



**WTM4SP-1H162120A00**

W4

**PHOTOELECTRIC SENSORS**

**SICK**  
Sensor Intelligence.



## Ordering information

Type	part no.
WTM4SP-1H162120A00	1136369

Other models and accessories → [www.sick.com/W4](http://www.sick.com/W4)

Illustration may differ



## Detailed technical data

### Features

<b>Functional principle</b>	Photoelectric proximity sensor
<b>Functional principle detail</b>	Background suppression, Foreground suppression, MultiMode, distance value
<b>MultiMode</b>	1 Background suppression 2 Foreground suppression 3 Two-point teach-in 4 Two independent switching points 5 Window 6 ApplicationSelect M manual / measurement
<b>Sensing range</b>	
Sensing range min.	4 mm (mode 1, 3, 4, 5) 0 mm (mode 2) 4 mm (mode 1 and 6 combined)
Sensing range max.	250 mm (mode 1, 3, 4, 5) 250 mm (mode 2) 500 mm (mode 1 and 6 combined)
Adjustable switching threshold for background suppression	10 mm ... 250 mm (mode 1, 3, 4, 5) 10 mm ... 500 mm (mode 1 and 6 combined)
Adjustable switching threshold for foreground suppression	10 mm ... 250 mm (mode 2)
Reference object	Object with 90% remission factor (complies with standard white according to DIN 5033)
Minimum distance between set sensing range and background (black 6% / white 90%)	5 mm, at a distance of 150 mm (mode 1, 3, 4, 5) 1.8 mm, at a distance of 100 mm (mode 2)

<sup>1)</sup> 90% remission factor.

<sup>2)</sup> Equivalent to 1 σ.

<sup>3)</sup> See repeatability characteristic lines.

Minimum object height at set sensing range in front of black background (6% remission factor)	8 mm, at a distance of 250 mm (mode 1 and 6 combined) 1.8 mm, at a distance of 100 mm (mode 2)
Recommended sensing range for the best performance	40 mm ... 170 mm (mode 1, 3, 4, 5) 40 mm ... 140 mm (mode 2) 50 mm ... 200 mm (mode 1 and 6 combined)
<b>Distance value</b>	
Measuring range	10 mm ... 250 mm
Resolution	0.1 mm
Repeatability	0.2 mm ... 6 mm <sup>1) 2) 3)</sup>
Accuracy	Typ. 5.0 mm at 10 ... 50 mm distance <sup>1)</sup> Typ. 6.0 mm at 15 ... 100 mm distance <sup>1)</sup> Typ. 8.0 mm at 100 ... 150 mm distance <sup>1)</sup> Typ. 12 mm at 150 ... 200 mm distance <sup>1)</sup> Typ. 16 mm at 200 ... 250 mm distance <sup>1)</sup>
Distance value output	Via IO-Link
Update rate of the distance value	20 ms
<b>Emitted beam</b>	
Light source	PinPoint LED
Type of light	Visible red light
Shape of light spot	Point-shaped
Light spot size (distance)	4 mm (150 mm)
Maximum dispersion of the emitted beam around the standardized transmission axis (squint angle)	< +/- 1.5° (at Ta = +23 °C)
<b>Key LED figures</b>	
Normative reference	EN 62471:2008-09   IEC 62471:2006, modified
LED risk group marking	Free group
Wave length	635 nm
Average service life	100,000 h at Ta = +25 °C
<b>Smallest detectable object (MDO) typ.</b>	
	0.2 mm (At 180 mm distance, mode 1, 3, 4, 5) 0.6 mm (at a distance of 140 mm, mode 2) 0.1 mm (At 180 mm distance, mode 1 and 6 combined) Object with 90% remission factor (complies with standard white according to DIN 5033)
<b>Adjustment</b>	
Teach-Turn adjustment	BluePilot: For adjusting the sensing range with mode selection
IO-Link	For configuring the sensor parameters and Smart Task functions
<b>Display</b>	

<sup>1)</sup> 90% remission factor.<sup>2)</sup> Equivalent to 1 σ.<sup>3)</sup> See repeatability characteristic lines.

	LED blue	BluePilot: Display of mode, display of output states $Q_{L1}$ (LED 3 permanently on) and $Q_{L2}$ (LED 5 permanently on)
	LED green	Operating indicatorStatic on: power on/Off: power off/Off: IO-Link mode
	LED yellow	Status of received light beamStatic on: object presentStatic off: object not present
<b>Special features</b>		MultiMode
<b>Special applications</b>		Detecting uneven, shiny objects, Detection of poorly reflecting and tilted objects

1) 90% remission factor.

2) Equivalent to 1  $\sigma$ .

3) See repeatability characteristic lines.

### Safety-related parameters

<b>MTTF<sub>D</sub></b>	1,404 years
<b>DC<sub>avg</sub></b>	0%

### Communication interface

<b>IO-Link</b>	✓, IO-Link V1.1
Data transmission rate	COM2 (38,4 kBaud)
Cycle time	2.3 ms
Process data length	16 Bit
Process data structure	Bit 0 = switching signal $Q_{L1}$ Bit 1 = switching signal $Q_{L2}$ Process data structure: Bit 2 ... 15 = current receiver level (live) mode 1-5. Process data structure B: Bit 2 ... 15 = distance value 0.1 mm (live) mode M.
VendorID	26
DeviceID HEX	0x800336
DeviceID DEC	8389430
Compatible master port type	A
SIO mode support	Yes

### Electronics

<b>Supply voltage <math>U_B</math></b>	10 V DC ... 30 V DC <sup>1)</sup>
<b>Ripple</b>	$\leq 5 V_{pp}$
<b>Usage category</b>	DC-12 (According to EN 60947-5-2) DC-13 (According to EN 60947-5-2)
<b>Current consumption</b>	$\leq 20$ mA, without load. At $U_B = 24$ V
<b>Protection class</b>	III
<b>Digital output</b>	
Number	2
Type	Push-pull: PNP/NPN
Switching mode	Light/dark switching
Signal voltage PNP HIGH/LOW	Approx. $U_B - 2.5$ V / 0 V
Signal voltage NPN HIGH/LOW	Approx. $U_B / < 2.5$ V

1) Limit values.

2) Signal transit time with resistive load in switching mode.

3) With light/dark ratio 1:1.

4) This switching output must not be connected to another output.

Output current $I_{max}$	$\leq 100$ mA
Circuit protection outputs	Reverse polarity protected
	Overcurrent protected
	Short-circuit protected
Response time	$\leq 500$ $\mu$ s (mode 1, 2, 3) <sup>2)</sup>
	$\leq 1,000$ $\mu$ s (mode 4, 5) <sup>2)</sup>
	$\leq 15$ ms (mode 1 and 6 combined) <sup>2)</sup>
Repeatability (response time)	500 $\mu$ s (mode 1, 2, 3) <sup>2)</sup>
	350 $\mu$ s (mode 4, 5) <sup>2)</sup>
	5 ms (mode 1 and 6 combined) <sup>2)</sup>
Switching frequency	1,000 Hz (mode 1, 2, 3) <sup>3)</sup>
	500 Hz (mode 4, 5) <sup>3)</sup>
	30 Hz (mode 1 and 6 combined) <sup>3)</sup>
<b>Pin/Wire assignment</b>	
Function of pin 4/black (BK)	Digital output, dark switching, object present $\rightarrow$ output $\bar{Q}L1$ LOW (Mode 1, 3, 4, 5, 6) <sup>4)</sup>
	Digital output, light switching, object present $\rightarrow$ output $QL1$ LOW (Mode 2) <sup>4)</sup>
	IO-Link communication C
Function of pin 4/black (BK) – detail	The pin 4 function of the sensor can be configured
	Additional possible settings via IO-Link
Function of pin 2/white (WH)	Digital output, light switching, object present $\rightarrow$ output $QL1$ HIGH (Mode 1, 3, 5, 6) <sup>4)</sup>
	Digital output, dark switching, object present $\rightarrow$ output $\bar{Q}L1$ HIGH (Mode 2) <sup>4)</sup>
	Digital output, dark switching, object present $\rightarrow$ output $\bar{Q}L2$ LOW (Mode 4) <sup>4)</sup>
Function of pin 2/white (WH) – detail	The pin 2 function of the sensor can be configured
	Additional possible settings via IO-Link

<sup>1)</sup> Limit values.

<sup>2)</sup> Signal transit time with resistive load in switching mode.

<sup>3)</sup> With light/dark ratio 1:1.

<sup>4)</sup> This switching output must not be connected to another output.

## Mechanics

<b>Housing</b>	Rectangular
<b>Design detail</b>	Slim
<b>Dimensions (W x H x D)</b>	12.1 mm x 41.9 mm x 18.6 mm
<b>Connection</b>	Cable, 4-wire, 2 m
<b>Connection detail</b>	
Deep-freeze property	Do not bend below 0 °C
Conductor size	0.14 mm <sup>2</sup>
Cable diameter	Ø 3.4 mm
Length of cable (L)	2 m
<b>Material</b>	
Housing	Plastic, VISTAL®
Front screen	Plastic, PMMA

	Cable	Plastic, PVC
<b>Maximum tightening torque of the fixing screws</b>		0.4 Nm

## Ambient data

<b>Enclosure rating</b>	IP66 (EN 60529) IP67 (EN 60529)
<b>Ambient operating temperature</b>	-40 °C ... +60 °C
<b>Ambient temperature, storage</b>	-40 °C ... +75 °C
<b>Typ. Ambient light immunity</b>	Artificial light: ≤ 50,000 lx Sunlight: ≤ 50,000 lx
<b>Shock resistance</b>	30 g, 11 ms (3 positive and 3 negative shocks along X, Y, Z axes, 18 total shocks (EN60068-2-27))
<b>Vibration resistance</b>	10 Hz ... 1,000 Hz (Amplitude 1 mm, 3 x 30 min (EN60068-2-6))
<b>Air humidity</b>	35 % ... 95 %, relative humidity (no condensation)
<b>Electromagnetic compatibility (EMC)</b>	EN 60947-5-2
<b>Resistance to cleaning agent</b>	ECOLAB
<b>UL File No.</b>	NRKH.E181493 & NRKH7.E181493

## Smart Task

<b>Smart Task name</b>	Base logics
<b>Logic function</b>	Direct AND OR
<b>Timer function</b>	Deactivated Switch-on delay Off delay ON and OFF delay Impulse (one shot)
<b>Inverter</b>	Yes
<b>Switching frequency</b>	SIO Logic: 900 Hz (mode 1, 2, 3) <sup>1)</sup> SIO Logic: 450 Hz (mode 4, 5) <sup>1)</sup> SIO Logic: 30 Hz (mode 1 and 6 combined) <sup>1)</sup> IOL: 800 Hz (mode 1, 2, 3) <sup>2)</sup> IOL: 450 Hz (mode 4, 5) <sup>2)</sup> IOL: 30 Hz (mode 1 and 6 combined) <sup>2)</sup>
<b>Response time</b>	SIO Logic: 550 µs (mode 1, 2, 3) <sup>1)</sup> SIO Logic: 1100 µs (mode 4, 5) <sup>1)</sup> SIO Logic: 15 ms (mode 1 and 6 combined) <sup>1)</sup> IOL: 600 µs (mode 1, 2, 3) <sup>2)</sup> IOL: 1100 µs (mode 4, 5) <sup>2)</sup> IOL: 15 ms (mode 1 and 6 combined) <sup>2)</sup>
<b>Repeatability</b>	SIO Logic: 200 µs <sup>1)</sup> SIO Logic: 400 µs <sup>1)</sup> SIO Logic: 5 ms <sup>1)</sup> IOL: 250 µs <sup>2)</sup> IOL: 450 µs <sup>2)</sup> IOL: 5 ms <sup>2)</sup>

<sup>1)</sup> Use of Smart Task functions without IO-Link communication (SIO mode).<sup>2)</sup> Use of Smart Task functions with IO-Link communication function.

<b>Switching signal</b>	
Switching signal $Q_{L1}$	Switching output
Switching signal $\bar{Q}_{L1}$	Switching output

1) Use of Smart Task functions without IO-Link communication (SIO mode).

2) Use of Smart Task functions with IO-Link communication function.

## Diagnosis

<b>Device temperature</b>	Measuring range	Very cold, cold, moderate, warm, hot
<b>Device status</b>		Yes
<b>Detailed device status</b>		Yes
<b>Operating hour counter</b>		Yes
<b>Operating hours counter with reset function</b>		Yes
<b>Quality of teach</b>		Yes

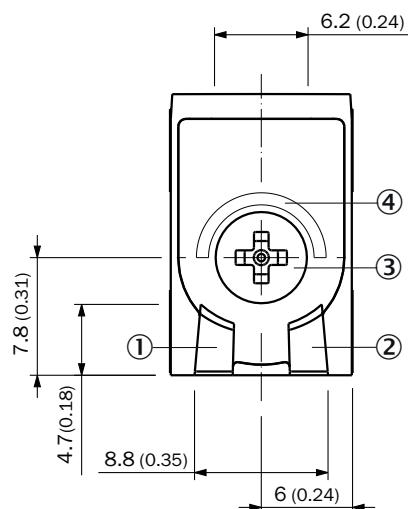
## Certificates

<b>EU declaration of conformity</b>	✓
<b>UK declaration of conformity</b>	✓
<b>ACMA declaration of conformity</b>	✓
<b>Moroccan declaration of conformity</b>	✓
<b>China-RoHS</b>	✓
<b>cULus certificate</b>	✓

## Classifications

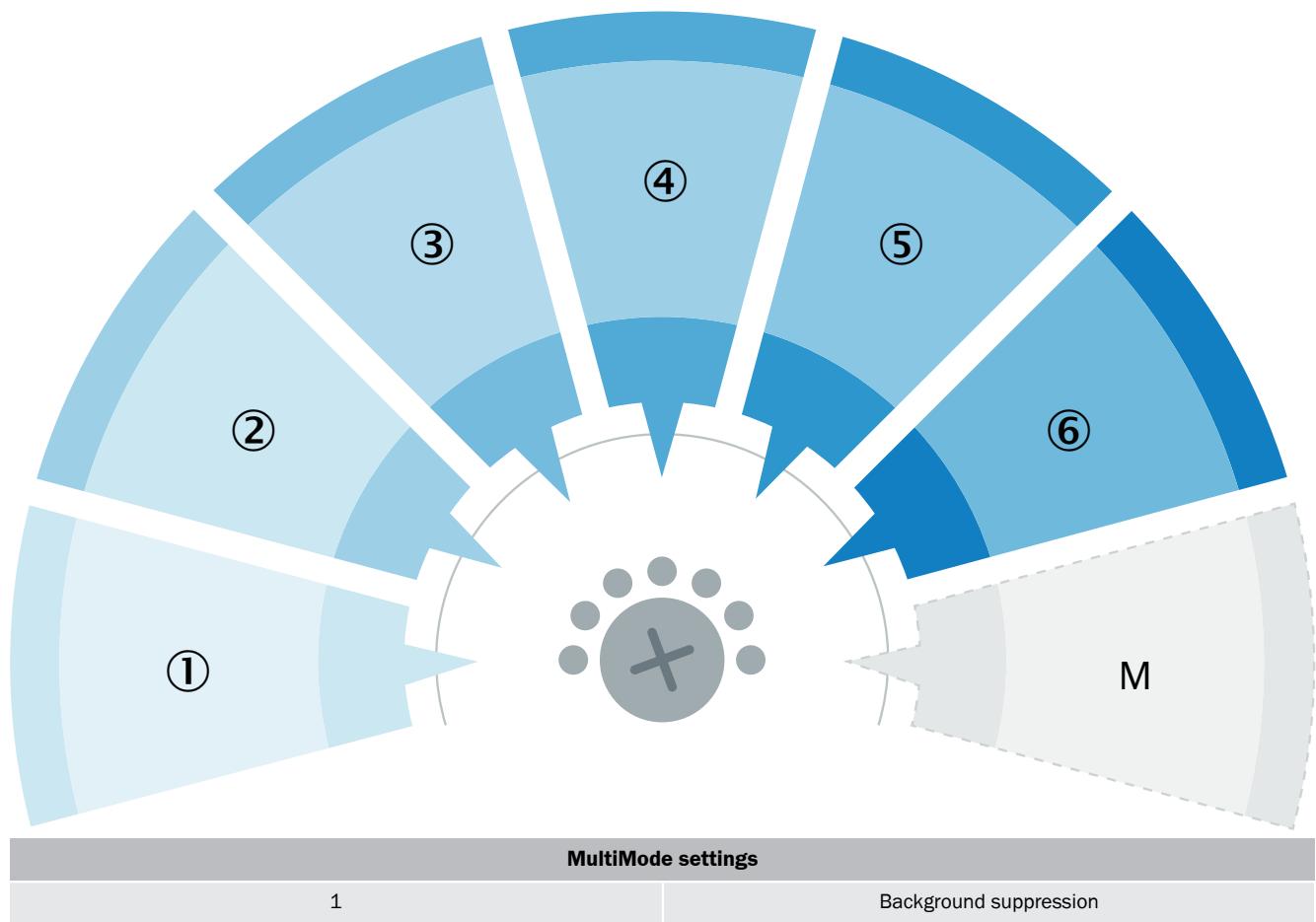
<b>ECLASS 5.0</b>	27270904
<b>ECLASS 5.1.4</b>	27270904
<b>ECLASS 6.0</b>	27270904
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<b>ECLASS 7.0</b>	27270904
<b>ECLASS 8.0</b>	27270904
<b>ECLASS 8.1</b>	27270904
<b>ECLASS 9.0</b>	27270904
<b>ECLASS 10.0</b>	27270904
<b>ECLASS 11.0</b>	27270904
<b>ECLASS 12.0</b>	27270903
<b>ETIM 5.0</b>	EC002719
<b>ETIM 6.0</b>	EC002719
<b>ETIM 7.0</b>	EC002719
<b>ETIM 8.0</b>	EC002719
<b>UNSPSC 16.0901</b>	39121528

## display and adjustment elements



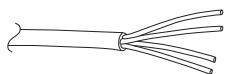
- ① LED green
- ② LED yellow
- ③ Teach-Turn adjustment
- ④ LED blue

## Display and setting detail

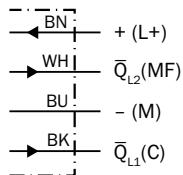


MultiMode settings	
2	Foreground suppression
3	Two-point teach-in
4	Two independent switching points
5	Window
6	ApplicationSelect
M	Manual / measurement

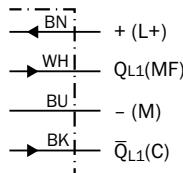
Connection type Cable, 4-wire



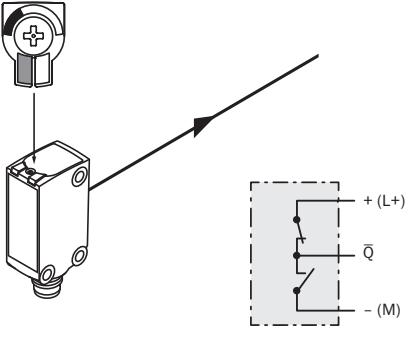
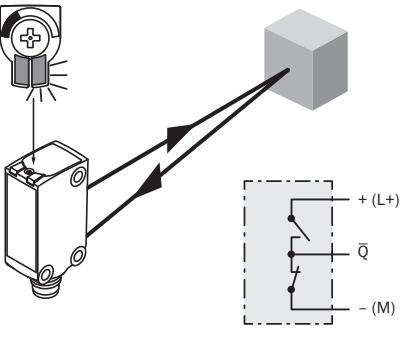
Connection diagram Cd-602 (Mode 4)



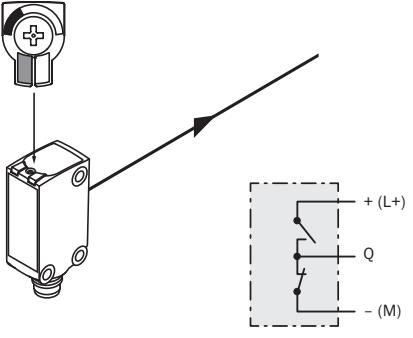
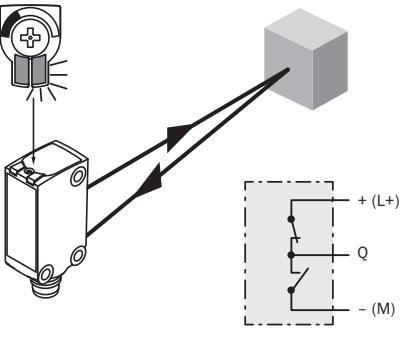
Connection diagram Cd-601 (Mode 1, 2, 3, 5, 6)



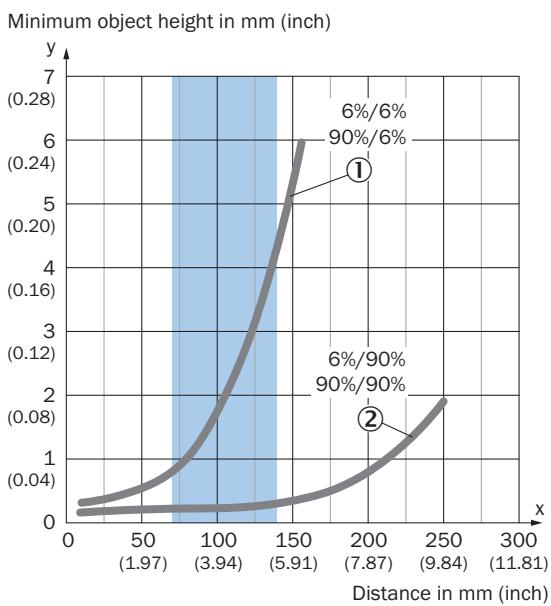
Truth table Push-pull: PNP/NPN – dark switching  $\bar{Q}$ 

Dark switching $\bar{Q}$ (normally closed (upper switch), normally open (lower switch))		
	Object not present → Output HIGH	Object present → Output LOW
Light receive	×	✓
Light receive indicator	×	●
Load resistance to L+	×	⚡
Load resistance to M	⚡	×
		

## Truth table Push-pull: PNP/NPN - light switching Q

Light switching Q (normally open (upper switch), normally closed (lower switch))		
	Object not present → Output LOW	Object present → Output HIGH
Light receive	×	✓
Light receive indicator	×	●
Load resistance to L+	⚡	×
Load resistance to M	×	⚡
		

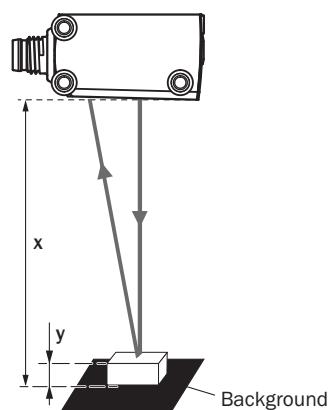
## Characteristic curve Mode 2



■ Recommended sensing range for the best performance

- ① Black background, 6% remission factor
- ② White background, 90% remission factor

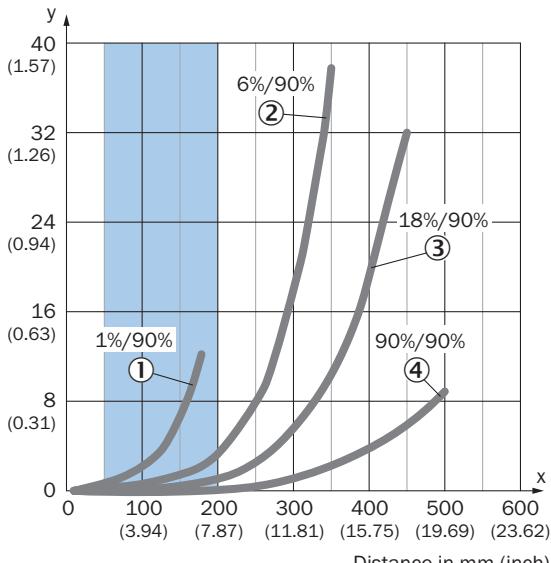
Example:  
Reliable detection of the object



Black background (6 % remission factor)  
Distance of sensor to background  $x = 100$  mm  
Required minimum object height  $y = 1.9$  mm  
For all objects regardless of their colors

## Characteristic curve Mode 1 and 6 combined

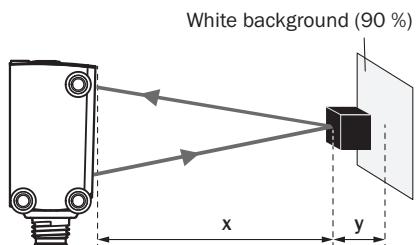
Minimum distance in mm (y) between the set sensing range and white background (90 % remission factor)



■ Recommended sensing range for the best performance

- ① ultra-black object, 1% remission factor
- ② Black object, 6% remission factor
- ③ Gray object, 18% remission factor
- ④ White object, 90% remission factor

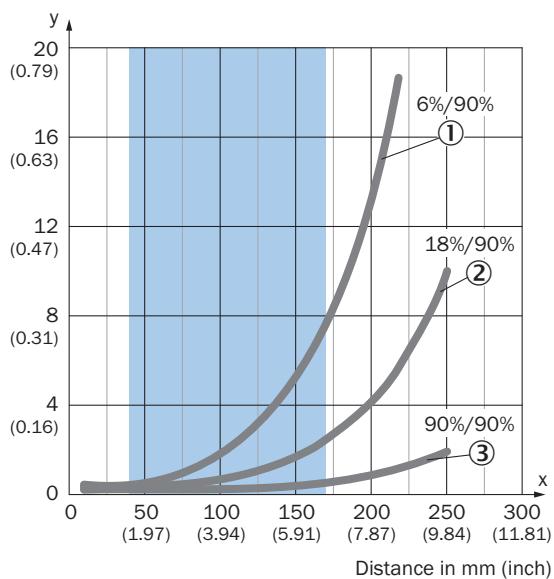
Example:  
Safe suppression of the background



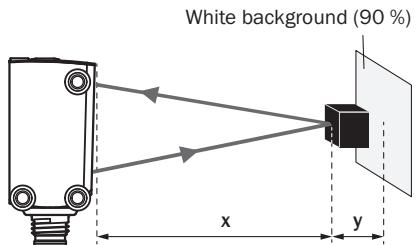
Black object (6 % remission factor)  
Set sensing range  $x = 300$  mm  
Needed minimum distance to white background  $y = 17$  mm

## Characteristic curve Mode 1, 3, 4, 5

Minimum distance in mm (y) between the set sensing range and white background (90 % remission factor)



Example:  
Safe suppression of the background



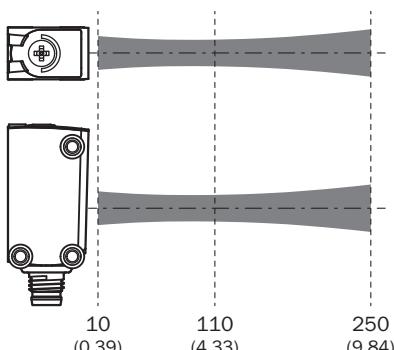
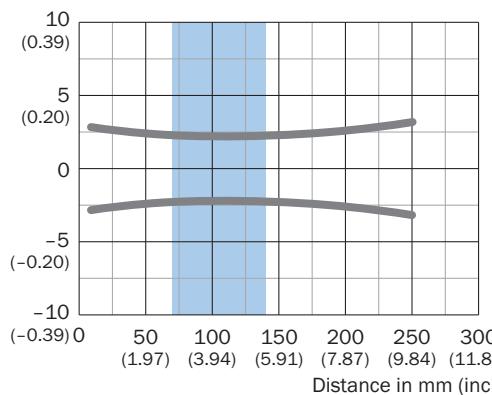
Black object (6 % remission factor)  
Set sensing range  $x = 150$  mm  
Needed minimum distance to white background  $y = 5.5$  mm

■ Recommended sensing range for the best performance

- ① Black object, 6% remission factor
- ② Gray object, 18% remission factor
- ③ White object, 90% remission factor

## Light spot size Mode 2

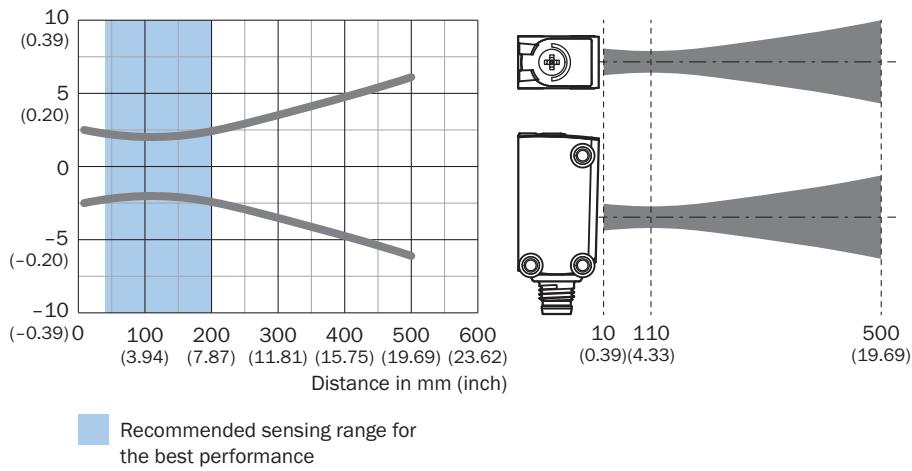
Dimensions in mm (inch)



■ Recommended sensing range for the best performance

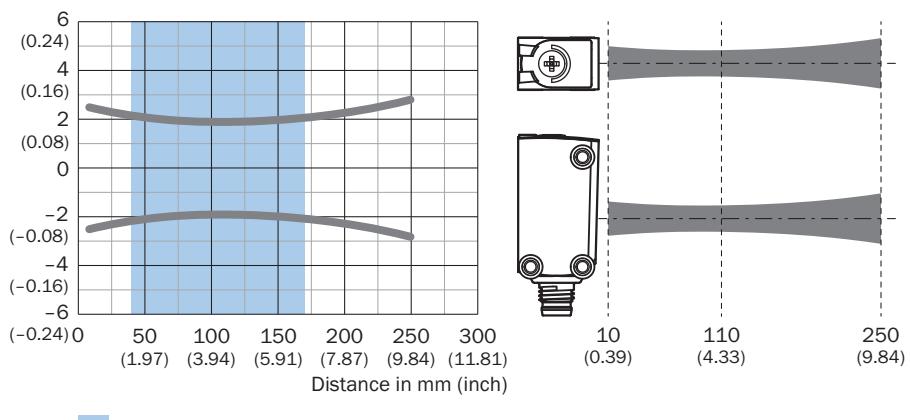
### Light spot size Mode 1 and 6 combined

Dimensions in mm (inch)

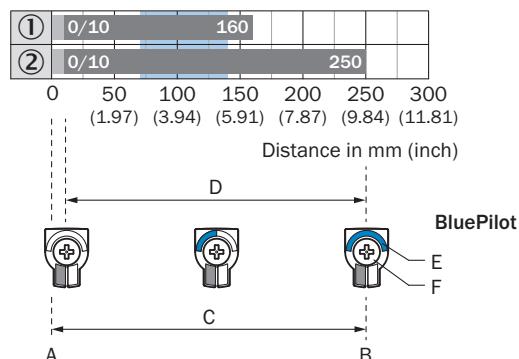


### Light spot size Mode 1, 3, 4, 5

Dimensions in mm (inch)



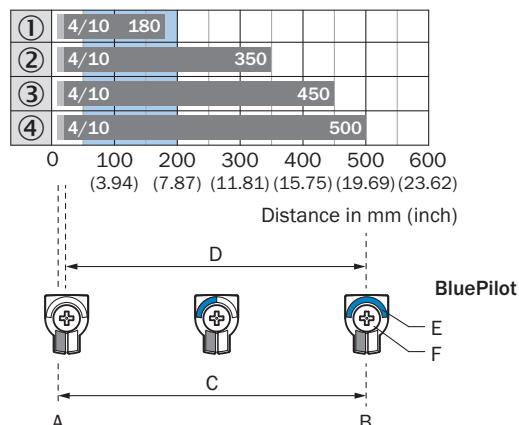
## Sensing range diagram Mode 2



■ Recommended sensing range for the best performance

1	Black background, 6% remission factor
2	White background, 90% remission factor
A	Sensing range min. in mm
B	Sensing range max. in mm
C	Field of view
D	Adjustable switching threshold for foreground suppression
E	Sensing range indicator
F	Teach-Turn adjustment

## Sensing range diagram Mode 1 and 6 combined

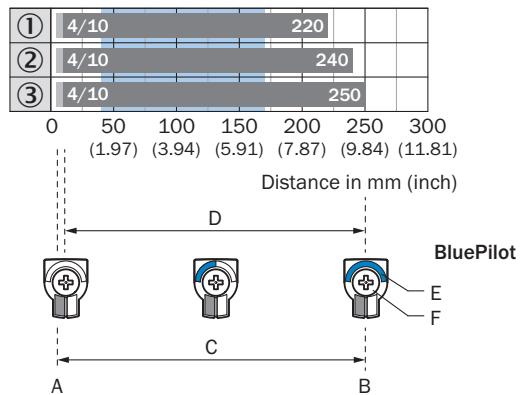


■ Recommended sensing range for the best performance

1	Ultra-black object, 1% remission factor
2	Black object, 6% remission factor
3	Gray object, 18% remission factor
4	White object, 90% remission factor
A	Sensing range min. in mm

B	Sensing range max. in mm
C	Field of view
D	Adjustable switching threshold for background suppression
E	Sensing range indicator
F	Teach-Turn adjustment

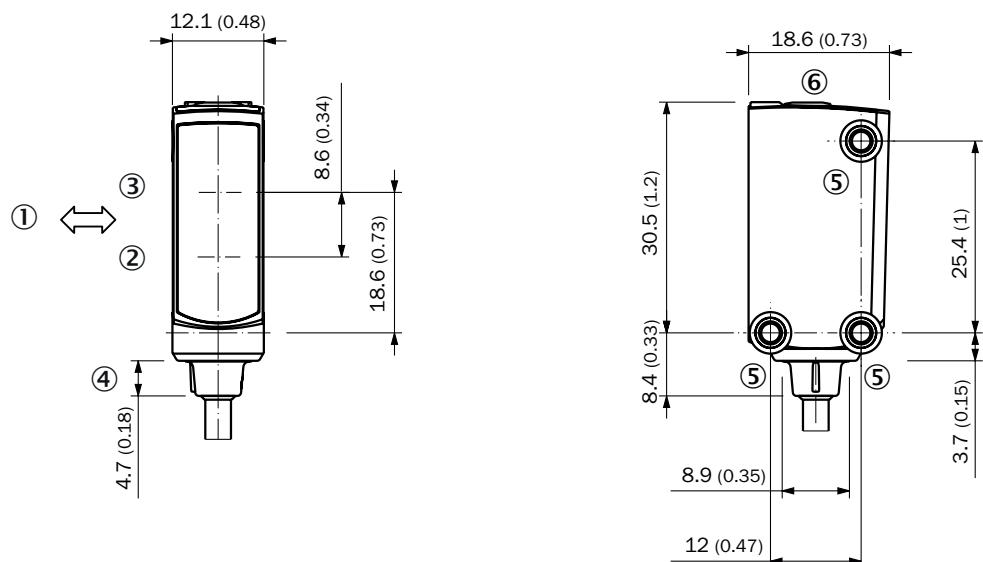
## Sensing range diagram Mode 1, 3, 4, 5



■ Recommended sensing range for the best performance

1	Black object, 6% remission factor
2	Gray object, 18% remission factor
3	White object, 90% remission factor
A	Sensing range min. in mm
B	Sensing range max. in mm
C	Field of view
D	Adjustable switching threshold for background suppression
E	Sensing range indicator
F	Teach-Turn adjustment

## Dimensional drawing, sensor



## SICK AT A GLANCE

SICK is one of the leading manufacturers of intelligent sensors and sensor solutions for industrial applications. A unique range of products and services creates the perfect basis for controlling processes securely and efficiently, protecting individuals from accidents and preventing damage to the environment.

We have extensive experience in a wide range of industries and understand their processes and requirements. With intelligent sensors, we can deliver exactly what our customers need. In application centers in Europe, Asia and North America, system solutions are tested and optimized in accordance with customer specifications. All this makes us a reliable supplier and development partner.

Comprehensive services complete our offering: SICK LifeTime Services provide support throughout the machine life cycle and ensure safety and productivity.

**For us, that is "Sensor Intelligence."**

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Contacts and other locations [www.sick.com](http://www.sick.com)