Technical Description

The mini optical series of sensors are among smallest sensors in the world. Mini optical sensors require almost no space and with their low mass (from a mere 1.2 grams) they are absolute lightweights. They can be easily installed inside moving machine parts like robot arms. Our smallest sensors measure 2 mm in diameter. The mini optical sensors are the preferred solution for all applications where the highest mobility, smallest sizes, and optimal part resolution is essential.

The mini optical sensors represent unique alternative to traditional fiber optics. Its foremost advantage lies in highly flexible electrical conductors made from copper cord encased within a corrosion-resistant polyurethane sheath. Unlike fiber optic cables, these conductors can withstand very high stresses from flexing and twisting without placing any limitations on the bending radius.

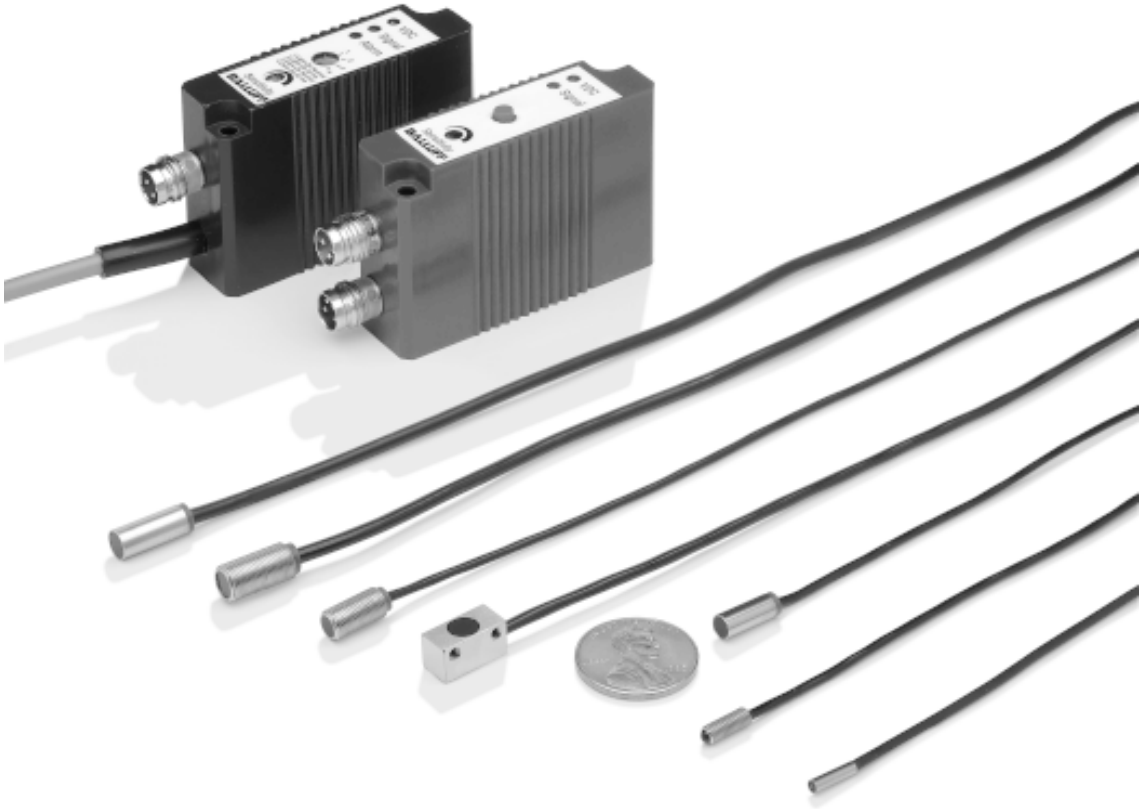
In addition to their small size, the mini optical sensors offer exceptional capabilities for detecting small objects. When used with standard resolution amplifiers, objects as small as 0.2mm can be detected. With the high resolution amplifiers, objects as small as 0.05mm can be sensed. This incredible sensitivity makes it possible to sense the thin wires of components used in small electronic assemblies. Potential applications for laser sensors can be reliably and less expensively handled by mini optical sensors.

Features

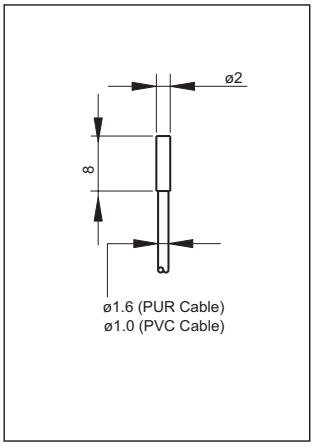
- Smallest sensing head in the industry
- Detects objects as small as 0.05mm with high resolution amp
- 10 kHz with high speed amp
- Detect ambient light sources with high speed amp
- 50 ms off delay available in universal amp
- Amp can be panel mounted or DIN rail mounted
- Sealed to IP67 standards
- Protected against short circuit and polarity reversal

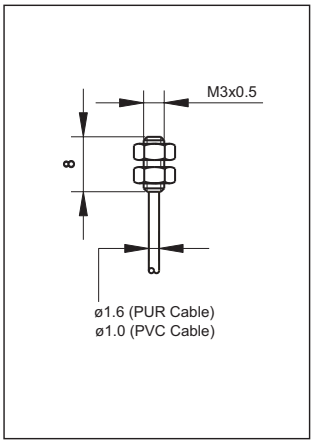
Applications

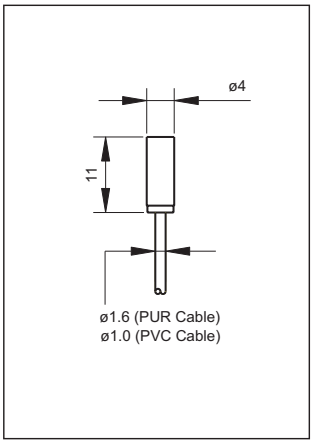
- Thread/wire detection
- Small part profiling
- Semiconductor component detection
- Robotic end-effectors
- High-performance alternatives to fiber-optics



Series	2mm Smooth Tubular	3mm Threaded Tubular	4mm Smooth Tubular
Diffuse with standard resolution amp	**12mm (0.5 in.)**	**12mm (0.5 in.)**	
Diffuse with high resolution amp	**3mm (0.12 in.)**	**3mm (0.12 in.)**	
Thru-Beam with standard resolution amp	**200mm (7.9 in.)**	**200mm (7.9 in.)**	**800mm (31 in.)**
Thru-Beam with high resolution amp	**80mm (3.1 in.)**	**80mm (3.1 in.)**	**250mm (9.8in.)**

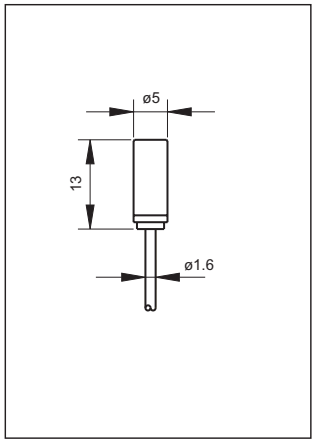
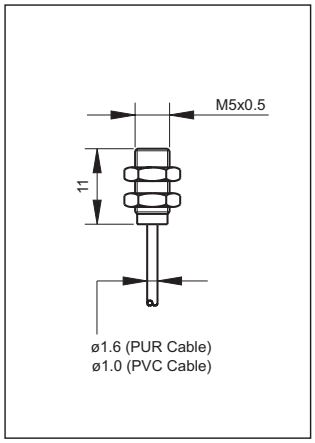
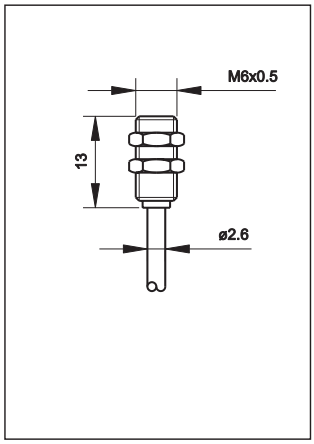
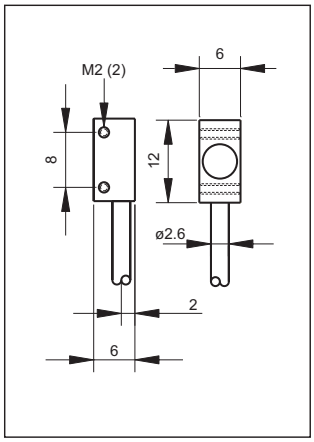




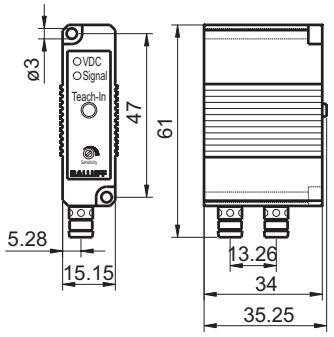


Diffuse				
PUR Cable	IR	BMOA-02SM-X12-1	BMOA-03TM-X12-1	
PVC High-Flex Cable	IR	BMOA-02SM-X12-F1	BMOA-03TM-X12-F1	
PUR Cable	visible red			
Thru-Beam				
PUR Cable	IR	BMOA-02SM-B200-1	BMOA-03TM-B200-1	BMOA-04SM-B800-1
PVC High-Flex Cable	IR	BMOA-02SM-B200-F1	BMOA-03TM-B200-F1	
PUR Cable	visible red	BMOA-02SM-B200-S70-1	BMOA-03TM-B200-R1	BMOA-04SM-B800-R1

Emitter light source, IR	Infrared 880 nm	Infrared 880 nm	Infrared 880 nm
Emitter light source, visible red	Visible red 660nm	Visible red 660nm	Visible red 660nm
Ambient operating temperature	-10°C to +55°C (+14°F to +131°F)	-10°C to +55°C (+14°F to +131°F)	-10°C to +55°C (+14°F to +131°F)
Storage temperature	-30°C to +70°C (-22°F to +158°F)	-30°C to +70°C (-22°F to +158°F)	-30°C to +70°C (-22°F to +158°F)
Degree of protection per IEC 529	IP 65	IP 65	IP 65
Relative Humidity	90% AT 20°C	90% AT 20°C	90% AT 20°C
Housing material	Stainless Steel	Nickel-plated Brass	Stainless Steel
Sensing face material	PMMA	PMMA	PMMA
Weight, diffuse models	3.2 g (PUR cable), 1.2 g (PVC cable)	3.4 g (PUR cable), 1.4 g (PVC cable)	-
Weight, thru-beam models	5.5 g (PUR cable), 2.5 g (PVC cable)	5.9 g (PUR cable), 2.9 g (PVC cable)	9 g
Connection	1m cable with amplifier connector	1m cable with amplifier connector	1m cable with amplifier connector

5mm Smooth Tubular **63mm (2.5 in.)** **15mm (0.6 in.)**	5mm Threaded Tubular **800mm (31 in.)** **250mm (9.8in.)**	6mm Threaded Tubular **63mm (2.5 in.)** **15mm (0.6 in.)**	6mm x 6mm Block **63mm (2.5 in.)** **15mm (0.6 in.)** **800mm (31 in.)** **250mm (9.8in.)**
			
BMOA-05SM-X63-1		BMOA-06TM-X63-1	BMOA-66RM-X63-1
BMOA-05SM-X63-R1		BMOA-06TM-X63-R1	BMOA-66RM-X63-R1
	BMOA-05TM-B800-1		BMOA-66RM-B800-1
	BMOA-05TM-B800-R1		BMOA-66RM-B800-R1
Infrared 880 nm	Infrared 880 nm	Infrared 880 nm	Infrared 880 nm
Visible red 660nm	Visible red 660nm	Visible red 660nm	Visible red 660nm
-10°C to +55°C (+14°F to +131°F)	-10°C to +55°C (+14°F to +131°F)	-10°C to +55°C (+14°F to +131°F)	-10°C to +55°C (+14°F to +131°F)
-30°C to +70°C (-22°F to +158°F)	-30°C to +70°C (-22°F to +158°F)	-30°C to +70°C (-22°F to +158°F)	-30°C to +70°C (-22°F to +158°F)
IP 65	IP 65	IP 65	IP 65
90% AT 20°C	90% AT 20°C	90% AT 20°C	90% AT 20°C
Stainless Steel	Nickel-plated Brass	Nickel-plated Brass	Nickel-plated Brass
PMMA	PMMA	PMMA	PMMA
7.5 g	-	9.5 g	6.6 g
-	12 g	-	13.2
1m cable with amplifier connector	1m cable with amplifier connector	1m cable with amplifier connector	1m cable with amplifier connector

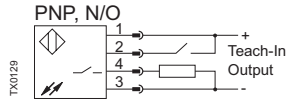
Series	**Teach-in Amplifier**
Sensing range depends on sensor head	Light Operate

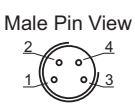


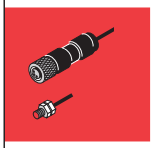
Standard versions (500Hz switching with standard resolution)	
PNP, modulated light, standard resolution	BMOA-AMP-F-PS-U-S75
NPN, modulated light, standard resolution	
High resolution versions (500Hz switching)	
PNP, modulated light, high. resolution	
NPN, modulated light, high. resolution	
High switching speed versions (10kHz switching with standard resolution)	
PNP, non-modulated light, standard resolution	
NPN, non-modulated light, standard resolution	
High switching speed and High resolution versions (10kHz switching)	
PNP, non-modulated light, high. resolution	
NPN, non-modulated light, high. resolution	

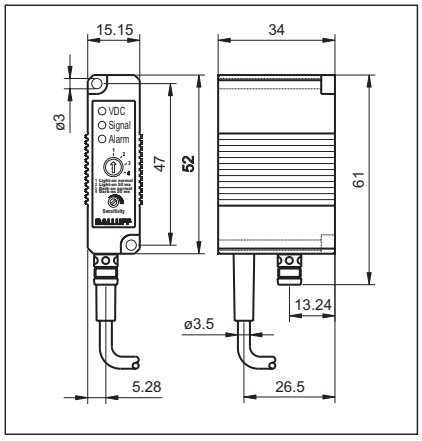
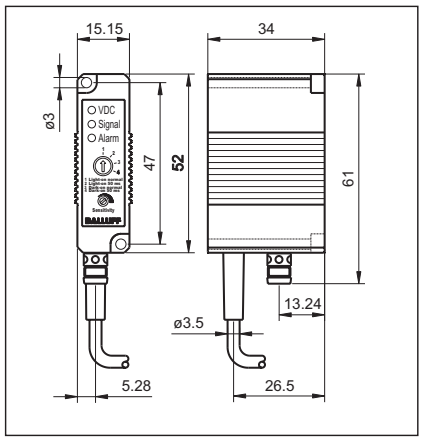
Voltage supply	10 to 30 Vdc
Voltage supply ripple	< 15% peak-to-peak
Voltage drop, output (digital)	2.0V at 100 mA
Rated output current (digital)	200 mA
Analog output type	-
Analog output load	-
Supply current (no load)	50 mA
Protections	Short circuit, polarity reversal
On/Off delay	0.5 ms standard
Switching frequency	1000 Hz standard
Output type	PNP
Output function	Light operate
Ambient operating temperature	-10°C to +55°C (+14°F to +131°F)
Storage temperature	-30°C to +70°C (-22°F to +158°F)
Degree of protection per IEC 529	IP 65
Relative Humidity	90% AT 20°C
Sensitivity/Range adjustment	Teach button
LED indicators	Yellow output , green power
Housing material	ABS plastic
Weight	62 g
Connection (to control system)	M8, 4-pin connector

Teach-In

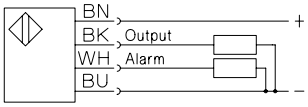




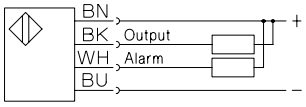


Universal Amplifier	**Analog Amplifier**
Configurable including off delayand alarm output	Analog and digital outputs
	
BMOA-AMP-B-PU-C2	BMOA-AMP-B-PU-S94-C2
BMOA-AMP-B-NU-C2	BMOA-AMP-B-NU-S94-C2
BMOA-AMP-D-PU-C2	
BMOA-AMP-D-NU-C2	
BMOA-AMP-A-PU-C2	
BMOA-AMP-A-NU-C2	
BMOA-AMP-C-PU-C2	
BMOA-AMP-C-NU-C2	
10 to 30 Vdc	10 to 30 Vdc
< 15% peak-to-peak	< 15% peak-to-peak
2.0V at 100 mA	2.0V at 100 mA
200 mA	200 mA
-	0 to 10V
-	1k W min.
50 mA	50 mA
Short circuit, polarity reversal	Short circuit, polarity reversal
1 ms standard, 50 ms high speed	1 ms standard
500 Hz standard, 10 kHz High speed	–
PNP or NPN	PNP
Selectable light/dark operate and 50 ms off delay	Selectable light/dark operate and 50 ms off delay
-10°C to +55°C (+14°F to +131°F)	-10°C to +55°C (+14°F to +131°F)
-30°C to +70°C (-22°F to +158°F)	-30°C to +70°C (-22°F to +158°F)
IP 65	IP 65
90% AT 20°C	90% AT 20°C
Multi-turn potentiometer	Multi-turn potentiometer
Yellow output , green power	Yellow output , green power
ABS plastic	ABS plastic
67 g	67 g
2m PVC cable (4 x 26 AWG)	2m PVC cable (4 x 26 AWG)

Universal Amplifier

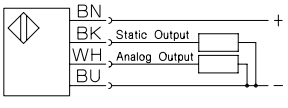


PNP

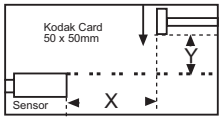


NPN

Analog Amplifier



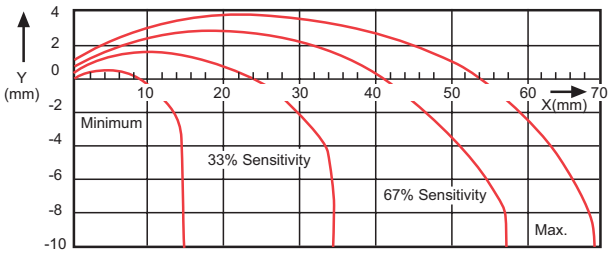
Sensing distance for Diffuse Sensors



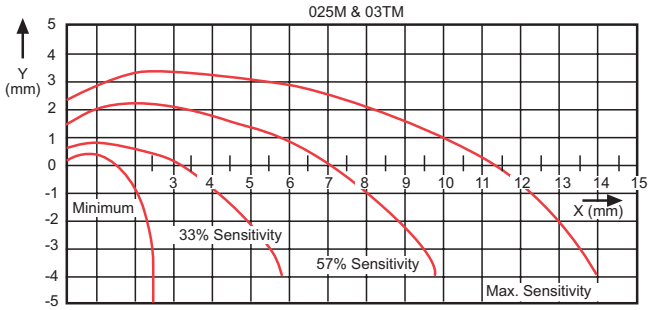
Measuring Arrangement

The Kodak card is moved at 90º angle step by step in front of the diffuse sensor. Several levels of sensitivity are shown below, using an amplifier with standard resolution.

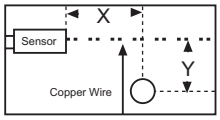
055M, 06TM & 66RM



025M & 03TM

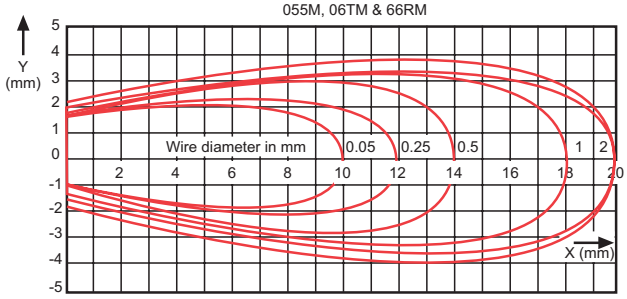


Object Resolution for Diffuse Sensors

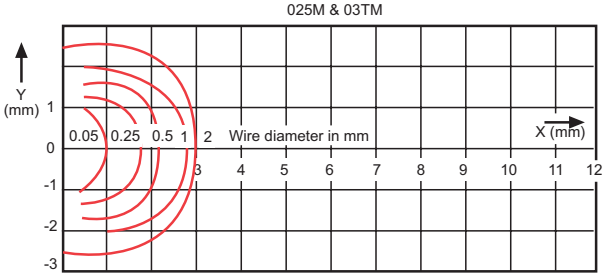


While the standard 50 x 50mm Kodak test card is used for determining sensing range, very few applications use this target. The following chart shows approximate performance of these sensors using several different wire sizes as a target and an amplifier with standard resolution.

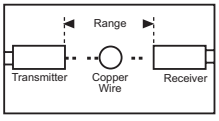
055M, 06TM & 66RM



025M & 03TM



Object Resolution for Thru-Beam Sensors

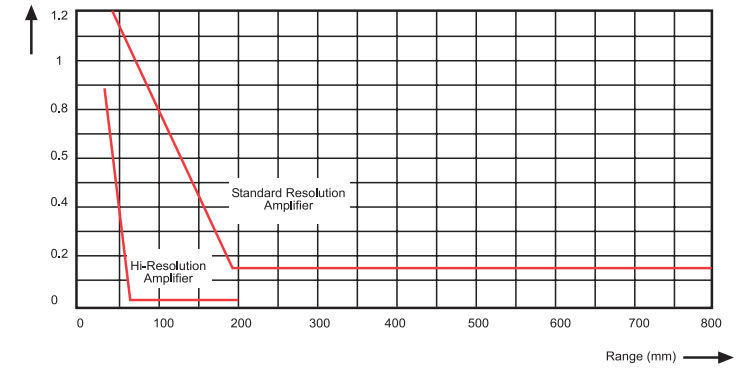


Measuring arrangement

Successful detection with the Balluff miniature optical thru-beam system is based on three factors: target size, beam intensity, and beam range. The following chart illustrates the approximate performance of different wire diameters breaking the beam at certain beam ranges. If a sizeable target does not break the beam, lowering the intensity of the beam via the control amplifier will usually remedy the problem.

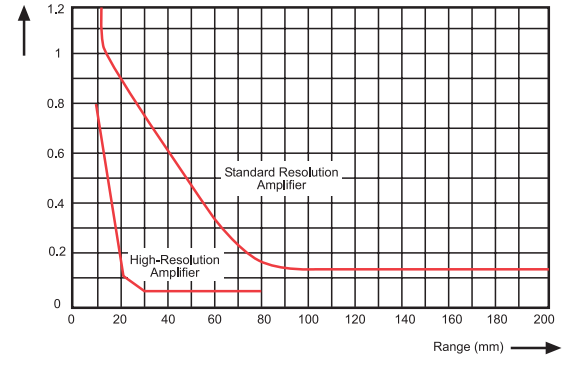
Wire Diameter (mm)

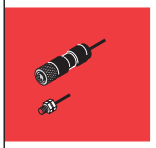
For parts...04SM, 05TM & 66RM



Wire Diameter (mm)

02SM & 03TM





Technical Description

The miniature series of compact diffuse sensors are among the smallest self-contained optical sensors in the world. The emitter and receiver, as well as all electronics are contained in these small packages.

The smooth tubular housings are easy to mount with clamping brackets. Threaded barrels are furnished with nuts for easy mounting.

The rectangular housing makes for easy positioning in tight spaces. In fact, two models come standard with quick disconnect and potentiometer for adjusting the sensing distance. The background suppression model is ideal highly for reflective surfaces, dark objects and location with extremely close and highly reflective backgrounds.

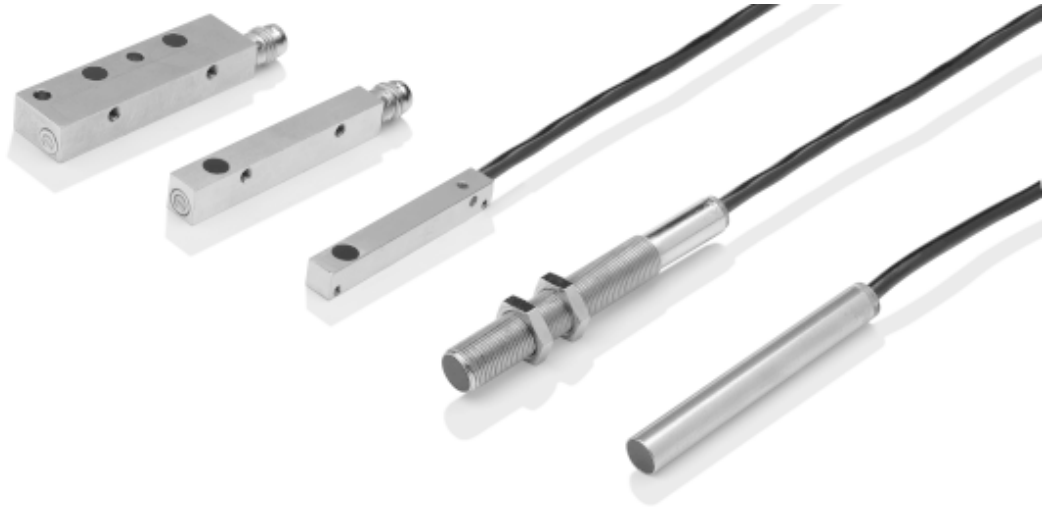
All versions come standard as PNP, normally open output. Cable out models come standard with 2 meters of PUR cable. Contact the factory for availability of other logic or cable styles.

Features

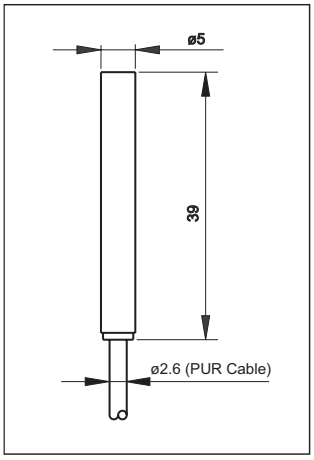
- Totally self-contained units, no separate amplifier
- Miniature housing is sealed to IP65 standards
- Background suppression model uses V-shape beam to ignore highly reflective backgrounds
- Protected against short-circuit and polarity reversal

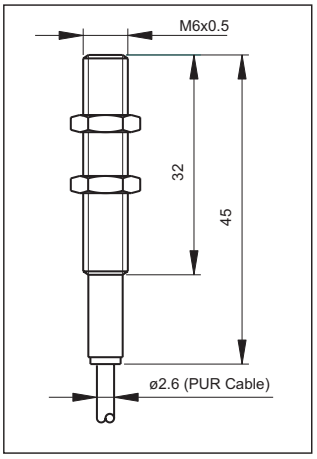
Applications

- General automation tasks
- Assembly and handling
- Machine building
- Packaging machinery
- Robots
- Machine tools



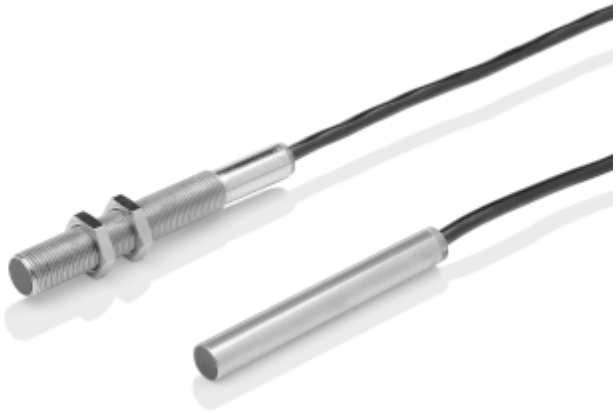
Series	5MM Smooth Tubular	6MM Threaded Tubular
Diffuse Range	**50mm (2.0 in.)**	**50mm (2.0 in.)**
Background Suppression		

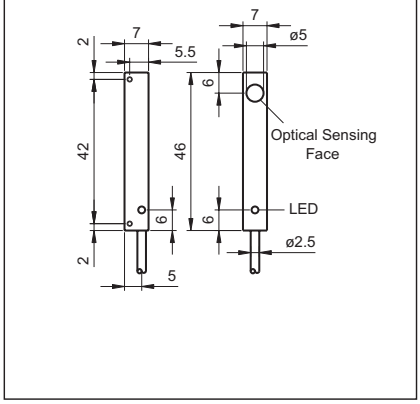
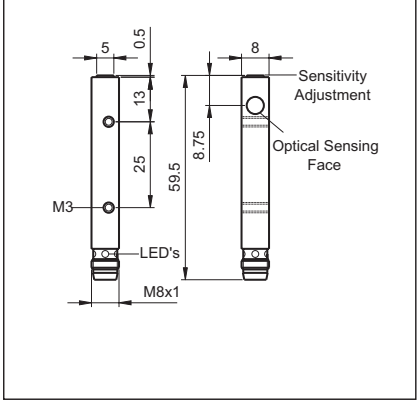
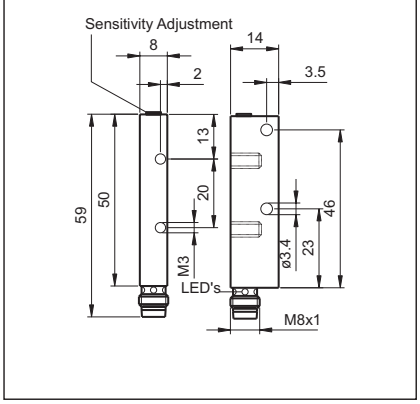


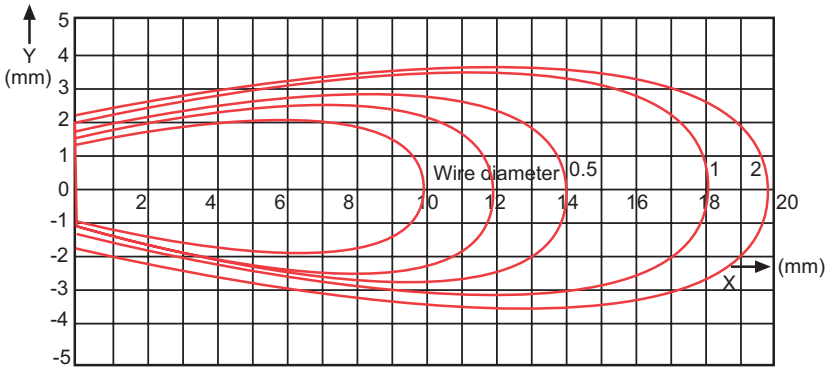


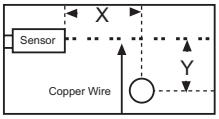
Diffuse		
PNP 50mm (2.0 in.)	BMOA-05SM-X50-PS-C-2	BMOA-06TM-X50-PS-C-2
NPN 50mm (2.0 in.)	BMOA-05SM-X50-NS-C-2	BMOA-06TM-X50-NS-C-2
Diffuse with Fixed Focus		
PNP 10mm (0.4 in.)		
PNP 10mm (0.4 in.)		

Voltage supply	10 to 30 Vdc
Voltage supply ripple	<15% peak-to-peak
Voltage drop, output	< 2.0V at 100mA
Rated output current	100 ma
Supply current (no load)	30 ma
Protections	Short circuit, polarity reversal
On/Off delay	1 ms
Switching frequency	500 Hz
Output type	PNP/NPN
Output function	Normally Open (NO)
Sensitivity/Range Adjustment	None
LED indicators	Red Output indication
Ambient Light Protection	Per EN 60947-5-2
Emitter light source	Infrared 880 nm
Ambient operating temperature	-10°C to +55°C (+14°F to +131°F)
Storage temperature	30°C to +70°C (-22°F to 158°F)
Degree of protection per IEC 529	IP 65
Relative Humidity	90% at 20°C
Housing material	Stainless Steel
Sensing face material	PMMA
Connection	2m cable (3-wire, 28 AWG), PUR
Recommended Connector	



Block, Cable out **50mm (2.0 in.)**	Block, Quick-disconnect, Adjustable Range **50mm (2.0 in.)**	Block, Quick-disconnect, Adjustable range 10mm (0.4 in.)
		
BMOA-66RM-X50-PS-C-2 BMOA-66RM-X50-NS-C-2	BMOA-78RM-X50-PS-C-S49 BMOA-78RM-X50-NS-C-S49	
		BMOA-148RM-X50-PS-C-S49/S81 BMOA-148RM-X50-NS-C-S49/S81
10 to 30 Vdc		
<15% peak-to-peak		
< 2.0V at 100mA		
100 ma		
30 ma		
Short circuit, polarity reversal		
1 ms		
500 Hz		
PNP/NPN		
Normally Open (NO)		
None	1-turn potentiometer	1-turn potentiometer
Red Output indication		
Per EN 60947-5-2		
Infrared 880 nm		
-10°C to +55°C (+14°F to +131°F)		
30°C to +70°C (-22°F to 158°F)		
IP 65		
90% at 20°C		
Nickel-plated brass		
PMMA		
2m cable (3-wire, 28 AWG), PUR		
	BKS S48 (straight) or BKS S49 (right angle)	BKS S48 (straight) or BKS S49 (right angle)





While the standard 50 x 50mm Kodak Test Card is used for determining sensing range, very few applications use this as the target. The following chart shows the approximate performance of these sensors using several different wire sizes as a target and an amplifier with standard resolution.

Connection diagram