

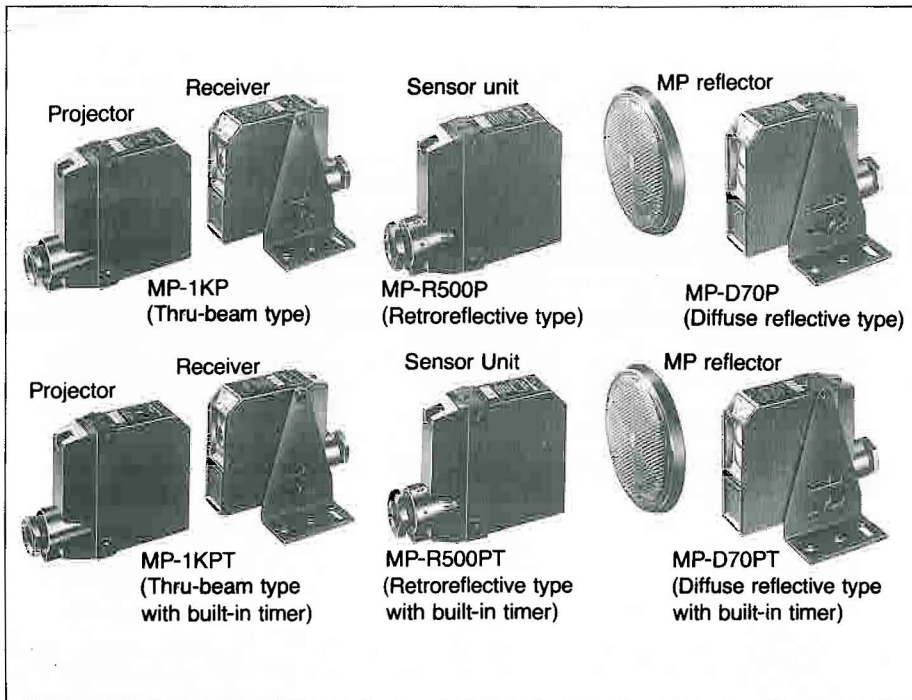


SLIM TYPE FOR EASY INSTALLATION AND ADJUSTMENT

Components for advanced technology

MP Selfcontained-AC/DC Photoelectric Sensors

- Operation with either AC or DC power source
- Built-in timer type also available
- Relay output 3 A 250 V AC
- No misoperation of output during power on or off condition
- Operation and adjustment indication LED
- Slim type for easy installation and adjustment
- Environmental resistance (IEC IP66)



PRODUCT TYPE

cm

Type	Part No.	Replacement for projector and receiver sold separately	Specifications
Standard type	MP-1KP-12/24V	Projector MP-L1KP-12/24V	Thru-beam type 1000 11 yards
		Receiver MP-T1KP-12/24V	
	MP-1KP-100/240V	Projector MP-L1KP-100/240V	Thru-beam type 1000 11 yards
		Receiver MP-T1KP-100/240V	
	MP-R500P-12/24V	—	Retroreflective type 500 5.5 yards
	MP-R500P-100/240V	—	Retroreflective type 500 5.5 yards
MP-D70P-12/24V	—	Diffuse reflective type 70 2.3 feet	
MP-D70P-100/240V	—	Diffuse reflective type 70 2.3 feet	
Timer built-in type	MP-1KPT-12/24V	Projector MP-L1KP-12/24V	Thru-beam type 1000 11 yards
		Receiver MP-T1KPT-12/24V	
	MP-1KPT-100/240V	Projector MP-L1KP-100/240V	Thru-beam type 1000 11 yards
		Receiver MP-T1KPT-100/240V	
	MP-R500PT-12/24V	—	Retroreflective type 500 5.5 yards
	MP-R500PT-100/240V	—	Retroreflective type 500 5.5 yards
MP-D70PT-12/14V	—	Diffuse reflective type 70 2.3 feet	
MP-D70PT-100/240V	—	Diffuse reflective type 70 2.3 feet	
MP reflector	MP-MP	Reflector for MP-R500P, MP-R500PT	

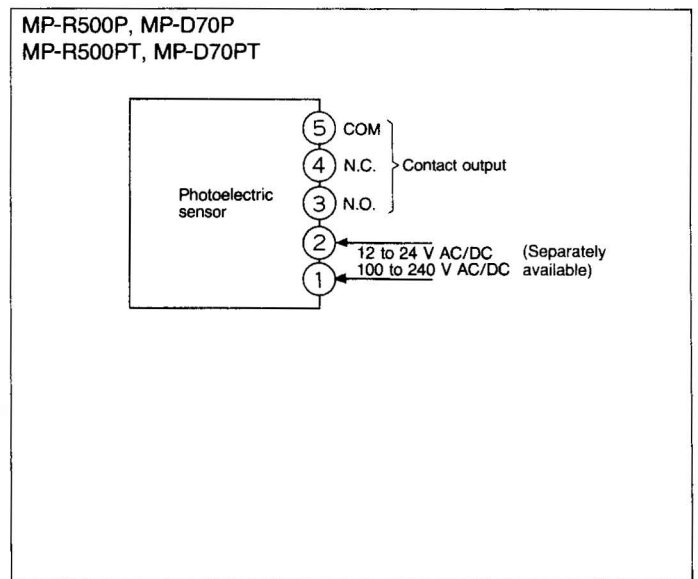
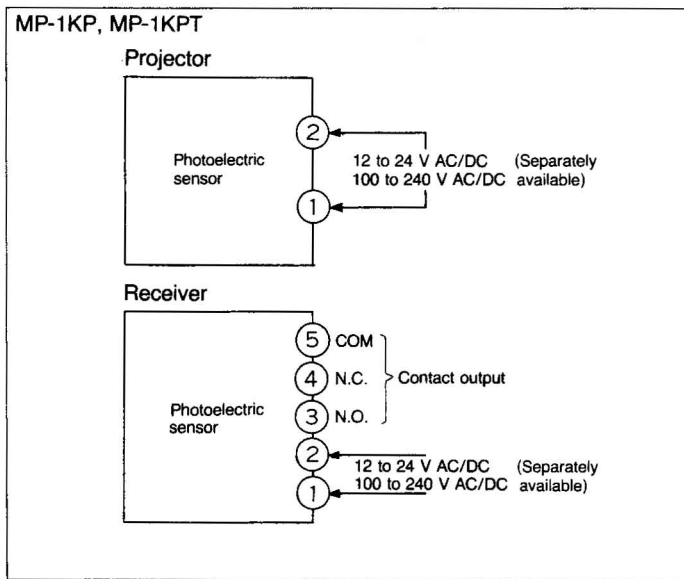
Note) MP-MP is provided with MP-R500P and MP-R500PT.

CIRCUIT DIAGRAM

Type	Operation		Circuit diagram	Built-in relay operating condition	Operation indicator (OPERATION)
Standard type	ON-OFF operation	Thru-beam type MP-1KP		When light is blocked ON	When light enters ON
		Retroreflective type MP-R500P		When light is blocked ON	When light enters ON
		Diffuse reflective type MP-D70P		When light enters ON	When light enters ON
Timer built-in type	Timed-out operation	Thru-beam type MP-1KPT		ON delay OFF delay One-shot (each operation changeable)	When light enters ON
		Retroreflective type MP-R500PT			When light enters ON
		Diffuse reflective type MP-D70PT			When light enters ON

Note: Timer built-in type can be used as a standard type by setting the timing adjustor to the minimum and using the operation mode of ON delay or OFF delay.

CONNECTION DIAGRAM



Note: No polarity even in the case of using the sensor with DC power source.

SPECIFICATIONS

Item	Type	Thru-beam type		Retroreflective type		Diffuse reflective type	
		MP-1KP	MP-1KPT	MP-R500P	MP-R500PT	MP-D70P	MP-D70PT
Rated operating voltage	12 to 24 V AC/DC, 100 to 240 V AC/DC (separately available)						
Rated power consumption	(AC) Projector: Max. 1.5 VA Receiver: Max. 2.5 VA (DC) Projector: Max. 1.5 W Receiver: Max. 1.5 W		(AC) Max. 2.5 VA (DC) Max. 2 W		(AC) Max. 2.5 VA (DC) Max. 2 W		
Rated control capacity (UL rating)	3A 250 V AC (resistive load)						
Standard target	30 mm 1.181 inch dia. metal plate (dull black finish)		70 mm 2.756 inch dia. metal plate (dull black finish)		White drawing paper 20 × 20 cm 7.874 × 7.847 inch		
Detectable target	Opaque target more than 15 mm .591 inch dia.		Opaque target more than 70 mm 2.756 inch dia.		Transparent & opaque target		
Operating voltage range	10.8 to 26.4 V AC/DC (50/60 Hz), 80 to 264 V AC/DC (50/60 Hz) (Separately available)						
Max. sensing distance	10 m 11 yards		5 m 5.5 yards (using an included MP reflector)		70 cm 2.3 feet		
Operating angle	Above 2° for both projector and receiver		Above 2°		—		
Hysteresis	—		—		Below 20% at rated setting distance		
Detection speed	25 times/sec.	20 times/sec.	25 times/sec.	20 times/sec.	25 times/sec.	20 times/sec.	
Operation indicating method	Projector: Power indicator (Red LED) Receiver: Indicator light ON light input (Red LED) Adjuster (Red LED)	Projector: Power indicator (Red LED) Receiver: Indicator lights ON light input (Red LED) Adjuster (Red LED) Relay operation indicator (Red LED)	Indicator lights ON light input (Red LED) Adjuster (Red LED)	Indicator lights ON light input (Red LED) Relay operation indicator (Red LED)	Indicator lights ON light input (Red LED)	Indicator lights ON light input (Red LED) Relay operation indicator (Red LED)	
Time setting interval	—	0.1 to 1 s, 0.5 to 10 s (changeable)	—	0.1 to 1 s, 0.5 to 10 s (changeable)	—	0.1 to 1 s, 0.5 to 10 s (changeable)	
Timer operation	—	ON-delay OFF-delay One-shot (changeable)	—	ON-delay OFF-delay One-shot (changeable)	—	ON-delay OFF-delay One-shot (changeable)	
Connection method	Screw terminal connection type						
Contact form	1 Form C						
Contact resistance (initial)	Below 100 mΩ at 6 V DC 1 A						
Contact material	Gold-flash silver alloy	Gold-clad silver alloy	Gold-flash silver alloy	Gold-clad silver alloy	Gold-flash silver alloy	Gold-clad silver alloy	
Electrical life min.	2 × 10 ⁵	10 ⁵	2 × 10 ⁵	10 ⁵	2 × 10 ⁵	10 ⁵	
Mechanical life min.	2 × 10 ⁷ operations						
Insulation resistance (initial)	Above 100 MΩ (using 500 V DC megger) between mutual each portion and contacts of charged terminals, uncharged metal parts and contact output						
Dielectric strength	2000 V AC (1500 V AC with timer type) for one minute between mutual each portion 1000 V AC (750 V AC with timer type) for one minute between contacts						
Vibration resistance	Functional	10 to 55 Hz (1 cycle/min) double amplitude 1.5 mm (2 h on 3 axes)					
	Destructive	10 to 55 Hz (1 cycle/min) double amplitude 0.5 mm (10 min on 3 axes)					
Shock resistance	Functional	100 G (5 times on 3 axes)					
	Destructive	10 G (6 times on 3 axes)					
Amplidier light level	Incandescent lamp: max. 10,000 lux						
Ambient temperature	-10°C to +55°C +14°F to +131°F						
Ambient humidity	Max. 85% RH						
Protective construction	Molded plastic body (equivalent to IEC IP66)						

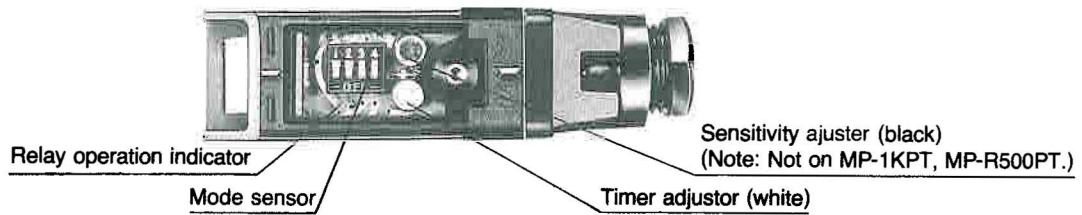
Notes:

1. Unless otherwise specified, the measurement conditions are: rated operating voltage, battery power, an ambient temperature of 20°C +68°F, the stand ard target and an illuminance of 200 lux on the receiver surface.
2. With the diffuse reflective type, the max. sensing distance and hysteresis are the values for the standard target.
The detection distance varies with the material, color and size of the target to be detected.

EXPLANATION OF THE TIMER MECHANISM (MP-1KPT, MP-R500PT, MP-D70PT)

1. Explanation of the control panel

Remove the upper panel cover to expose the control panel. (Photo shows MP-D70PT.)



2. Explanation of operation

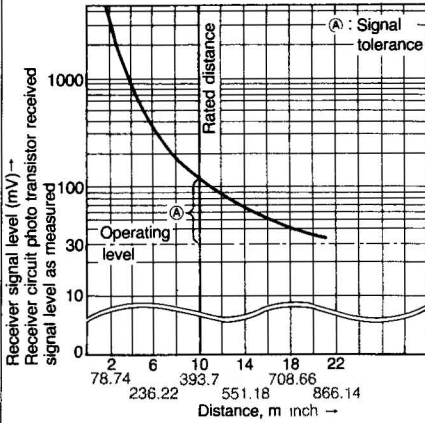
Operation type	Description	Time chart $T = \text{timer interval}$	Mode sensor <input type="checkbox"/> ON <input checked="" type="checkbox"/> OFF
ON-delay	Not usable for short-interval detection. Used for long-period detection like checking the stoppage of production lines.		
OFF-delay	Lengthens output signal to set time interval. If the response time of the load apparatus is slow, the detection time is lengthened to match it.		
One-shot	Emits signal for certain period of time after detection. Used for machinery which always requires a signal of a certain level as input.		
Time selection	<p>Timer interval</p> <p>With sensor 1 off, 0.1 to 1 s</p> <p>With sensor 1 on, 0.5 to 10 s</p> <p>Adjust the time interval with the timer adjustor (white).</p>		<p>0.1 to 1 second</p> <p>0.5 to 10 seconds</p>

Note: If the timer adjustor is set at the minimum value MIN and the sensor is used in the ON-delay or OFF-delay mode, it can be used as a fundamental operation type.

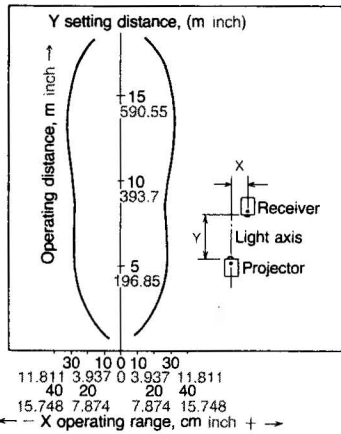
DATA

MP-1KP, MP-1KPT (Thru-beam type) characteristic examples

1. Receiver signal level and distance characteristics

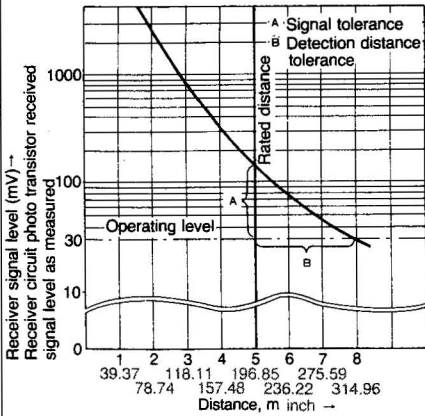


2. Operating level region characteristics

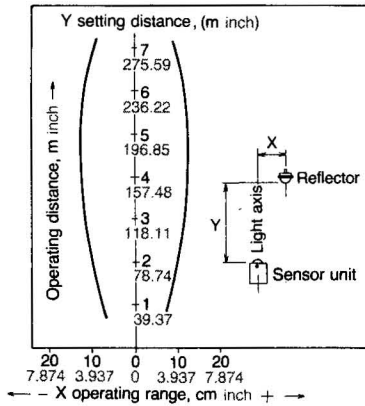


MP-R500P, MP-R500PT (Retroreflective type) characteristic examples

1. Receiver signal level and distance characteristics

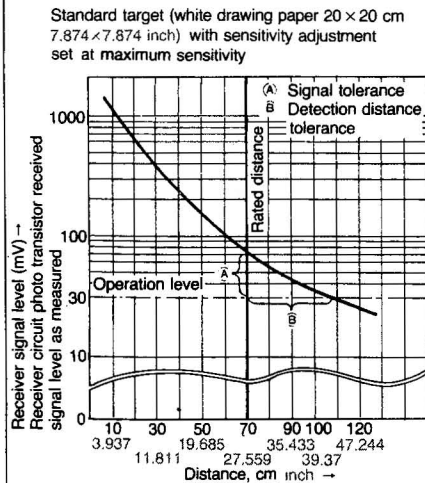


2. Operating level region characteristics

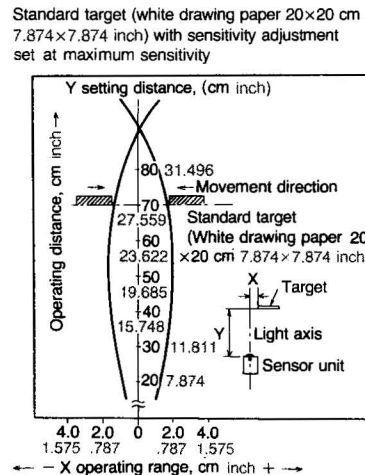


MP-D70P, MP-D70PT (Diffuse reflective type) characteristic examples

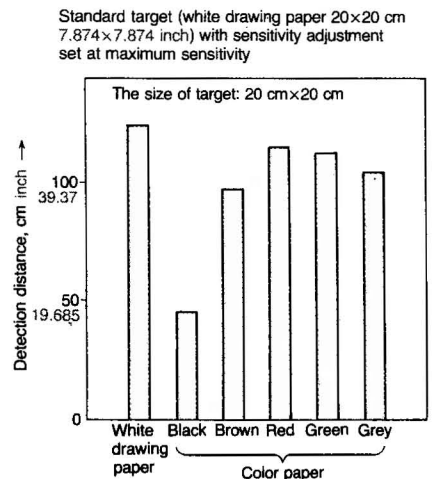
1. Receiver signal level and distance characteristics



2. Operating level region characteristics

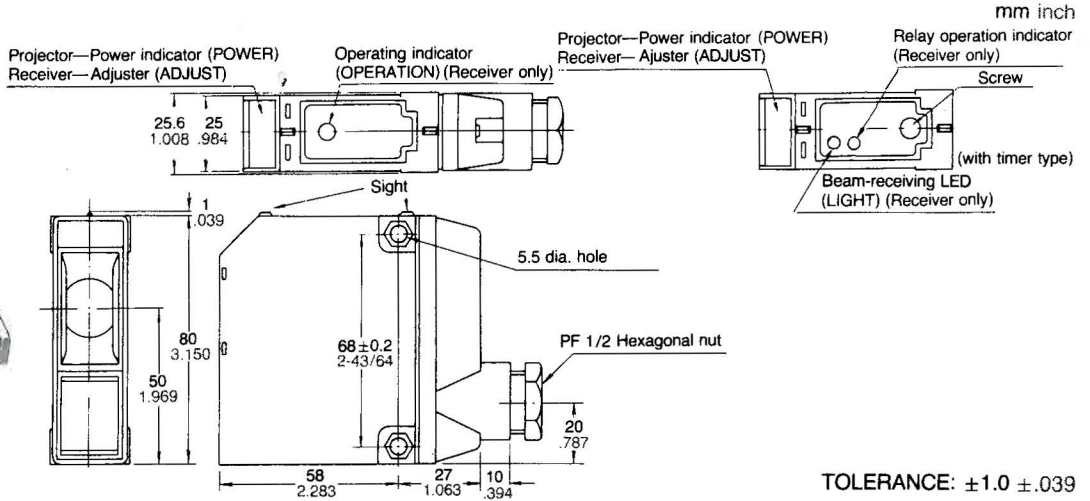
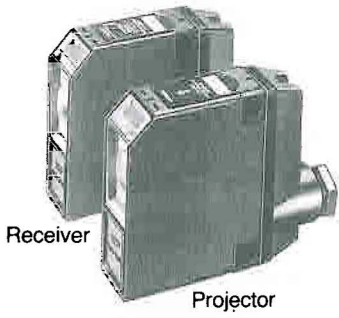


3. Detection distance—color characteristics



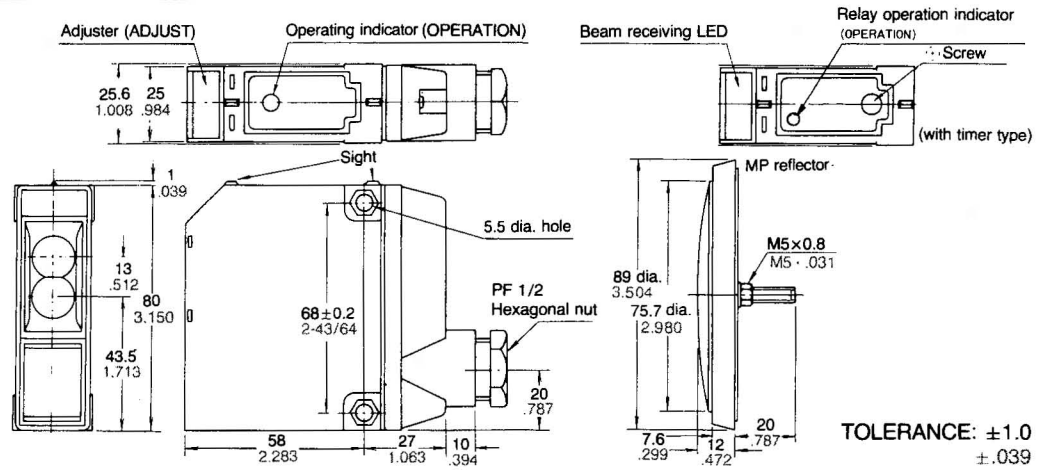
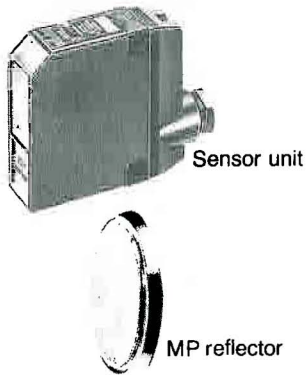
DIMENSIONS

Thru-beam type
MP-1KP, MP-1KPT



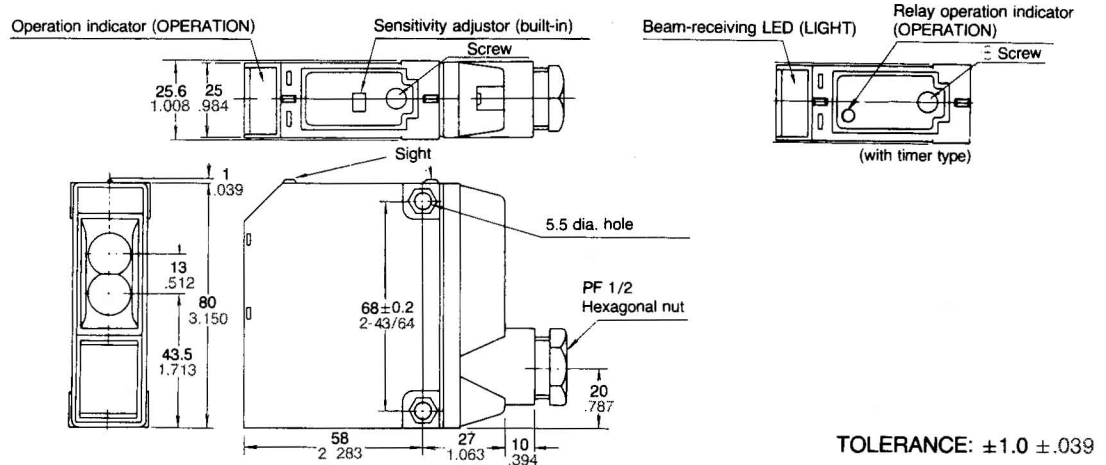
TOLERANCE: ±1.0 ±.039

Retroreflective type
MP-R500P, MP-R500PT



TOLERANCE: ±1.0 ±.039

Diffuse reflective type
MP-D70P, MP-D70PT



TOLERANCE: ±1.0 ±.039

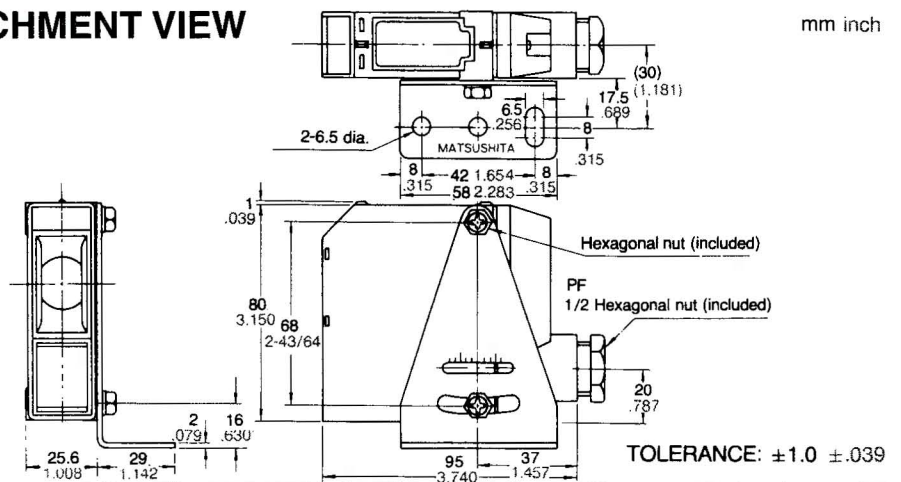
MOUNTING BRACKET ATTACHMENT VIEW

MP-1KP, MP-R-500P, MP-D70P
MP-1KPT, MP-R500PT, MP-D70PT



(Photo shows the receiver of MP-1KP)

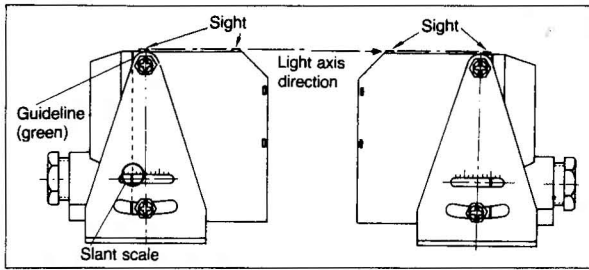
*Accessories are enclosed in each carton box.



TOLERANCE: ±1.0 ±.039

REGARDING LIGHT AXIS AND SENSITIVITY ADJUSTMENT

1. Sight, guideline, slant scale



Light beam axis adjustment is simple with the sights on the top of the housing. Guide-lines (green) are also on the sensor unit and using the mounting accessory, the unit can be slanted according to the scale (1 graduation per about 2°).

2. Light beam adjustment with the thru-beam type

- 1) Temporarily mount the projector and the receiver. With the light beam being received, the OPERATION LED or the beam-receiving LED (LIGHT) will go on.
- 2) Move the projector left and right, up and down to a position in the center of the range indicated by the ADJUST LED.
- 3) Next, move the receiver right and left, up and down to a position in the center of the range indicated by the ADJUST LED.
- 4) Be careful that vibration or impact

during the installation does not cause misalignment of the light beam axis.

3. Light beam adjustment of the retroreflective type

- 1) Temporarily mount photoelectric sensor in a straight line by visual alignment.
 - 2) Move the photoelectric sensor left and right, up and down to a position in the center of the range indicated by the lighting up of the ADJUST LED, or in the case of the sensor with a timer, the LIGHT LED.
 - 3) Pass the target in the detection field and check that the photoelectric sensor operates properly.
 - 4) Affix the reflector and the photoelectric sensor in position. Be careful that vibration or impact does not cause misalignment.
- Note: The targets which can be detected are listed as opaque or translucent materials. However, shiny materials (like cans, mirrors, plated metals) reflect too well and may not be detected by the sensor. In such a case, the detection angle should be changed to allow proper detection.

4. Sensitivity adjustment for the diffuse reflective type

- 1) Temporarily mount the photoelectric sensor facing the direction of detection.
 - 2) Without any target in the field, gradually turn the sensitivity adjuster from its maximum position, toward the left until the operation LED goes off. If LED is off even when the setting is at the maximum position leave the setting at the maximum.
 - 3) Place the target in the field and continue turning the adjuster toward the left until the operation LED goes off.
 - 4) Set the volume at the center between the settings found in steps 2) and 3).
 - 5) Affix the photoelectric sensor in position. Be careful that vibration or impact does not cause misalignment.
- Note: The detection distance varies with the material, color, size, shape and direction of the target as well as the environmental conditions. The actual target should be used to make the proper adjustments.

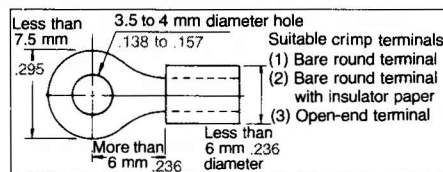
CAUTIONS

1. Use within the ambient temperature range of -10° to +55°C +14°F to +131°F.
2. If the external surge voltage exceeds the following values, the internal circuit may be damaged; a surge absorber should be used.

12 to 24 V AC/DC type	500 V
100 to 240 V AC/DC type	4,000 V

Surge waveform: $\pm(1 \times 40) \mu\text{s}$ of single polarity full-wave voltage.

3. Do not use where there is much steam, dust or corrosive gas or where organic solvents can adhere to the device.
4. Mistake wiring can damage the internal circuit. Re-check the connections before turning on the power.
5. To maintain water protection, the cord should have an outer diameter of 9 to 11 mm .354 to .433 with a smooth covering material that allow the sealing rubber and hexagonal nut accessories to be securely tightened.
6. Wiring and circuit construction
 - 1) Make the connections as shown in the wiring diagram.
 - 2) If crimp terminals are to be used, affix the connected pressure terminals to a UP terminal (M3.5 screw).



- 3) Output from the built-in relay IC contact is sent to the output terminal. For switching an inductive load, a contact protection circuit should be included.
7. Detection section

- 1) Dirtiness or soiling of the detector surface can lower the detection distance allowance. Keep the detector surface clean. The lens cover can easily be removed for the cleaning. (The lens cover is not of water-protected construction.)
- 2) The lens is of acryl and the lens cover is of polycarbonate. They can withstand water, dilute acid or alkali, aliphatic hydrocarbons, and oils. They cannot withstand ketones, esters, halogen hydrocarbons, and aromatic hydrocarbons.
8. Remove the panel cover on the top of the photoelectric sensor to adjust the sensitivity, set the time interval, set the sensor. After the adjustments have been made, replace the packing and securely tighten the screws of the panel cover to preserve the water-protection.

PROTECTIVE CIRCUIT

Circuit example	Conditions
	(1) r must be more than several tens of ohms. (2) AC voltage is used when: i) The impedance of R is large. ii) The impedance of R is c and sufficiently low in comparison to the impedance c and r.
	Can be used for both AC and DC. $r = R$ $c = 0.1 \mu\text{F}$
	(1) For DC only (2) Not for AC
	Can be used for both AC and DC.

Note: The R in the circuits represents inductive load.