720

Functional reserves

①	**RD-25 KL**
②	**RF-50 KL**
③	**RF-230 KL** **R2-2LB1** **R3-2LK1**
④	**R5/L**

155-01715

Light spot size

155-01716

Small part detection

Reflector	Reflector distance	Scanning distance	Smallest detectable part
R5L	1000 ... 4000 mm	0 ... 4000 mm	≥ 1 mm
RD-25 KL	50 ... 500 mm	50 ... 500 mm	≥ 0.2 mm
RF-230 KL	500 ... 2500 mm	0 ... 500 mm	≥ 0.2 mm
R2-2LB1	500 ... 2500 mm	0 ... 500 mm	≥ 0.2 mm
R3-2LK1	500 ... 2500 mm	0 ... 500 mm	≥ 0.2 mm
RF-50 KL	100 ... 500 mm	100 ... 500 mm	≥ 0.2 mm

Reflector	Operating range (min./max. reflector distance)
R5L	0 ... 4000 mm
RD-25 KL	50 ... 600 mm
RF-230 KL	0 ... 2500 mm
R2-2LB1	0 ... 2500 mm
R3-2LK1	0 ... 2500 mm
RF-50 KL	0 ... 800 mm

FR 55-RLO

Autocollimation laser retroreflective photoelectric sensor


PRODUCT HIGHLIGHTS

- Reliable small-part detection from a size of 0.2 mm at a scanning distance of 0–5 m
- Precise front-edge detection even in fastest automation processes thanks to a high switching frequency of 5 kHz
- Reliable detection of objects through the smallest of openings thanks to autocollimation; therefore sensor can be placed outside any danger zone
- No blind zone - detection from a range of 0 mm

Optical data	
Limit range	0.3 … 14 m[1]
Operating range	0.3 … 12 m[1]
Type of light	LED, red, 640 nm
Light spot size	See diagram
Laser Class (DIN EN 60825-1:2008-5)	1
Polarising filter	Yes

Functions		
Indicator LED, green	Operating voltage indicator	
Indicator LED, yellow	Switching output indicator / contamination indicator	
Sensitivity adjustment	Via Teach-in button and control input	
Teach-in modes	Mode 1: during running process Mode 2: during standing process	
Adjustment possibilities	N.O./N.C. via Teach-in button and control input Button lock via control input	
Default settings	Max. range and N.O.	

Electrical data	
Operating voltage, $+U_B$	10 … 30 V DC[2]
No-load current, I_0	≤ 30 mA
Output current, Ie	≤ 100 mA
Protective circuits	Reverse-polarity protection, U_B / short-circuit protection (Q)
Protection Class	2
Standby time	< 300 ms
Switching output, Q	PNP/NPN (see Selection Table)
Output function	N.O./N.C.
Switching frequency, f (ti/tp 1:1)	(see Selection Table)
Response time	(see Selection Table)
Control input, IN	$+U_B$ = teach-in -U_B = button locked Open = normal operation

Mechanical data	
Dimensions	50 × 50.08 × 23 mm[3]
Enclosure rating	IP 69K & IP 67[3]
Material, housing	PC-ABS
Material, front screen	PMMA
Type of connection	(see Selection Table)
Ambient temperature: operation	-20 … +60 °C
Ambient temperature: storage	-20 … +80 °C
Weight (plug device)	35 g
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

Switching frequency f (ti/tp 1:1)[2]	Response time	Switching output	Type of connection	Part number	Article number
≤ 5 kHz	100 µs	PNP	Plug M12×1, 4-pin	FR 55-RLO1-PS-L4	621-11021
≤ 5 kHz	100 µs	NPN	Plug M12×1, 4-pin	FR 55-RLO1-NS-L4	621-11022
≤ 2,5 kHz	200 µs	PNP	Plug M12×1, 4-pin	FR 55-RLO2-PS-L4	621-11023
≤ 2,5 kHz	200 µs	NPN	Plug M12×1, 4-pin	FR 55-RLO2-NS-L4	621-11024

Plug connection
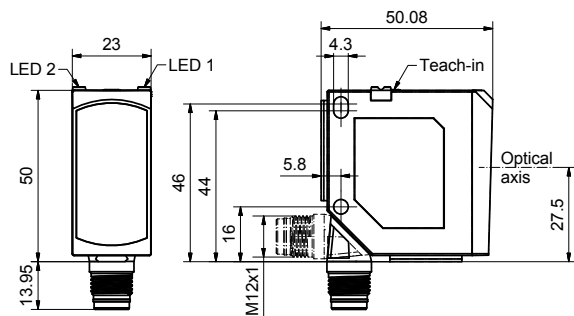
153-01090

Connection, 4-pin

+U$_B$	1	BN
IN	2	WH
Q	4	BK
-U$_B$	3	BU
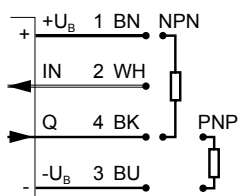
154-00312

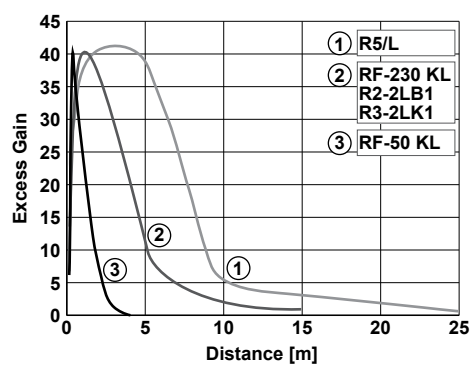## Lateral object approach
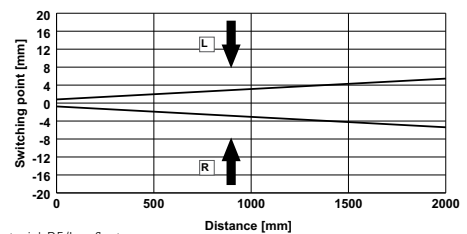
Reference material: R5/L reflector

155-01724

Functional reserves

①	R5/L
②	RF-230 KL R2-2LB1 R3-2LK1
③	RF-50 KL

155-01723

Light spot size
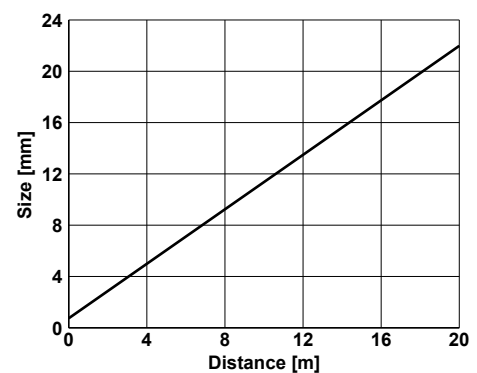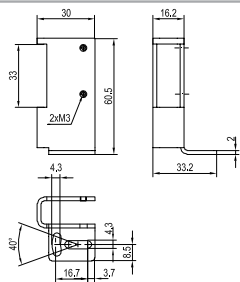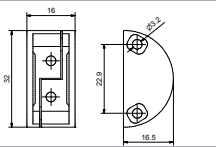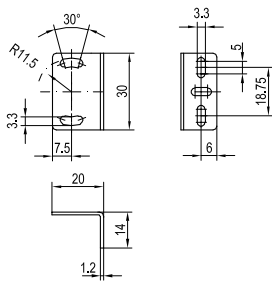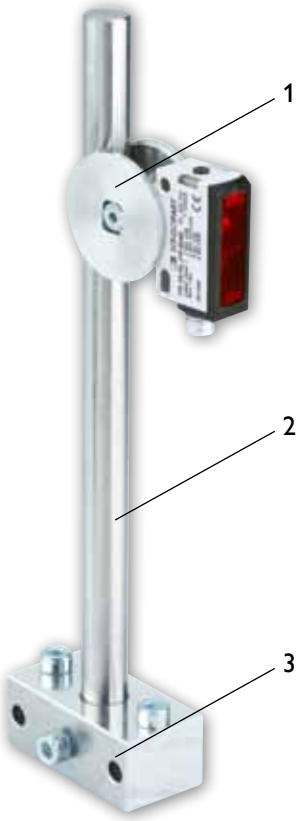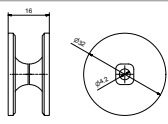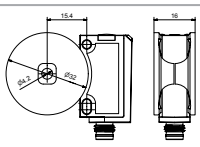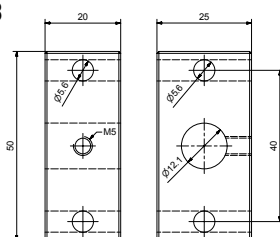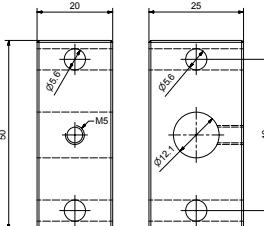
155-01722

Reflector	Operating range (min./max. reflector distance)
R5/L	0 … 20 m
RF-230 KL	0 … 15 m
R2-2LB1	0 … 15 m
R3-2LK1	0 … 15 m
RF-50 KL	0 … 3 m

Accessories

Brackets
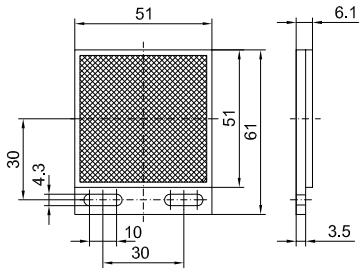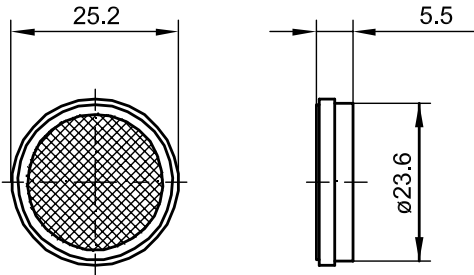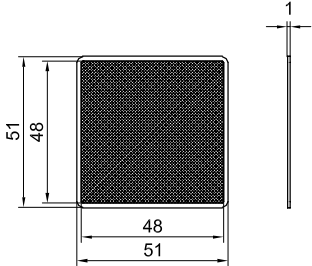
Brackets for F 25			
	153-00296	Part number / Article number	MSP F 20-1 / 558-41004
		Description	Protective sensor angle bracket with screws, very robust Material: stainless steel V2A
		Suitable for	F 20 F 25 UT 20 FL 20
	153-00945 153-00946	Part number / Article number	MBD F 25 / 661-01000
		Description	Dovetail clamp mounting, adjustable ± 15°, with screws Material: anodised aluminium
		Suitable for	F 25
	153-00241	Part number / Article number	MS F 20 / 558-41000
		Description	Mounting bracket with screws Material: nickel-plated steel
		Suitable for	F 20 F 25 UT 20 FL 20
	1 153-01001 153-01002	Part number / Article number	MBD F 25ST / 661-01001
		Description	Bracket for dovetail on M12 rod, with clamping screw Material: aluminium
		Suitable for	F 25
	2 x = 200 MST 45-20 x = 300 MST 45-30 x = 400 MST 45-40 153-00545	Part number / Article number	MST 45-20 / 543-11005 MST 45-30 / 543-11006 MST 45-40 / 543-11007
		Description	Mounting rod with M6 internal thread Material: aluminium
		Suitable for	MB ST1 MP 45 MBD F 25ST MZ 45 MS F88-2 MG 45 MS F88-3
	3 153-01000	Part number / Article number	MB ST1 / 661-01002
		Description	Bracket for M12 rods, with clamping screw Material: aluminium
		Suitable for	MST 45-20 MST 45-30 MST 45-40

Brackets for F 25 and F 55

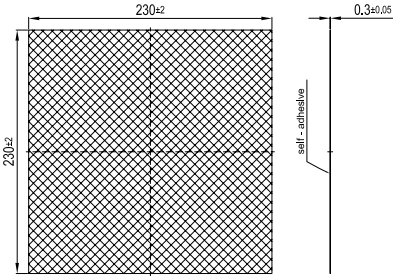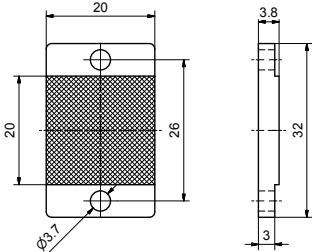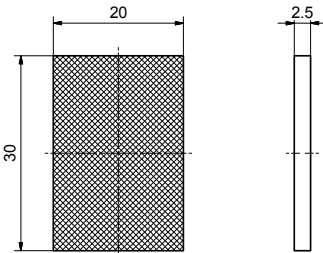|			
	153-00297	Part number / Article number	MSP F 20-2 / 558-41005
		Description	Protective sensor angle bracket with screws, very robust Material: stainless steel V2A
		Suitable for	F 20 UT 20-150 F 25 UT 20-S150 FL 20 UT 20-240
	153-00972	Part number / Article number	MSP F 20-12 / 558-41007
		Description	Protective sensor angle bracket with screws, very robust Material: stainless steel V2A
		Suitable for	F 20 UT 20-150 F 25 UT 20-S150 FL 20 UT 20-240
	153-00065	Part number / Article number	MS F 50 / 579-50000
		Description	Angle bracket with screws Material: stainless steel VA
		Suitable for	F 50 F 55
	153-00818	Part number / Article number	MS F 55 / 579-50010
		Description	Angle bracket with screws Material: stainless steel V2A
		Suitable for	F 50 F 55
	153-00819	Part number / Article number	MSP F 55 / 579-50011
		Description	Protective sensor angle bracket with screws, very robust Material: stainless steel V2A
		Suitable for	F 55
	153-00542	Part number / Article number	MBD-S94 / 533-21000
		Description	Dovetail double clamp mounting Material: metal
		Suitable for	F 55 FGL

Accessories

Reflectors

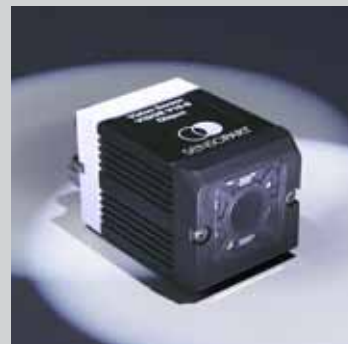| Reflectors		

153-00242

Part number / Article number	R5L / 904-51543
Description	Reflector in housing
Dimensions	51 × 61 × 6.1 mm³
Mounting	2 mounting holes (slots)
Temperature range	-20 … +60 °C
Suitable for	Retroreflective photoelectric sensor (laser)

153-00699

Part number / Article number	RD-25 KL / 904-51589
Description	Reflector in housing
Dimensions	Ø 25.2 × 5.5 mm³
Mounting	Self-adhesive
Temperature range	-20 … +60 °C
Suitable for	Retroreflective photoelectric sensor (laser)

153-00701

Part number / Article number	RF-50 KL / 904-51590
Description	Reflective tape
Dimensions	51 × 51 mm²
Mounting	Self-adhesive
Temperature range	-40 … +70 °C
Suitable for	Retroreflective photoelectric sensor (laser)

153-00923

Part number / Article number	RF-230 KL / 904-51593
Description	Reflective tape, to cut to size
Dimensions	230 × 230 mm²
Mounting	Self-adhesive
Temperature range	-40 … +70 °C
Suitable for	Retroreflective photoelectric sensor (laser)

153-01046

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

153-01047

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

Version: 04/2013. Subject to changes; diagrams similar

Accessories

Cables

Cables for F 25

Part number	Article number	Description
M8, 4-pin		
K4-2m-G-PUR	902-50801	2 m, straight, PUR
K4-5m-G-PUR	902-51617	5 m, straight, PUR
K4-10m-G-PUR	902-51610	10 m, straight, PUR
K4-2m-W-PUR	902-50803	2 m, 90°, PUR
K4-5m-W-PUR	902-51618	5 m, 90°, PUR
K4-10m-W-PUR	902-51629	10 m, 90°, PUR
K4-2m-W-PL-PUR	902-51642	2 m, 90°, PUR, with indicator LED
K4-5m-W-PL-PUR	902-51643	5 m, 90°, PUR, with indicator LED
CM4 FG-E-5m-PVC	902-50221	5 m, straight, PVC, with hex nut SW 9 stainless steel (IP 69K)
CM4 FW-E-5m-PVC	902-50222	5 m, 90°, PVC, with hex nut SW 9 stainless steel (IP 69K)

Cables for F 55

Part number	Article number	Description
M12, 4-pin		
L4-2m-G-PUR	902-50805	2 m, straight, PUR
L4-5m-G-PUR	902-51612	5 m, straight, PUR
L4-10m-G-PUR	902-51628	10 m, straight, PUR
L4-2m-W-PUR	902-50807	2 m, 90°, PUR
L4-5m-W-PUR	902-51602	5 m, 90°, PUR
L4-2m-W-PL-PUR	902-50808	2 m, 90°, PUR, with indicator LED
L4-5m-W-PL-PUR	902-51603	5 m, 90°, PUR, with indicator LED
L4-10m-W-PL-PUR	902-51604	10 m, 90°, PUR, with indicator LED
L4S-2m-G-PVC	902-51632	2 m, straight, PVC, shielded
L4S-5m-G-PVC	902-51634	5 m, straight, PVC, shielded
L4S-2m-W-PVC	902-51633	2 m, 90°, PVC, shielded
L4S-5m-W-PVC	902-51635	5 m, 90°, PVC, shielded
CL4 FG-E-5m-PVC	902-50219	5 m, straight, PVC, with hex nut SW 14 stainless steel (IP 69K)
CL4 FW-E-5m-PVC	902-50220	5 m, 90°, PVC, with hex nut SW 14 stainless steel (IP 69K)
L4F/L4M-0,48 PUR	902-51670	Extension cable, M12 (90°) to M12 (straight), 0.48 m, PUR
L4F/L4M-0,6 PVC	902-51645	Connection adapter, M12 (female) to M8 (male), 4-pin

We look ahead.

Yesterday, today and in the future.

SENSOR TECHNOLOGY

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

VISION

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

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

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

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

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