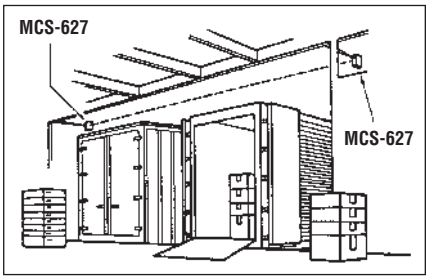
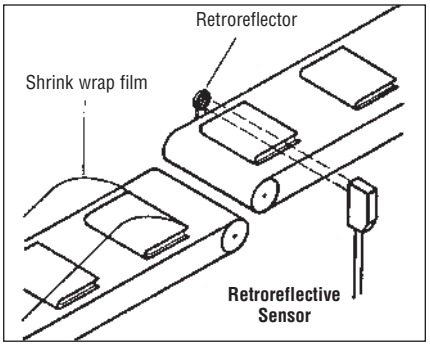
Photoelectric Applications

- Jam detection and prevention
- Empty line detection
- Counting
- Sorting by size, color or surface
- Automatic routing
- Feed control
- Hopper level control
- Color mark registration
- Edge guiding
- Web break detection
- Positioning
- Cut-off control
- Filling
- Folding and wrapping
- Batch counting
- Missing part detection
- Correct count
- Open flap detection
- Ejected part detection
- Incorrect closure
- Door control
- Sizing



Truck Height Control

A long range through-beam sensor was positioned at a height just below the over-hanging roof and a couple of feet in front, so the breaking of the beam would activate an output wired to an alarm alerting the driver to stop.



Conveyor/Material Handling

A retroreflective sensor was chosen to look across the conveyor at the retroreflector. When the book blocks the beam, a signal is given to stop the conveyor.

Photoelectric Identification Codes

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	+
Example:	**O**	**M**	**1**	**2**	**R**	**T**	**—**	**D**	**H**	**T**	**P**	**—**	**0**	**2**	**0**	**0**	**—**	**C**	**L**	

1 O = Photoelectric Sensor

2
- M = Metric metal housing
- T = Metric thermoplastic housing
- R = Rectangular design
- Z = Cylindrical design

3/4 Specification of housing dimensions
e.g. 12 = M12
18 = M18
20 = 20 series
90 = 90 series

5/6
- ES = Through-beam sensor (Complete set)
- EE = Through-beam, receiver only
- SE = Through-beam, transmitter only
- LC = Fiber optic control (sensor with fiber optics connection)
- RH = Diffuse reflective sensor with background suppression
- RS = Retroreflective sensor
- RT = Diffuse reflective sensor
- FF = Convergent beam sensor, fixed focus
- PR = Print registration sensor
- PS = Polarized retro sensor

7 Dash

8 Voltage type
- A = AC
- D = DC
- M = Multivoltage, AC/DC, UC
- P = Programmable voltage (AC or DC)

9 Output function
- A = Complementary LA/DA (light activated/ dark activated)
- D = Dark activated (DA)
- H = Light activated (LA)
- O = No output (through-beam transmitter)
- P = Selectable LA/DA (light activated/ dark activated)
- X = Customer-specified output

10 Output type
- A = Analog output
- N = NAMUR
- O = No output
- Q = Triac
- R = Relay
- S = Others
- T = Transistor
- Y = Thyristor

11
- N = NPN transistor output (switched to negative)
- P = PNP transistor output (switched to positive)
- G = Push/Pull
- S = Through-beam light source
- U = Switch selectable NPN/PNP
- 2 = 2-wire output
- 3 = 3-wire output
- 4 = 4-wire output

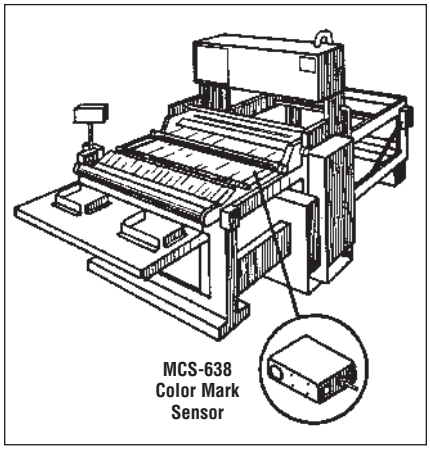
12 Dash

13-16 Sensing distance
Sensing distance specifications are always indicated by 4 digits
– mm: without decimal point
– m: with decimal point
e.g. 06.0 = 6 m
e.g. 15.0 = 15 m
e.g. 0500 = 500 mm

17 Dash

18 Connection type
- A = Screw termination
- B = Plug with screw terminals
- C = Cable (standard C = 2 m or length in m)
- S = Plug-in connector

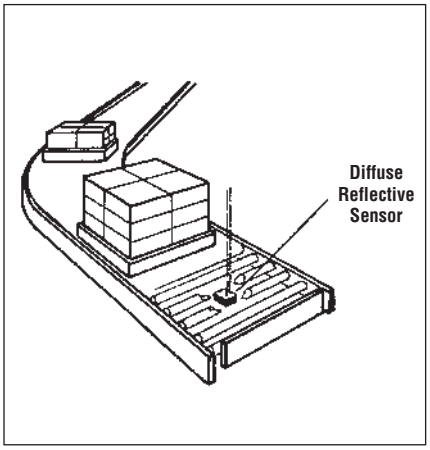
19 Options
- C = Control/diagnostic input
- D = LED for output indication
- E = Adjustable sensitivity
- F = Diagnostic circuit with output and LED for indicator
- G = LED for output mode, supply voltage and beam control indication
- H = LED for supply voltage and output mode indication
- L = LED for output indicator
- T = Adjustable timer circuit
- V = LED for operating voltage indication
- X = Customer-specific options
- Z = Fixed timer



Bag Cutting Machine

Basically, with this being a specialized application, there is only one solution and product selection, and that is the MCS 638 Series Color/Print Registration Sensor.

These units were designed to solve this application with the sensor being capable of sensing small changes in contrast levels or shade differences.



Object Detection

By placing a diffuse reflective type underneath the conveyor and looking up through the rollers, a safe sensing position has been found for the sensor away from fork lift trucks and other possible damaging actions.

Photoelectric Sensors

OR20 Series

Description

The OR20 Series is a family of self-contained photoelectric sensors, with multi-voltage input and relay output. Standard features include adjustable sensitivity and timing circuits which are easily accessible after removing the "snap cover". Sensing modes available include: Through-Beam, Retro, Polarized, Diffused Reflective and Background Suppression.

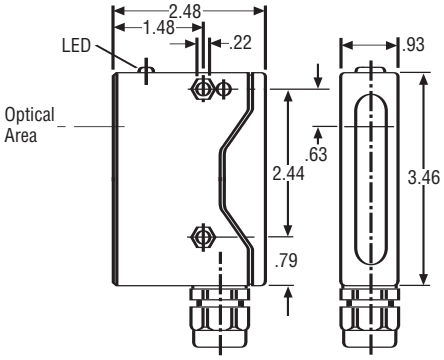
- Rectangular high impact plastic housing
- LED indication of output
- NEMA 4
- Sensitivity control
- Programmable timing Delay or Hold
- Timing range 0.1-10 seconds
- Temperature range -4°F to +158°F
- Multi-voltage 12-265 VAC/DC
- Screw terminals for wiring
- Snap shut hinged back cover
- Relay output - 3A

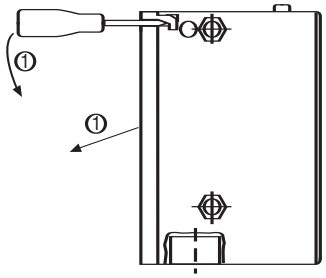
Sensor Selection

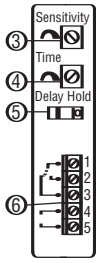
Sensing Principle	Sensing Range	Input Voltage	Switching Function	Output Mode	Maximum Cycle Rate	Output Current	Model	Part Number
Through-Beam	65 ft.	12-265 VAC/DC	SPDT	Relay	>50 Hz	3A	OR20 ES-MAR5-20.0-ALET	655-1686-103*
Retro-Reflective	26 ft.	12-265 VAC/DC	SPDT	Relay	>50 Hz	3A	OR20 RS-MAR5-08.0-ALET	655-4686-001
Polarized Retro	19 ft.	12-265 VAC/DC	SPDT	Relay	>50 Hz	3A	OR20 PS-MAR5-06.0-ALET	655-5686-001
Diffuse Reflective	4.9 ft.	12-265 VAC/DC	SPDT	Relay	>50 Hz	3A	OR20 RT-MAR5-01.5-ALET	655-7686-003
Diffuse Reflective	1.9 ft.	12-265 VAC/DC	SPDT	Relay	>50 Hz	3A	OR20 RT-MAR5-0600-ALET	655-7686-001
BkGnd Suppression	1.2 ft.	12-265 VAC/DC	SPDT	Relay	>50 Hz	3A	OR20 RH-MAR5-0400-ALET	655-8686-002

* A Through-Beam Sensor can be supplied as separate pieces
Projector = Part # 655-1086-001
Receiver = Part # 655-1686-003

Mechanical Data (Dimensions are in inches)







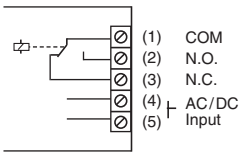
Notes on operation of OR20 Series Housing types:

① Snap-cover housings (to be opened with screwdriver)

Operation elements:

③ Sensitivity potentiometer
④ Timer potentiometer
⑤ Delay-type switch
⑥ Connection terminals

Wiring Data



Relay Output

Accessories

Reflective Disc – 3 1/4" Dia.	Part # 610-8002-001
Mounting Bracket – Fixed	Part # 7430-448-005
Mounting Bracket Adjustable	Part # 7430-448-010

Photoelectric Sensors

OR90 Series

Description

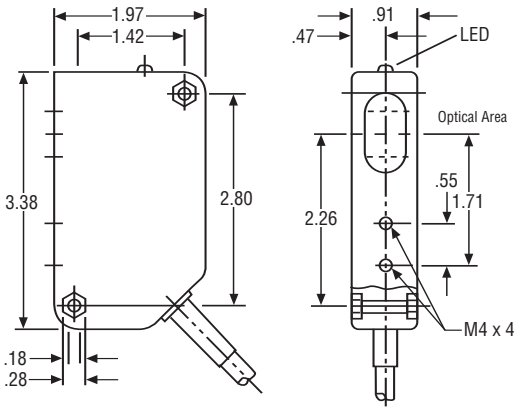
The OR90 Series offers a low cost self-contained family of sensors, housed in a high impact rectangular thermoplastic housing. Termination is made via a 6 ft. long 5 conductor integral cable. Features include, multi-voltage input with relay output, and LED indication of output signal. The series includes 3 sensing modes: Retro, Diffuse and Background Suppression. The OR90 is a simple, low maintenance sensor ideal for material handling applications.

- Totally sealed plastic housing
- LED indication of output
- NEMA 1,3,4,12
- Temperature rating -4°F to +158°F
- 6 ft. cable -5 conductor
- Multi-voltage 12-265 VAC/DC

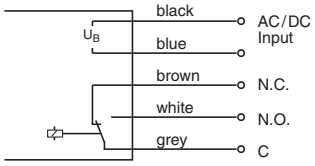
Sensor Selection

Sensing Principle	Sensing Range	Input Voltage	Switching Function	Output Mode	Maximum Cycle Rate	Output Current	Model	Part Number
Retro-Reflective	26 ft.	12-265 VAC/DC	SPDT	Relay	>80 Hz	3A	OR90 RS-MAR5-08.0-CL	655-4696-001
BkGnd Suppression	3 in.	12-265 VAC/DC	SPDT	Relay	>80 Hz	3A	OR90 RH-MAR5-0080-CL	655-8696-001
Diffuse Reflective	23.6 in.	12-265 VAC/DC	SPDT	Relay	>80 Hz	3A	OR90 RT-MAR5-0600-CL	655-7696-001

(Dimensions are in inches)



Wiring Data



Relay Output

Accessories

Reflective Disc – 3 1/4" Dia.	Part # 610-8002-001
Mounting Bracket	Part # 7430-448-007

Photoelectric Sensors

MCS-144/159/165

Description

This proven range of photoelectric sensors provides the user with a standard self-contained sensor with the possibility of modular expansion with plug-in timer, counter and output modules. A "plug-in" double pole double throw 7 amp relay is supplied with all units. Features include a light activated/dark activated switch, adjustable sensitivity and LED output indication.


MCS-159/165


MCS-144

- Heavy duty plastic housing
- LED indication of sensing
- Sensitivity control
- Optional timing and counting modules
- Replaceable industrial relay
- Selectable LA/DA operation
- Temperature rating 0°F to 125°F
- Screw terminals for wiring
- NEMA 12
- Screw down back cover

Sensor Selection

Sensing Principle	Sensing Range	Input Voltage	Switching Function	Output Mode	Maximum Cycle Rate	Output Current	Model	Part Number
Retro-Reflective	30 ft.	110 VAC	DPDT	Relay	>25 Hz	7A	MCS-144/814	7120-448-004
Retro-Reflective	15 ft.	110 VAC	DPDT	Relay	>25 Hz	7A	MCS-165/814	7120-448-015
Diffuse Reflective	6 ft.	110 VAC	DPDT	Relay	>25 Hz	7A	MCS-159/814	7100-448-002

MCS-144, 159 – Plug-in Modules (Order Separately)

Timer Modules

Model	Part Number	Timing Range
MCS-836	7400-448-024	0.4 to 15 seconds
MCS-836-1	7400-448-029	1 to 30 seconds

Timer Functions (Programmable)

On Delay / Off Delay / Dual Delay / One-Shot
One-Shot Drop / Delayed One-Shot / Delayed One-Shot Drop

Counter Modules

Model	Part Number	Counting Range
MCS-831	7400-448-019	1 to 99
MCS-832	7400-448-020	1 to 9999

Output Module (Supplied as Standard)

Model	Part Number	Switching Type
MCS-814	7410-448-008	DPDT 7 Amp

MCS-165 – Plug-in Modules (Order Separately)

Timer Modules

Model	Part Number	Timing Range
MCS-830	7400-448-018	0.4 to 15 seconds
MCS-830-1	7400-448-026	1 to 30 seconds

Timer Functions (Programmable)

On Delay / Off Delay / Dual Delay / One-Shot
One-Shot Drop / Delayed One-Shot / Delayed One-Shot Drop

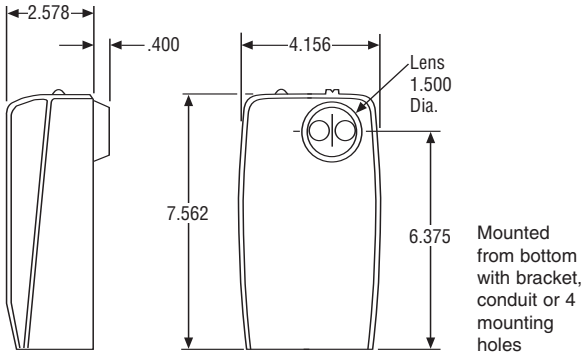
Counter Modules

Model	Part Number	Counting Range
MCS-833	7400-448-021	1 to 99
MCS-834	7400-448-022	1 to 9999

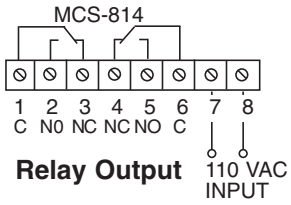
Output Module (Supplied as Standard)

Model	Part Number	Switching Type
MCS-814	7410-448-008	DPDT 7 Amp

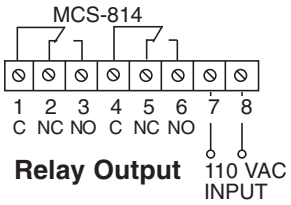
Mechanical Data (Dimensions are in inches)



Wiring Data



MCS-144, 159



MCS-165

Accessories

Reflective Disc – 3 1/4" Dia.	Part # 610-8002-001
Mounting Bracket	Part # 7430-448-001

Photoelectric Sensors

MCS-500 Series

Description

The MCS-500 Series is a self-contained modular design with many standard features that include programmable multi-function timing circuits, sensitivity adjustment, and LED output indication. Once installed, the base module will accept any of the 3 sensing control heads, which can provide Retro, Polarized and Diffused Reflective modes of sensing. The MCS-850 relay is a plug-in module and is supplied as a standard component when purchased as a complete sensor.

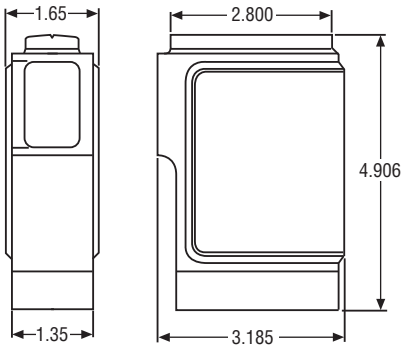
- High impact plastic housing
- Modular design (Control Head/Output Module/Base)
- LED indication of sensing status
- Sensitivity control
- NEMA 12
- Two timing ranges
  Low range 0.5-10 seconds
  High range 3.0-30 seconds
- Programmable timing
- Temperature range 0°F to 125°F
- Screw terminals for wiring

MCS-500 Series

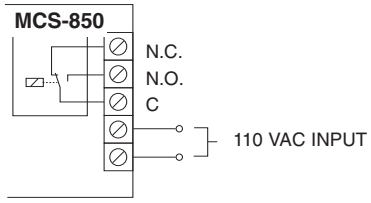
Sensor Selection

Sensing Principle	Sensing Range	Input Voltage	Switching Function	Output Mode	Maximum Cycle Rate	Output Current	Model	Part Number
Retro-Reflective	15 ft.	110 VAC	SPDT	Relay	>50 Hz	5A	MCS-500-01	7150-448-004
Polarized Retro	12 ft.	110 VAC	SPDT	Relay	>50 Hz	5A	MCS-500P-01	7151-448-001
Diffuse Reflective	6 ft.	110 VAC	SPDT	Relay	>50 Hz	5A	MCS-501-01	7150-448-003

Mechanical Data (Dimensions are in inches)



Wiring Data



Relay Output

MCS-500 Timing Functions

Switch selectable, multi-function timing is a standard feature on the MCS-500, MCS-500P and MCS-501.

The timing function can be switched from a low timing range of 0.5 to 5.0 seconds to a high timing range of 3.0 to 30 seconds. When no timing is required, the function can be switched off.

On delay, off delay, dual delay, one shot, and delayed one shot functions are quickly achieved by setting the timing switches on the unit. Easy-access timing adjustment controls are accessible from the top of the unit to allow fine tuning during operation.

Timing functions can be employed for light or dark operation.

Timing Ranges

Low range 0.5 to 5.0 seconds

High range 3.0 to 30 seconds

On-Off switch selectable

Ordering Information for Individual modules

Control Module	Part Number
MCS-500-120-CON	7150-101-004
MCS-500P-120-CON	7151-101-001
MCS-501-120-CON	7150-101-003
Base Module	
MCS-500-120-BAS	7150-101-013
Output Module	
MCS-850-REL-OUT SPDT Relay 5A	7150-101-016

Accessories

Reflective Disc – 3 1/4" Dia.	Part # 610-8002-001
Mounting Bracket	Part # 7150-101-020
Cable Gland	Part # 7420-448-029

Photoelectric Sensors

Compact Series

Description

The COMPACT Series of photoelectric sensors are rugged industrial DC voltage input photoelectric sensors with a reliable performance for many general purpose applications. Sensing mode capabilities include: Through-Beam (up to 500 ft.), Retro and Diffuse Reflective. Output standard on all units is light activated/dark activated NPN transistor. LA/DA is selectable at the time of installation by wire selection. All Compact Series of sensors are designed to work with the Warner Electric range of sensor controls.

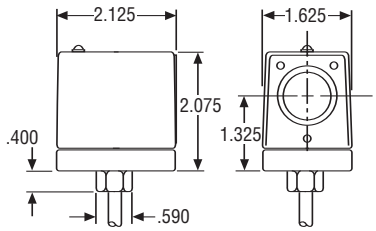
- Heavy duty zinc die cast housing
- LED indication of output
- NEMA 1, 12
- Temperature rating -40°F to +158°F (MCS-629 only)
- Temperature rating -22°F to +158°F
- 10 ft. cable

Compact Series

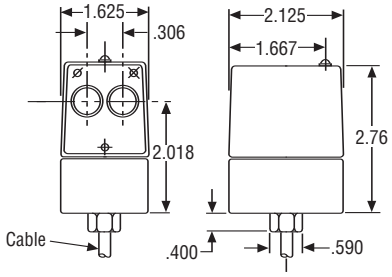
Sensor Selection

Sensing Principle	Sensing Range	Input Voltage	Switching Function	Output Mode	Maximum Cycle Rate	Output Current	Model	Part Number
Through-Beam	500 ft.	10-30 VDC	LA/DA	NPN	>25 Hz	250 mA	MCS-629	7115-448-005
Through-Beam	50 ft.	12-18 VDC	LA/DA	NPN	>250 Hz	250 mA	MCS-627	7115-448-003
Through-Beam	50 ft.	22-28 VDC	LA/DA	NPN	>250 Hz	250 mA	MCS-637	7115-448-001
Retro-Reflective	15 ft.	12-18 VDC	LA/DA	NPN	>250 Hz	250 mA	MCS-625	7125-448-002
Retro-Reflective	15 ft.	22-28 VDC	LA/DA	NPN	>250 Hz	250 mA	MCS-635	7125-448-003
Diffuse Reflective	0 to 1 ft.	12-18 VDC	LA/DA	NPN	>250 Hz	250 mA	MCS-626	7105-448-002
Diffuse Reflective	0 to 1 ft.	22-28 VDC	LA/DA	NPN	>250 Hz	250 mA	MCS-636	7105-448-005
Diffuse Reflective	.1 to 6 ft.	12-18 VDC	LA/DA	NPN	>250 Hz	250 mA	MCS-626-2	7105-448-007
Diffuse Reflective	.1 to 6 ft.	22-28 VDC	LA/DA	NPN	>250 Hz	250 mA	MCS-636-2	7105-448-011

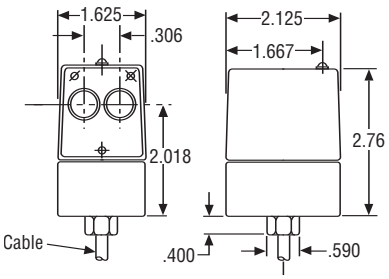
Mechanical Data (Dimensions are in inches)



MCS-627/629

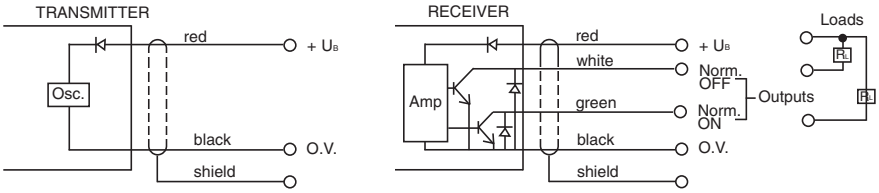


MCS-626/636

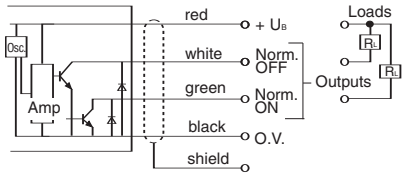


MCS-625/635

Wiring Data



MCS-627/629



MCS-625/635/626/636/626-2/636-2

Accessories

Reflective Disc – 3 1/4" Dia.	Part # 610-8002-001
Mounting Bracket	Part # 7430-448-003

Photoelectric Sensors

OT18 Series

Description

This series of 18mm plastic tubular sensors provides the user with a self-contained DC low voltage sensor with NPN or PNP output. Programmable light activated/dark activated output. Modes of sensing include: Through-Beam, Retroreflective, Polarized Retro-reflective, Diffuse Reflective and Fixed Focus types.

- 18mm diameter cylindrical plastic housing
- Self-contained with 6.5 ft. cable
- IP 67/NEMA 4
- LED indication of output
- Temperature range –20°C to +70°C (–4°F to +158°F)
- 10–36 VDC input voltage
- No-load supply current ≤15 mA (Emitter ≤20 mA)
- Reverse polarity protection
- Short circuit protected
- 200mA switching current
- Voltage drop ≤2 VDC
- Hysterisis ≤15%
- Repeat accuracy ≤10%
- Switching frequency 500 Hz

OT18 Series

Sensor Selection

Sensing Principle	Sensing Range	Switching Function	Sensitivity	Model Description	Part Number
Through-Beam	26 ft.	NPN	Fixed	OT18ES-DPTN-08.0-CL	655-1219-102
Through-Beam	26 ft.	PNP	Fixed	OT18ES-DPTP-08.0-CL	655-1819-101
Retro-Reflective	2 in. to 9.5 ft.	NPN	Fixed	OT18RS-DPTN-03.0-CL	655-4219-002
Retro-Reflective	2 in. to 9.5 ft.	PNP	Fixed	OT18RS-DPTP-03.0-CL	655-4819-003
Polarized Retro-Reflective	0 in. to 8.2 ft.	NPN	Adjustable	OT18PS-DPTN-02.5-CLE	655-5219-001
Polarized Retro-Reflective	0 in. to 8.2 ft.	PNP	Adjustable	OT18PS-DPTP-02.5-CLE	655-5819-003
Diffuse Reflective	19.6 in.	NPN	Adjustable	OT18RT-DPTN-0500-CLE	655-7219-006
Diffuse Reflective	19.6 in.	PNP	Adjustable	OT18RT-DPTP-0500-CLE	655-7819-006
Diffuse Reflective	11.8 in.	NPN	Adjustable	OT18RT-DPTN-0300-CLE	655-7219-005
Diffuse Reflective	11.8 in.	PNP	Adjustable	OT18RT-DPTP-0300-CLE	655-7819-005
Fixed Focus	1.57 in.	NPN	Fixed	OT18FF-DPTN-0040-CL	655-8219-001
Fixed Focus	1.57 in.	PNP	Fixed	OT18FF-DPTP-0040-CL	655-8819-001

Through Beam Sensors:

To order separate transmitters and receivers use the following:

Transmitter:

Part Number 655-1019-001

Model: OT18SE-DOOS-08.0-C

Receiver:

Part Number: 655-1219-002

Model: OT18EE-DPTN-08.0-CL

Part Number: 655-1819-001

Model: OT18EE-DPTP-08.0-CL

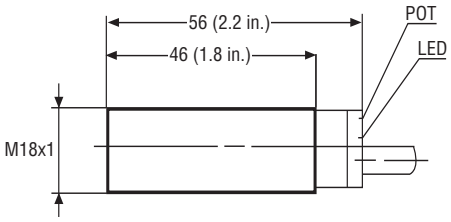
Accessories

Reflective Disc-3-1/4" Dia.	Part #610-8002-001
Mounting Bracket	Part #7125-101-001

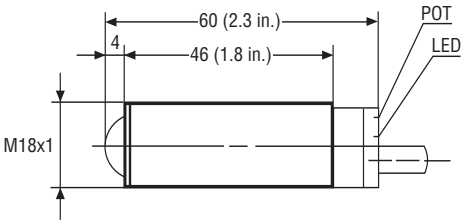
Note: The sensors on this page are also available in nickel–plated brass or stainless steel housings, also available in quick disconnect version. Contact Factory.

Photoelectric Sensors
OT18 Series

Dimensions and Wiring Details



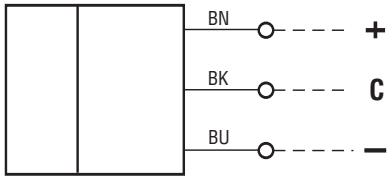
Through-Beam, Retro, Diffuse, Fixed Focus, Sensors



Polarized Retroreflective Sensors

Wire Colors:
Brown = Plus 10 – 36 Volts DC
Blue = Zero Volts Common
Black = Output Wire
White = Control Wire
Note: The LED output indicator is on when the output is active.

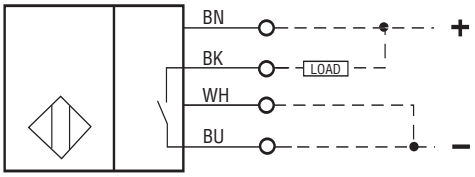
Wiring Diagram of the Through-Beam Emitter



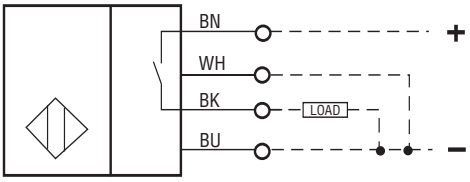
Black = Control Input. The emitter will be turned off when the control wire is connected to minus (common). System Test Function.

Normally Off

NPN – sensors

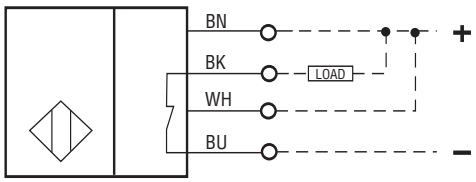


PNP – sensors

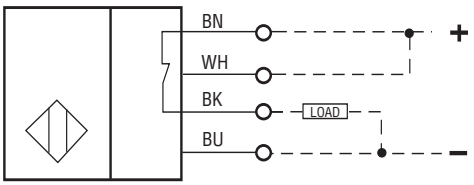


Normally On

NPN – sensors



PNP – sensors



With the Control Wire (White) the output function is programmable. A not connected white wire produces a Normally Open function. Diffuse Reflective and Fixed Focus types are usually operated light active (Normally Off) and other sensors like the Retro, Polarized Retro, and the Through-Beam are usually operated Dark Active (Normally On).

Photoelectric Sensors

MCS-638 Series

Print Registration/Color Mark/Contrast Sensor

- Dual Lens Position
- Automatic selection of best color light source (Green, Red, Blue)
- Static Mode Teach allows one automatic teach step for the target and one automatic teach step for the background.
- Remote Teach Imput allows colors to be programmed externally
- Light Operate/Dark Operate modes
- Housing Material Makrolon
- Quick Disconnect (2 Meter Straight Cable included with Sensor)
- Temperature Range -4°F to + 140°F
- LED Indication of Output Status
- Output - Push-Pull (NPN/ PNP)

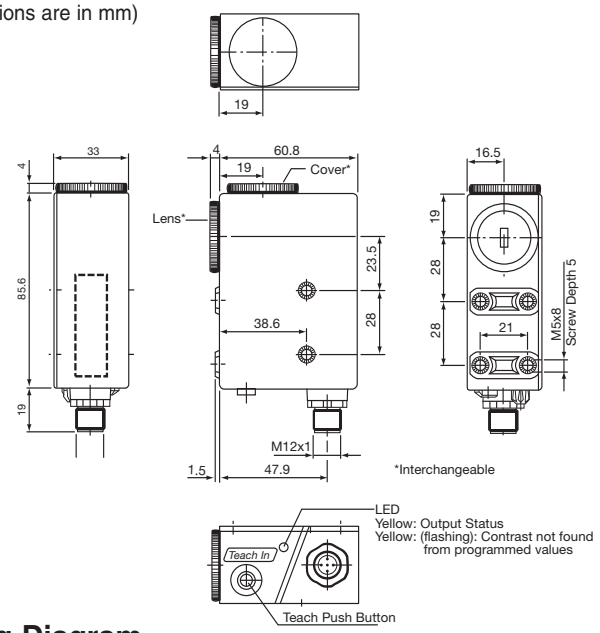
CE

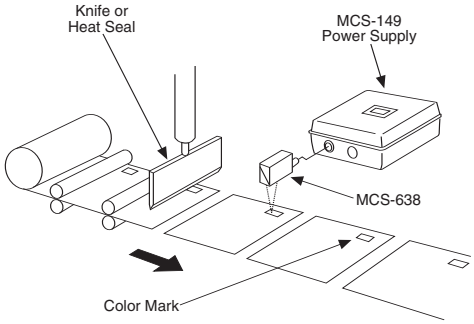
Sensor Selection

Sensing Range	Input Voltage	Current Consumption	Maximum Cycle Rate	Output Current	Model	Part Number
9.5 mm (3/8 in.)	10 -30 VDC	≤60 mA	16.5 KHz	200 mA	MCS-638-3	7135-448-011
25 mm (1 in.)	10 -30 VDC	≤60 mA	16.5 KHz	200 mA	MCS-638-4	7135-448-012

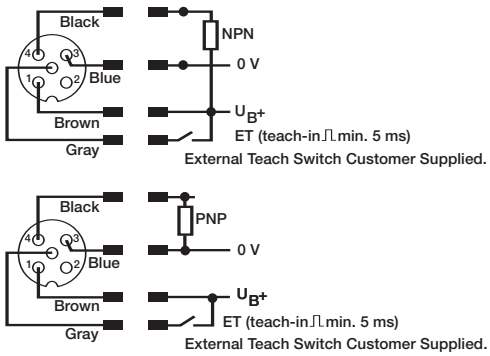
Mechanical Data

(Dimensions are in mm)





Wiring Diagram



Programming

1. Connect the supply voltage to the wires noted in the wiring diagram.
2. Aim the light spot at the target mark. For glossy or reflective surfaces, the sensor should be angled at 10° to 15° off the perpendicular axis from the target.
3. Press the Teach push button on the sensor or apply V+ to the Teach Input for a minimum of 50 milliseconds. The LED should flash slowly (at a rate of approximatel 1 Hz).
4. Aim the light spot at the background.
5. Press the Teach push button on the sensor or apply V+ to the Teach Input for a minimum of 50 milliseconds. The LED will now turn on when the target mark is present and off when it is absent after a successful teach. If the teach was not successful or the contrast was not sufficient, the LED flashes quickly (at a rate of approximately 4 Hz). Programming the MCS-638 as indicated above sets the switching threshold exactly in the middle of the target and background values. The above procedure is for Light Operate mode. For Dark Operate mode, reverse steps 2 and 4.