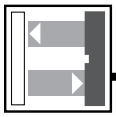
MP Series
Modular Photoelectric Sensors

- Harsh Duty
- Modular design
  - Exchangeable rotatable heads
  - Limit switch and mini style plug-in bases
  - Screw terminal, preleaded, and connector version receptacles
- Withstands 1200 psi washdown, IP69K
- 6 A SPDT and 5 A DPDT relay models
- Multifunction timer/logic cards available
- DC, AC, AC/DC models

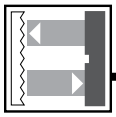
MP Series modular sensors enable users to customize a sensing solution for almost any application. For this reason, the components of this series are sold separately. Refer to pages 594-595 for instruction on how to assemble an MP Series sensor.



Diffuse Mode

Sensing Ranges: 300 mm, 450 mm, 760 mm, 900 mm, 1.3 m, 1.8 m, 3 m

Outputs: Dependent on base selected

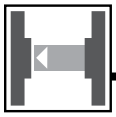


Retro-Reflective Mode

Features:
- Polarization filter to detect shiny objects

Sensing Ranges: 4.5 m, 6 m, 9 m

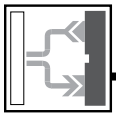
Outputs: Dependent on base selected



Thru-Beam Mode

Sensing Ranges: 36 m, 60 m

Outputs: Dependent on base selected



Fiber Optic Mode

Sensing Ranges: Dependent on fibers selected

Outputs: Dependent on base selected

See page 610-620 for MP Series sensing charateristics, wiring, dimensions and accessories.

BUILD AN MP SENSOR → 1. SELECT A HEAD

1 Head → 2 Plug-in/DPDT Relay Base | SPDT Relay Base | Mini Style Base → 3 Receptacle





STANDARD HEADS (pages 596-597)		Models	
	Diffuse: 450 mm range, 1 ms response, plastic lens, infrared	MPD6HD	ϟ
	Diffuse: 3 m range, 10 ms response, glass lens, infrared	MPD1HD	•
	Diffuse: 3 m range, 10 ms response, plastic lens, infrared	MPD2HD	ϟ
	Diffuse: 900 mm range, 10 ms response, plastic lens, infrared	MPD4HD	ϟ
	Diffuse: 1.3 m range, 10 ms response, plastic lens, infrared	MPD8HD	
	Polarized Retro-Reflective: 4.5 m range, 1 ms response, glass lens, visible red	MPP6HD	ϟ
	Polarized Retro-Reflective: 6 m range, 10 ms response, glass lens, visible red	MPP1HD	•
	Retro-Reflective: 9 m range, 1 ms response, glass lens, infrared	MPL16HD	
	Retro-Reflective: 9 m range, 1 ms response, plastic lens, infrared	MPL6HD	•
	Retro-Reflective: 9 m range, 10 ms response, glass lens, infrared	MPL1HD	
	Retro-Reflective: 9 m range, 10 ms response, plastic lens, infrared	MPL2HD	ϟ
	Thru-Beam: 60 m range, transmitter, glass lens, infrared	MPE1HD	•
	Thru-Beam: 60 m range, transmitter, plastic lens, infrared	MPE2HD	ϟ
	Thru-Beam: 60 m range, receiver, 1 ms response, glass lens, infrared	MPR16HD	
	Thru-Beam: 60 m range, receiver, 1 ms response, plastic lens, infrared	MPR6HD	ϟ
	Thru-Beam: 60 m range, receiver, 10 ms response, glass lens, infrared	MPR1HD	•
	MPF Fiber Optic: 1 ms response, infrared	MPF6HD	ϟ
	MPF Fiber Optic: 5 ms response, visible red	MPF2HD	
	MPG Fiber Optic: 1 ms response, infrared	MPG6HD	•

ANALOG HEADS (page 598)		Models
	MPF Fiber Optic: infrared	MPF5HD

2-WIRE AC HEADS (pages 598-600)		Models	
	Diffuse: 300 mm range, plastic lens, infrared	MP2D7HD	
	Diffuse: 760 mm range, plastic lens, infrared	MP2D4HD	ϟ
	Diffuse: 1.8 m range, glass lens, infrared	MP2D1HD	
	Diffuse: 1.8 m range, plastic lens, infrared	MP2D2HD	•
	Polarized Retroreflective: 4.5 m range, glass lens, visible red	MP2P1HD	
	Retroreflective: 9 m range, glass lens, infrared	MP2L1HD	
	Retroreflective: 9 m range, plastic lens, infrared	MP2L2HD	ϟ
	Thru-Beam: 36 m range, transmitter, glass lens, infrared	MPE3HD	
	Thru-Beam: 36 m range, transmitter, plastic lens, infrared	MPE4HD	
	Thru-Beam: 36 m range, receiver, plastic lens, infrared	MP2R2HD	
	MPF Fiber Optic: infrared	MP2F1HD	
	MPF Fiber Optic: visible red	MP2F2HD	

2. SELECT A BASE

3. SELECT A RECEPTACLE

PLUG-IN BASES (pages 602-603)		Models
AC/DC	10.8-140 VDC/18-140 VAC 4-wire FET w/output indicator	MPS18HD ϟ
DC	10-30 VDC emitter base only	MPS30HD
	10-30 VDC NPN and PNP, 4-wire DC	MPS33HD ϟ
	10-30 VDC NPN N.O./N.C., 4-wire DC	MPS31HD ●
	10-30 VDC PNP, 3-wire DC	MPS32HD ●
AC	198-264 VAC 4-wire solid state AC relay 1 A max.	MPS12HD
	198-264 VAC emitter base only	MPS13HD
	92-132 VAC 4-wire bilateral FET (AC/DC) 100 mA max.	MPS17HD ●
	92-132 VAC 4-wire solid state AC relay 1 A max.	MPS11HD ϟ
	92-132 VAC emitter base only	MPS10HD ●

RECEPTACLE		Models
Standard 4-terminal, 1/2" NPT conduit thread	■	MPB20 ϟ
5-pin mini connector	●	MPB22
4-pin micro connector	❍	MPB27

AC DPDT RELAY BASE (page 603)		Model
RELAY	DPDT, 92-132 VAC, 5 A, output indicator	MPSD11HD ϟ

DPDT RECEPTACLE		Models
8-terminal, 1/2" NPT conduit hole	■	MPB23 ●
8-terminal, 3/4" NPT conduit hole	■	MPB24

SPDT RELAY BASES (page 604)			Models
DC	SPDT, 10-30 VDC, 6 A	■	MPV31HD ●
SPDT RELAY AC	SPDT, 103-132 VAC, 6 A	■	MPV11HD
	SPDT, 192-264 VAC, 6 A	■	MPV12HD
	SPDT, 20-260 VAC/VDC, 6 A	■	MPV14HD ●
	SPDT, 22-26 VAC, 6 A	■	MPV13HD

NO RECEPTACLE NEEDED

MINI STYLE BASES (pages 605-607)			Models
3-WIRE DC	10-30 VDC, 2 m preleaded cable, emitter base only	▲	MPT30HD
	10-30 VDC, NPN N.O., 2 m preleaded cable	▲	MPT31HD ●
	10-30 VDC, PNP N.O., 2 m preleaded cable	▲	MPT32HD
	10-30 VDC, NPN and PNP, N.O., 2 m preleaded cable	▲	MPT33HD ϟ
4-WIRE AC	92-132VAC, 2m preleaded cable, emitter base only	▲	MPT10HD
	92-132 VAC, 4-wire bilateral FET (AC/DC), 100 mA max., 2 m preleaded cable	▲	MPT17HD
	92-132 VAC, 4-wire solid state AC relay, 0.5 A max., 2 m preleaded cable	▲	MPT11HD
AC/DC	22-26 VAC/VDC, 4-wire bilateral FET, 100 mA max., 2 m preleaded cable	▲	MPT16HD ●
MICRO CONNECT. DC	10-30 VDC, NPN N.O., 4-pin micro connector	❍	MPT41HD-CM
	10-30 VDC, PNP N.O., 4-pin micro connector	❍	MPT42HD-CM ●
	10-30 VDC, NPN and PNP, N.O., 4-pin micro connector	❍	MPT43HD-CM ϟ
	10-30 VDC, 4-pin micro connector, emitter base only	❍	MPT40HD-CM
MINI CONNECT. DC	10-30 VDC, NPN and PNP, 4-pin mini connector	●	MPT43HD ϟ
	10-30 VDC, NPN N.O., 4-pin mini connector	●	MPT41HD
	10-30 VDC, PNP N.O., 4-pin mini connector	●	MPT42HD ●
MINI CONNECT. AC	92-132 VAC, 3-pin mini connector, emitter base only	●	MPT20HD
	92-132 VAC, 4-wire solid state AC relay, 0.5 A max., 5-pin mini connector	●	MPT21HD ●
	92-132 VAC, 4-wire bilateral FET (AC/DC), 100 mA max., 5-pin mini connector	●	MPT27HD ●
MINI AC/DC	10.8-140 VDC/18-140 VAC, 4-wire FET w/output ind., 5-pin mini connector	●	MPT28HD
MINI RELAY AC	92-132 VAC, 6 A, SPDT relay, 2 m preleaded cable	▲	MPW11HD ●
	92-132 VAC, 6 A, SPDT relay, 5-pin mini connector	●	MPW21HD

NO RECEPTACLE NEEDED

ELECTRICAL CONNECTION KEY

- ■ Terminal connectors
- ● Mini connectors
- ❍ Micro connectors
- ▲ Preleaded cable

ANALOG PLUG-IN BASE (page 608)		Model
ANALOG	12-24 VDC analog output (0-5 VDC or 4-20 mA)	MPS35HD

2-WIRE PLUG-IN BASES (page 609)		Models
DC	10-30 VDC emitter base only	MPS30HD
2-WIRE AC	92-132 VAC emitter base only	MPS10HD ●
	198-264 VAC emitter base only	MPS13HD
	22-26 VAC/VDC emitter base only	MPS14HD
	22-260 VAC plug-in base	MP2S11HD ϟ

RECEPTACLE		Models
Standard 4-terminal, 1/2" NPT conduit thread	■	MPB20 ϟ
5-pin mini connector	●	MPB22

ϟ Stocked item
● Typical delivery 4 weeks or less
Consult factory for all other models

STANDARD HEADS

Diffuse Mode

Specifications	Infrared			
SENSING RANGE	450 mm	900 mm	1.3 m	3 m
SENSITIVITY ADJUSTMENT	Yes	Yes	Yes	Yes
MODEL NUMBER(S)	MPD6HD	MPD4HD	MPD8HD	MPD1HD
	—	—	—	MPD2HD
RESPONSE TIME*	≤ 1 ms	≤ 10 ms	≤ 10 ms	≤ 10 ms
HOUSING MATERIAL	Polycarbonate	Polycarbonate	Polycarbonate	Polycarbonate
LENS	Plastic	Plastic	Plastic	Glass (1HD)/plastic (2HD)
ADDITIONAL DATA	*See page 601*			

*NOTE: Total response time is the sum of the sensor head and base response times.

Retro-Reflective Mode

Specifications	Visible Red		Infrared	
SENSING RANGE	4.5 m	6 m	9 m	9 m
SENSITIVITY ADJUSTMENT	Yes	Yes	Yes	Yes
POLARIZED FILTER	Yes	Yes	No	No
MODEL NUMBER(S)	MPP6HD	MPP1HD	MPL1HD	MPL16HD
	—	—	MPL2HD	MPL6HD
RESPONSE TIME*	≤ 1 ms	≤ 10 ms	≤ 10 ms	≤ 1 ms
HOUSING MATERIAL	Polycarbonate	Polycarbonate	Polycarbonate	Polycarbonate
LENS	Glass	Glass	Glass (1HD)/plastic (2HD)	Glass (16HD)/plastic (6HD)
ADDITIONAL DATA	*See page 601*			

*NOTE: Total response time is the sum of the sensor head and base response times.

STANDARD HEADS

Thru-Beam Mode

Specifications		Infrared		
SENSING RANGE		60 m	60 m	60 m
SENSITIVITY ADJUSTMENT		Yes	Yes	Yes
MODEL NUMBER(S)	*Transmitter*	MPE1HD	MPE1HD	MPE2HD
	Receiver	MPR1HD	MPR16HD	MPR6HD
RESPONSE TIME*		≤ 10 ms	≤ 1 ms	≤ 1 ms
HOUSING MATERIAL		Polycarbonate	Polycarbonate	Polycarbonate
	LENS	Glass	Glass	Plastic
ADDITIONAL DATA		*See page 601*		

*NOTE: Total response time is the sum of the sensor head and base response times.

Fiber Optic Mode

Specifications	Visible Red	Infrared
SENSING RANGE	Determined by cable†	Determined by cable†
SENSITIVITY ADJUSTMENT	Yes	Yes
MODEL NUMBER(S)	MPF2HD	MPF6HD
	—	MPG6HD
RESPONSE TIME*	≤ 5 ms	≤ 1 ms
HOUSING MATERIAL	Polycarbonate	Polycarbonate
ADDITIONAL DATA	*See page 601*	

*NOTE: Total response time is the sum of the sensor head and base response times.

†See pages 761-796 for fiber optic lengths and specifications.

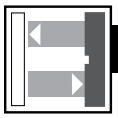
ANALOG HEADS

Fiber Optic Mode

Specifications	Infrared
SENSING RANGE	Determined by cable†
SENSITIVITY ADJUSTMENT	Yes
MODEL NUMBER(S)	MPF5HD
RESPONSE TIME	≤ 10 ms
HOUSING MATERIAL	Polycarbonate
ADDITIONAL DATA	*See page 601*

†See pages 761-796 for fiber optic lengths and specifications.

2-WIRE AC HEADS



Diffuse Mode

Specifications	Infrared		
SENSING RANGE	300 mm	760 mm	1.8 m
SENSITIVITY ADJUSTMENT	Yes	Yes	Yes
MODEL NUMBER(S)	MP2D7HD	MP2D4HD	MP2D1HD
	—	—	MP2D2HD
RESPONSE TIME*	≤ 10 ms	≤ 15 ms	≤ 15 ms
HOUSING MATERIAL	Polycarbonate	Polycarbonate	Polycarbonate
LENS	Plastic	Plastic	Glass (1HD)/plastic (2HD)
ADDITIONAL DATA	*See page 601*		

*NOTE: Total response time is the sum of the sensor head and base response times.

2-WIRE AC HEADS

Retro-Reflective Mode

Specifications	Visible Red	Infrared
SENSING RANGE	4.5 m	9 m
SENSITIVITY ADJUSTMENT	Yes	Yes
POLARIZED FILTER	Yes	No
MODEL NUMBER(S)	MP2P1HD	MP2L1HD
	—	MP2L2HD
RESPONSE TIME*	≤ 10 ms	≤ 10 ms
HOUSING MATERIAL	Polycarbonate	Polycarbonate
LENS	Glass	Glass (1HD)/plastic (2HD)
ADDITIONAL DATA	*See page 601*	

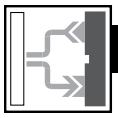
*NOTE: Total response time is the sum of the sensor head and base response times.

Thru-Beam Mode

Specifications	Infrared
SENSING RANGE	36 m
SENSITIVITY ADJUSTMENT	Yes
MODEL NUMBER(S) *Transmitter*	MPE3HD
	MPE4HD
Receiver	MP2R2HD
RESPONSE TIME*	≤ 10 ms
HOUSING MATERIAL	Polycarbonate
LENS	Glass (3HD) Plastic (4HD/2HD)
ADDITIONAL DATA	*See page 601*

*NOTE: Total response time is the sum of the sensor head and base response times.

2-WIRE AC HEADS



Fiber Optic Mode

Specifications	Visible Red	Infrared
SENSING RANGE	Determined by cable†	Determined by cable†
SENSITIVITY ADJUSTMENT	Yes	Yes
MODEL NUMBER(S)	MP2F2HD	MP2F1HD
RESPONSE TIME*	≤1 ms	≤1 ms
HOUSING MATERIAL	Polycarbonate	Polycarbonate
ADDITIONAL DATA	*See page 601*	

*NOTE: Total response time is the sum of the sensor head and base response times.

†See pages 761-796 for fiber optic lengths and specifications.

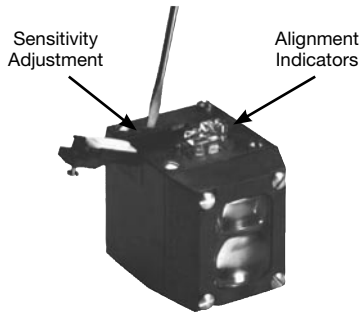
MP Series Head Specifications

MP Series Head Specifications

LED(s)		Yes (2)
OPERATING MODE		Light on/dark on
PROTECTION (IEC)		IP69K when all components are properly assembled
TEMPERATURE RANGE	*WORKING*	-22 ºF to +158 ºF
	STORAGE	-67 ºF to +185 ºF
HUMIDITY RANGE		95% RH (non-condensing)
VIBRATION		10 G,10-500 Hz
SHOCK		50 G
HEAD HOUSING		Glass-filled polycarbonate
ACCESS COVER		Glass-filled acetal, Type 20
SEALS		Santoprene
STANDARDS		EN 60947-5-2
APPROVALS		CE UL CSA

Reference Guide

Operating/Adjustment Of All Heads



Light On/Dark On Mode Selector Switch

Every MP Series photoelectric sensor head has a light on/dark on selector switch located on the PC board inside the sensor head. The operating mode should be set prior to assembling the head to its respective base.

Dark On - The output (load) is energized when the light is blocked (retro and thru scan), or object absent (diffuse scan); the photosensor is dark.

Light On - The output (load) is energized when the light is not blocked (retro and thru scan), or object is present (diffuse scan); the photosensor is illuminated.

Alignment Indicators

Two LED indicators are located on top of the sensor head. Sufficient light level turns the green light ON. When the light level decreases to 150% of the minimum operating level, the red light turns ON.

Sensitivity Adjustment

Use a small blade screwdriver to open the cover on top of the sensor head. This exposes the sensitivity adjustment screw, labeled “S”.

The 15-turn sensitivity potentiometer will normally click at both extremes of the sensitivity range.

- Turn the screw clockwise to increase the sensitivity.
- Turn the screw counterclockwise to decrease sensitivity.
- Snap the cover closed and fasten with a screw.

Fiber Optic Head Options

Fiber optic heads are furnished in two cable connection styles, MPF and MPG, as designated by the first three letters in their catalog listings.

MPF fiber optic sensor heads use dual slot glass cables and are part of the original MP product line. The sensor head has a dual slot end tip bezel connection on the sensor head which maintains compatibility with FE-MLS8C-FO sensors. With the MPZFOADPT adapter, the MPF heads can accept plastic cables too.

MPG fiber optic sensor heads use universal style glass cables. MPG heads accept the same universal style cables used with our MHP miniature high performance sensors and furnished by many manufacturers of photoelectric products. They cannot be used with plastic cables.

PLUG-IN BASE

Specifications

	DC	AC	AC/DC
MODEL NUMBER(S)	**MPS30HD†**	**MPS10HD†**	**MPS18HD**
	MPS31HD	**MPS11HD**	—
	MPS32HD	**MPS12HD**	—
	MPS33HD	**MPS13HD†**	—
	—	**MPS17HD**	—
OUTPUT	1 NPN (31HD) 1 PNP (32HD) 1 NPN and 1 PNP (33HD)	Solid state relay (11HD/12HD) Thyristor (17HD)	Thyristor
LOAD CURRENT	250 mA max. (31HD/32D) 100 mA max. (33HD)	5 mA-1 A (11HD/12HD) 100 mA max. (17HD)	100 mA max.
LEAKAGE CURRENT	≤ 10 µA	≤ 200 µA (11HD) ≤ 240 µA (12HD) ≤ 10 µA (17HD)	≤ 10 µA
INRUSH CURRENT	—	30 A for 8 ms (11HD/12HD) 250 mA for 8 ms (17HD)	250 mA for 8 ms, (non-repetitive)
VOLTAGE DROP	≤ 1.0 VDC (31HD/32HD) ≤ 0.8 VDC (33HD)	≤ 1.4 VAC at rated load (11HD/12HD) ≤ 3 V at 60 mA (17HD)	≤ 5 VDC (DC operation)
RESPONSE TIME*	≤ 10 µs	≤ 10 ms (11HD/12HD) ≤ 2 ms (17HD)	≤ 2 ms
SHORT CIRCUIT AND OVERLOAD PROTECTION	No (30HD/31HD/32HD) Yes (33HD)	No	No
REVERSE POLARITY PROTECTION	Yes	No	No
SUPPLY VOLTAGE	10-30 VDC	92-132 VAC, 50/60 Hz (10HD/11H/17HD) 198-264 VAC, 50/60 Hz (12HD/13HD)	10.8-140 VDC 18-140 VAC, 50/60 Hz
CURRENT CONSUMPTION	≤ 25 mA	≤ 70 mA	≤ 50 mA
ELECTRICAL CONNECTION	Dependent on receptacle selection	Dependent on receptacle selection	Dependent on receptacle selection
ADDITIONAL DATA	***See page 603***		

*NOTE: Total response time is the sum of the sensor head and base response times.

†NOTE: Emitter base only.

PLUG-IN BASE

Plug-in Base Specifications

TEMPERATURE RANGE	*WORKING*	-22 ºF to +158 ºF
	STORAGE	-67 ºF to +185 ºF
SHOCK		50 G
VIBRATION		10 G,10-500 Hz
HUMIDITY RANGE		95% RH (non-condensing)
HEAD/BASE SEAL		Santoprene
RECEPTACLE/BASE SEAL		Buna-N
PROTECTION (IEC)		IP69K when all components are properly assembled
HOUSING MATERIAL		Glass-filled Polysulfone
STANDARDS		EN 60947-5-2
APPROVALS		CE UL CSA

RECEPTACLE MODELS

MPB20	Standard 4-terminal, 1/2" NPT conduit thread
MPB22	5-pin mini connector
MPB27	4-pin micro connector

See pages 803-854 for cordsets

DPDT RELAY BASE

Specifications

		AC
MODEL NUMBER		**MPSD11HD**
SUPPLY VOLTAGE		92-132 VAC, 50/60 Hz
OUTPUT		DPDT relay
ELECTRICAL CONTACT RATING		250 VAC/5 A
POWER CONSUMPTION		≤ 6.6 VA
MECHANICAL LIFE OF RELAY		5 x 10^7 operations
RESPONSE TIME*		≤ 10 ms
PROTECTION (IEC)		IP69K when all components are properly assembled
TEMPERATURE RANGE	*WORKING*	-22 ºF to 158 ºF
	STORAGE	-67 ºF to 185 ºF
SHOCK		10G
VIBRATION		6 G, 10-55 Hz @ double amplitude of 1 mm
HUMIDITY		95% RH (non-condensing)
HOUSING MATERIAL		Glass-filled Polysulfone
STANDARDS		EN 60947-5-2
APPROVALS		CE UL CSA
ELECTRICAL CONNECTION		dependent on receptacle selection

*NOTE: Total response time is the sum of the sensor head and base response times.

DPDT RECEPTACLE MODELS

MPB23	8-terminal, 1/2" NPT conduit thread
MPB24	8-terminal, PG 13.5 conduit thread

SPDT RELAY BASE

Specifications

		DC	AC
MODEL NUMBER(S)		MPV31HD	MPV11HD
		—	MPV12HD
		—	MPV13HD
		—	MPV14HD
OUTPUT		SPDT relay	SPDT relay
SUPPLY VOLTAGE		10-30 VDC	103-132 VAC, 50/60 Hz (11HD) 192-264 VAC, 50/60 Hz (12HD) 22-26 VAC, 50/60 Hz (13HD) 20-260 VAC/DC (14HD)
POWER CONSUMPTION		≤ 10 VA	≤ 10 VA (11HD) ≤ 18.5 VA (12HD) ≤ 2 VA (13HD) ≤ 4 VA (14HD)
ELECTRICAL CONTACT RATING	*DC*	28 V/6 A	24 V/6 A
	AC	300 V/6 A	300 V/ 6A
ELECTRICAL CONNECTION		 5-terminal 1/2" conduit hole	 5-terminal 1/2" conduit hole

SPDT Relay Base Specifications

MECHANICAL LIFE OF RELAY		20 x 10^6 operations
RESPONSE TIME*		≤ 10 ms
TEMPERATURE RANGE	*WORKING*	-22 ºF to +158 ºF
	STORAGE	-67 ºF to +185 ºF
PROTECTION (IEC)		IP69K when all components are properly assembled
SHOCK		10 G
VIBRATION		10 G,10-100 Hz
HUMIDITY RANGE		95% RH (non-condensing)
BASE		Glass-filled polycarbonate
COVER/BASE SEAL		Buna-N
HEAD/BASE SEAL		Santoprene
COVER		Die cast zinc
STANDARDS		EN 60947-5-2
APPROVALS		CE UL SP

*NOTE: Total response time is the sum of the sensor head and base response times.

MINI STYLE BASE

Specifications

	DC	AC	AC/DC
MODEL NUMBER(S)	**MPT30HD†**	**MPT10HD†**	**MPT16HD**
	MPT31HD	**MPT11HD**	—
	MPT32HD	—	—
	MPT33HD	**MPT17HD**	—
OUTPUT	1 NPN (31HD) 1 PNP (32HD) 1 NPN and 1 PNP (33HD)	Solid state relay (11HD) Thyristor (17HD)	Thyristor
LOAD CURRENT	250 mA max. (31HD/32D) 100 mA max. (33HD)	5 mA-500 mA (11HD) 100 mA max. (17HD)	100 mA max.
LEAKAGE CURRENT	≤ 10 µA	≤ 400 µA (11HD) ≤ 10 µA (17HD)	≤ 10 µA
INRUSH CURRENT	—	12 A for 16 ms (11HD) 250 mA for 8 ms (17HD)	250 mA for 8 ms, (non-repetitive)
VOLTAGE DROP	≤ 1 VDC (32HD/31HD) ≤ 0.6 VDC (33HD)	≤ 1.2 VAC at rated (11HD) ≤ 3 V (17HD)	≤ 3 V (DC operation)
RESPONSE TIME*	≤ 10 µs	≤ 10 ms (11HD) ≤ 2 ms (17HD)	≤ 2 ms
SHORT CIRCUIT AND OVERLOAD PROTECTION	No (30HD/31HD/32HD) Yes (33HD)	No	No
REVERSE POLARITY PROTECTION	No	No	No
SUPPLY VOLTAGE	10-30 VDC	92-132 VAC, 50/60 Hz (10HD/11H/17HD) 198-264 VAC, 50/60 Hz (12HD/13HD) 24 VAC, 50/60 Hz (14HD)	24 VAC/VDC
CURRENT CONSUMPTION	≤ 25 mA	≤ 70 mA	≤ 70 mA
ELECTRICAL CONNECTION	 2-meter cable, PVC covered, 4-conductor, #18 AWG	 2-meter cable, PVC covered, 4-conductor, #18 AWG	 2-meter cable, PVC covered, 4-conductor, #18 AWG
ADDITIONAL DATA	***See page 607***		

*NOTE: Total response time is the sum of the sensor head and base response times.

†NOTE: Emitter base only.

MINI STYLE BASE

Specifications

	DC	DC	AC	AC/DC
MODEL NUMBER(S)	—	**MPT40HD-CM†**	**MPT20HD†**	**MPT28HD**
	MPT41HD	**MPT41HD-CM**	**MPT21HD**	—
	MPT42HD	**MPT42HD-CM**	**MPT27HD**	—
	MPT43HD	**MPT43HD-CM**	—	—
OUTPUT	1 NPN (41HD) 1 PNP (42HD) 1 NPN and 1 PNP (43HD)	1 NPN (41HD) 1 PNP (42HD) 1 NPN and 1 PNP (43HD)	Solid state relay (21HD) Thyristor (27HD)	Thyristor
LOAD CURRENT	250 mA max. (41HD/42D) 100 mA max. (43HD)	250 mA max. (41HD/42D) 100 mA max. (43HD)	500 mA max. (21HD) 100 mA max. (27HD)	100 mA max.
LEAKAGE CURRENT	≤ 10 µA	≤ 10 µA	≤ 400 µA (21HD) ≤ 10 µA (27HD)	≤ 10 µA
INRUSH CURRENT	—	—	12 A for 16 ms (21HD/22HD) 250 mA for 8 ms (27HD)	250 mA for 8 ms (non-repetitive)
VOLTAGE DROP	≤ 1 VDC (42HD/41HD) ≤ 0.6 VDC (43HD)	≤ 1 VDC (42HD/41HD) ≤ 0.6 VDC (43HD)	≤ 1.2 VAC (21HD) ≤ 3 V (27HD)	≤ 5 V (DC operation)
RESPONSE TIME*	≤ 10 µs	≤ 10 µs	≤ 10 ms (21HD) ≤ 2 ms (27HD)	≤ 2 ms
SHORT CIRCUIT AND OVERLOAD PROTECTION	No (40HD/41HD/42HD) Yes (43HD)	No (40HD/41HD/42HD) Yes (43HD)	No	No
REVERSE POLARITY PROTECTION	Yes	Yes	No	No
SUPPLY VOLTAGE	10-30 VDC	10-30 VDC	92-132 VAC, 50/60 Hz	10.8-140 VDC 18-140 VAC, 50/60 Hz
CURRENT CONSUMPTION	≤ 25 mA	≤ 25 mA	≤ 70 mA	≤ 70 mA
ELECTRICAL CONNECTION	 Quick disconnect type V94	 Quick disconnect type V1	 Quick disconnect type V93 (20HD) type V95 (21HD/27HD)	 Quick disconnect type V95
ADDITIONAL DATA	***See page 607***			

*NOTE: Total response time is the sum of the sensor head and base response times.

†NOTE: Emitter base only.

MINI STYLE BASE

Mini Style Base Specifications

TEMPERATURE RANGE	*WORKING*	-22 ºF to +158 ºF
	STORAGE	-67 ºF to +185 ºF
SHOCK		50 G
VIBRATION		10 G,10-500 Hz
HUMIDITY RANGE		95% RH (non-condensing)
BASE		Glass-filled polycarbonate
BASE SEAL		Santoprene
PROTECTION (IEC)		IP69K when all components are properly assembled
STANDARDS		EN 60947-5-2
HOUSING MATERIAL		Glass-filled Polysulfone
APPROVALS		CE UL CSA

MINI RELAY BASE

Specifications

		AC
MODEL NUMBER(S)		**MPW11HD**
		MPW21HD
SUPPLY VOLTAGE		92-132 VAC, 50/60 Hz
POWER CONSUMPTION		≤ 10 VA (including load)
OUTPUT		SPDT relay
ELECTRICAL CONTACT RATING	*DC*	30 V/6 A
	AC	125 V/6 A
MECHANICAL LIFE OF RELAY		50 x 10^6 operations
RESPONSE TIME*		10 ms
PROTECTION (IEC)		IP69K when all components are properly assembled
TEMPERATURE RANGE	*WORKING*	-22 ºF to 158º F
	STORAGE	-67 ºF to 185 ºF
SHOCK		20 G (no contact transfer) 100 G (no damage)
VIBRATION		10 G, 10-500 Hz
HUMIDITY		95% RH (non-condensing)
HOUSING MATERIAL		Glass-filled Polysulfone
STANDARDS		EN 60947-5-2
APPROVALS		CE UL CSA
ELECTRICAL CONNECTION	*MPW11HD*	 2-meter cable, PVC covered, 4-conductor, #18 AWG
	MPW21HD	 Quick disconnect type V95

*NOTE: Total response time is the sum of the sensor head and base response times.

ANALOG PLUG-IN BASE

Specifications		DC
SENSING RANGE		Determined by cable†
MODEL NUMBER(S)		MPS35HD
OUTPUT	*Voltage*	0-5 VDC
	Current	4-20 mA
LOAD CURRENT		5 mA max.
DRIFT	*(68ºF to 140ºF)*	3% typical
	(0 to 68ºF)	6% typical
SHORT CIRCUIT AND OVERLOAD PROTECTION		No
REVERSE POLARITY PROTECTION		Yes
SUPPLY VOLTAGE		12-24 VDC
POWER CONSUMPTION		≤ 40 mA
REPEATABILITY		± 1% typical
PROTECTION (IEC)		IP69K when all components are properly assembled
TEMPERATURE RANGE	*WORKING*	+32 ºF to 140 ºF
	STORAGE	-67 ºF to 185 ºF
HOUSING MATERIAL		Glass-filled Polysulfone
SHOCK		50 G
VIBRATION		10 G, 10-500 Hz
HUMIDITY		95% RH (non-condensing)
STANDARDS		EN 60947-5-2
APPROVALS		CE UL CSA
ELECTRICAL CONNECTION		Dependent on receptacle selected

†See pages 761-796 for fiber optic lengths and specifications.

APPLICATION CONSIDERATION

The MPF5HD head emits an IR beam, which is bounced off the detected object and returned. Depending on the distance to the object and its reflectivity, the head produces a signal with a magnitude proportional to the sensed distance between the object and the head. The MPS35 uses this signal to produce a voltage output and a current output.

The MPS35HD base provides a voltage output from 0-5VDC. The voltage output sources voltage to the user's load, which is then connected to the MPS35HD's negative supply terminal or ground. Current flows from the voltage output to ground. The voltage output can only supply up to 5mA of current and therefore, the load impedance must be 1000 ohms or more. Lower impedances will produce false output voltage readings.

The MPS35HD base also provides a current output from 4-20mA. The user's load is connected from the MPS35HD's positive supply terminal and to the analog current "output" terminal. The "output" pin sinks current (current flows into it). Output current is monitored through an internal resistor in the current amplifier. As the target is moved toward the sense head, increased current is sent to the load and to the sense resistor. Without limitations, this current would produce voltages across these two resistances that would exceed the MPS35HD's supply voltage. Under these conditions, the output current will reach some value and just stay there. Therefore, to ensure proper operation of the MPF5HD/ MPS35HD sensor, the current output load resistance cannot exceed 250 ohms. The current output can only operate with loads of 0-250 ohms.

The MPF5HD head produces only one output signal from which the MPS35HD produces its voltage output. The voltage output is then used to run the current amplifier via an internal connection. There is only one set of range and offset adjustments provided. These adjust both the voltage and current outputs. Due to differences in the two amplifiers, only one output can be set accurately. Therefore only one output should be used with the other left unconnected. Should it be necessary to use both outputs, the voltage output must see a minimum load resistance of 5000 ohms. This is necessary to prevent overloading of the sensor, which could produce incorrect output voltage and current values.

RECEPTACLE MODELS

MPB20	Standard 4-terminal, 1/2" NPT conduit thread
MPB22	5-pin mini connector

See pages 803-854 for cordsets

2-WIRE AC BASE

Specifications	AC/DC	AC
MODEL NUMBER(S)	MPS14HD†	MP2S11HD
SUPPLY VOLTAGE	22-26 VAC/DC	22-260 VAC
POWER CONSUMPTION	70 mA	—
OUTPUT	—	Solid state AC relay
LOAD CURRENT	—	500 mA max.
LEAKAGE CURRENT	—	≤ 1.9 mA
INRUSH CURRENT	—	5 A/8 ms
VOLTAGE DROP	—	≤ 10 V
RESPONSE TIME*	—	≤ 2 ms
SHORT CIRCUIT AND OVERLOAD PROTECTION	No	No
REVERSE POLARITY PROTECTION	No	Yes
ELECTRICAL CONNECTION	Dependent on receptacle selected	Dependent on receptacle selected

*NOTE: Total response time is the sum of the sensor head and base response times.

†NOTE: Emitter base only.

NOTE: For specifications on Models: MPS10HD, MPS13HD and MPS30HD emitter bases, see pages 602-603

2-Wire AC Base Specifications		
PROTECTION (IEC)		IP69K when all components are properly assembled
TEMPERATURE RANGE	*WORKING*	-22 ºF to +158 ºF
	STORAGE	-67 ºF to +185 ºF
HOUSING MATERIAL		Glass-filled Polysulfone
SHOCK		50 G
VIBRATION		10 G,10-500 Hz
HUMIDITY RANGE		95% RH (non-condensing)
PLUG-IN RECEPTACLE		Die-cast zinc
STANDARDS		EN 60947-5-2
APPROVALS		CE UL CSA

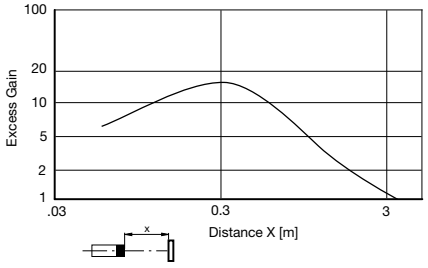
RECEPTACLE MODELS	
MPB20	Standard 4-terminal, 1/2" NPT conduit thread
MPB22	5-pin mini connector

See pages 803-854 for cordsets

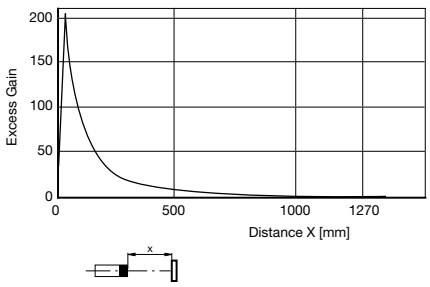
Standard Head Sensing Characteristics

Diffuse Scan Sensing Characteristics

Excess Gain vs. Sensing Range MPD2HD

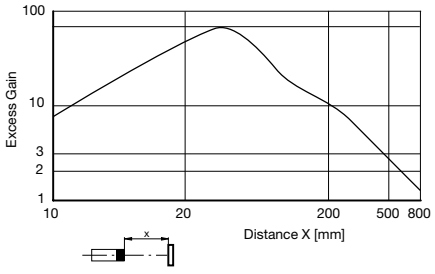


Excess Gain vs. Sensing Range MPD4HD

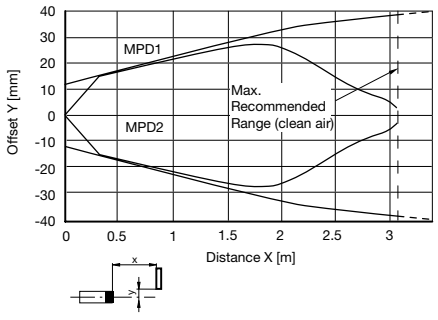


Diffuse Scan Sensing Characteristics

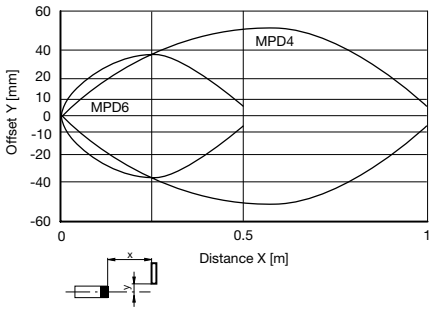
Excess Gain vs. Sensing Range MPD6HD



Movement Characteristics MPD1/D2

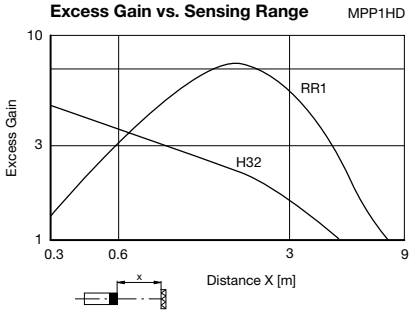


Movement Characteristics MPD4HD/6HD

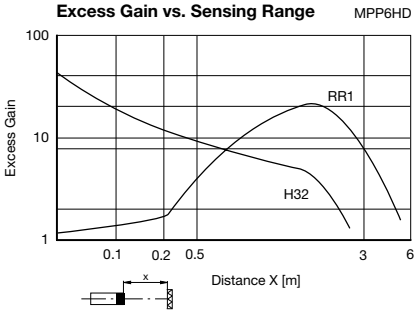


Polarized Scan Sensing Characteristics

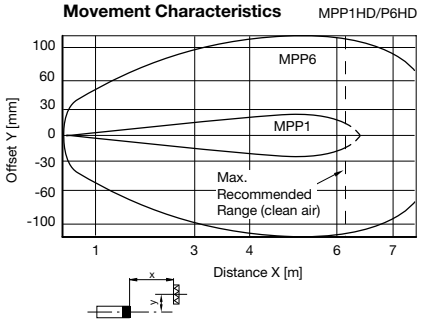
Excess Gain vs. Sensing Range MPP1HD



Excess Gain vs. Sensing Range MPP6HD

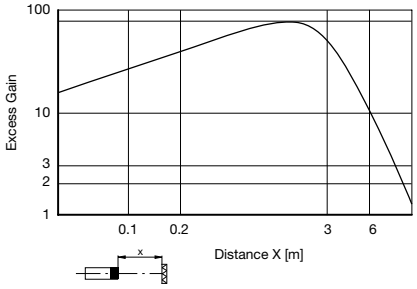


Movement Characteristics MPP1HD/P6HD

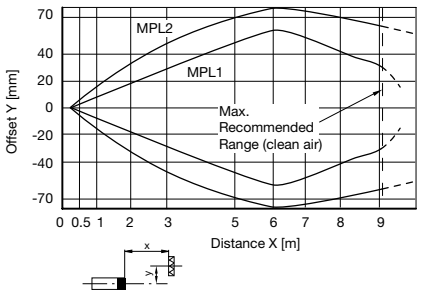


Retro-Reflective Scan Sensing Characteristics

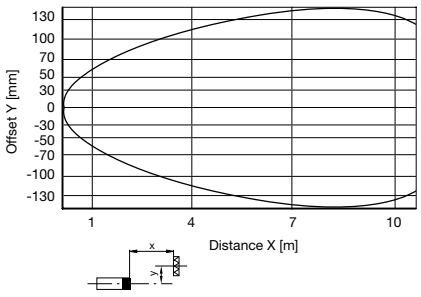
Excess Gain vs. Sensing Range MPL2HD/6HD



Movement Characteristics MPL1/MPL2



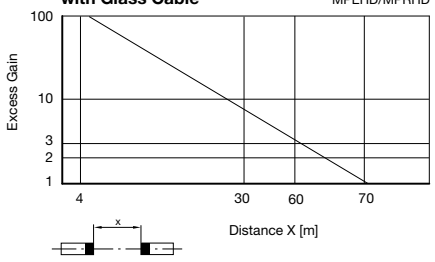
Movement Characteristics MPL6HD



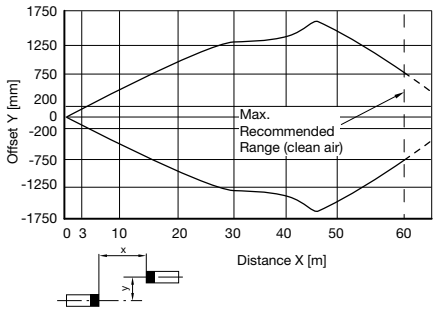
Standard Head Sensing Characteristics

Thru-Beam Scan Sensing Characteristics

Excess Gain vs. Sensing Range with Glass Cable MPEHD/MPRHD

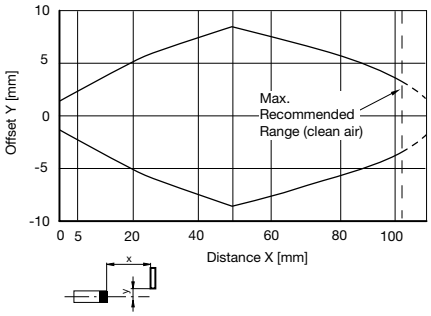


Movement Characteristics MPE6HD/MPR6HD

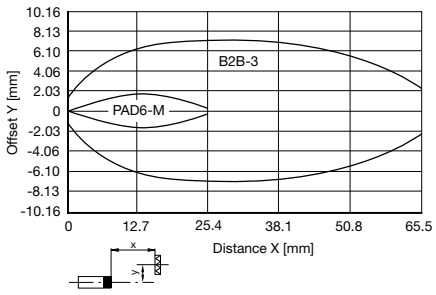


Fiber Optic Sensing Characteristics

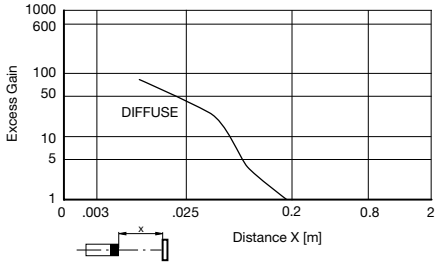
Movement Characteristics MPF6HD/MPG6HD



Movement Characteristics MPF2HD/MPG2HD



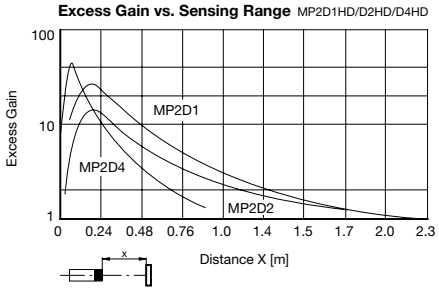
Excess Gain vs. Sensing Range MPF6HD



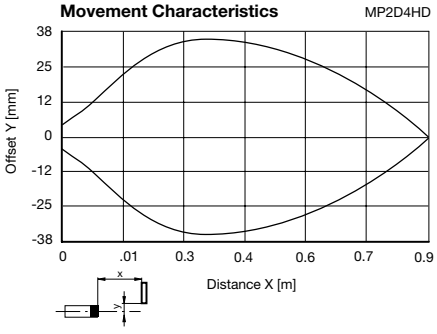
2-Wire AC Head Sensing Characteristics

Diffuse Scan Sensing Characteristics

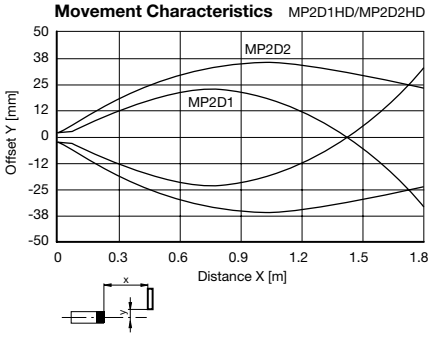
Excess Gain vs. Sensing Range MP2D1HD/D2HD/D4HD



Movement Characteristics MP2D4HD

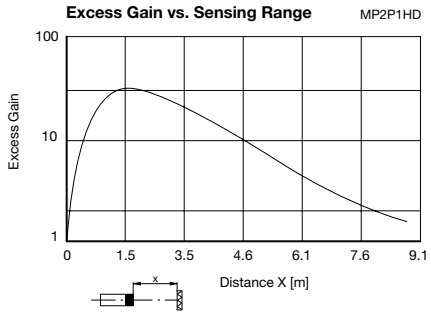


Movement Characteristics MP2D1HD/MP2D2HD

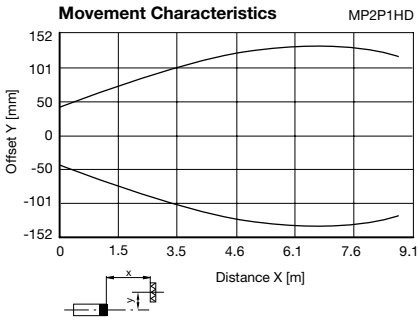


Polarized Scan Sensing Characteristics

Excess Gain vs. Sensing Range MP2P1HD



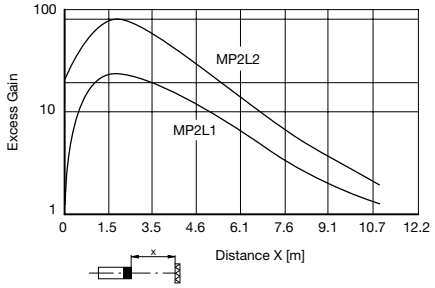
Movement Characteristics MP2P1HD



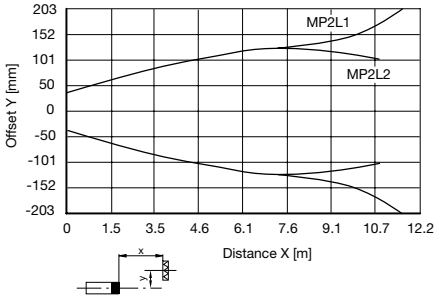
2-Wire AC Head Sensing Characteristics

Retro-Reflective Scan Sensing Characteristics

Excess Gain vs. Sensing Range MP2L1HD/L2HD

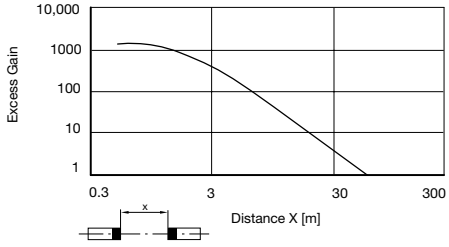


Movement Characteristics MP2L1HD/MP2L2HD

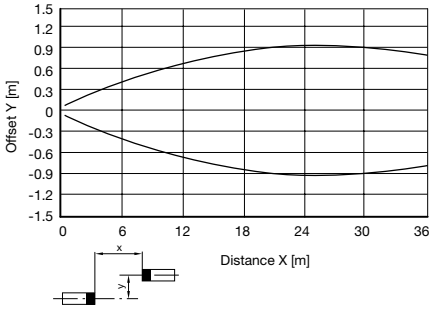


Thru-Beam Scan Sensing Characteristics

Excess Gain vs. Sensing Range MP2R2HD

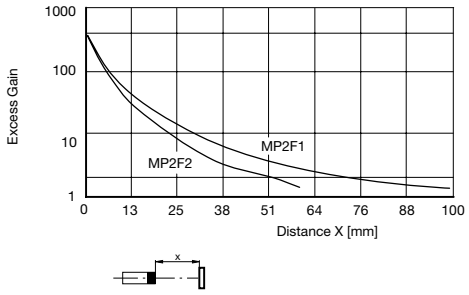


Movement Characteristics MP2R2HD/MPE4HD

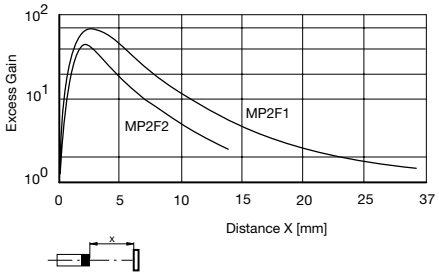


Fiber Optic Diffuse Scan Sensing Characteristics

Excess Gain vs. Sensing Range with Glass Cable (FE-B2B-3) MP2F1HD/F2HD



Excess Gain vs. Sensing Range with Plastic Cable (FEF-PAD6-M) MP2F1HD/F2HD

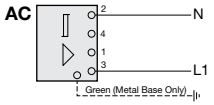


Wiring Diagrams

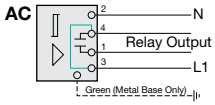
AC

Terminal Connection

Model: MPS10HD

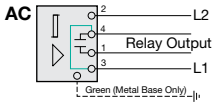


Model: MPS11HD



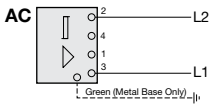
NOTE: Pins 3 and 4 must be jumpered (jumper wire not included)

Model: MPS12HD

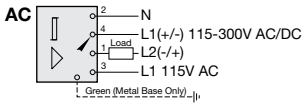


NOTE: Pins 3 and 4 must be jumpered (jumper wire not included)

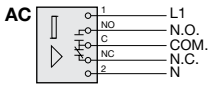
Model: MPS13HD



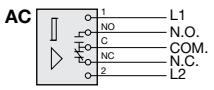
Model: MPS17HD



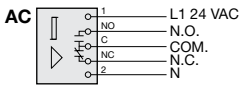
Model: MPV11HD



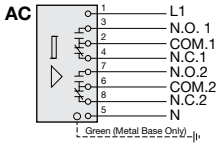
Model: MPV12HD



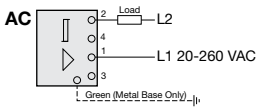
Model: MPV13HD



Model: MPSD11HD



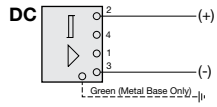
Model: MP2S11HD



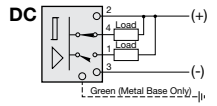
DC

Terminal Connection

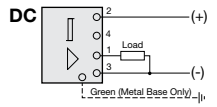
Model: MPS30HD



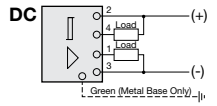
Model: MPS31HD



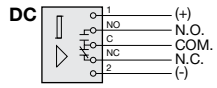
Model: MPS32HD



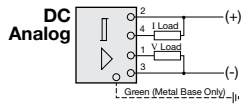
Model: MPS33HD



Model: MPV31HD



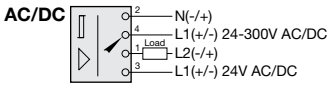
Model: MPS35HD



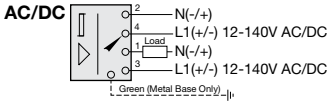
AC/DC

Terminal Connection

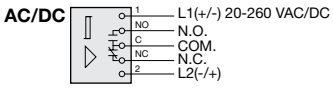
Model: MPS16HD



Model: MPS18HD



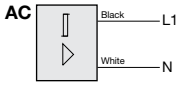
Model: MPV14HD



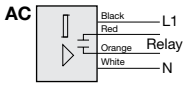
AC

Cable Connection

Model: MPT10HD

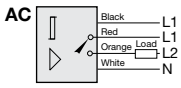


Model: MPT11HD

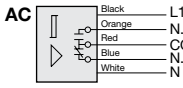


NOTE: Relay also requires AC power

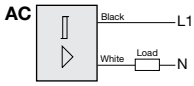
Model: MPT17HD



Model: MPW11HD



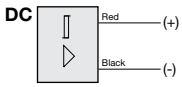
Model: MP2T11HD



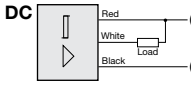
DC

Cable Connection

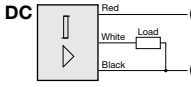
Model: MPT30HD



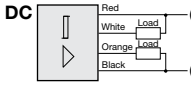
Model: MPT31HD



Model: MPT32HD



Model: MPT33HD

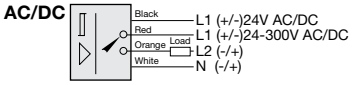


Wiring Diagrams

AC/DC

Cable Connection

Model: MPT16HD



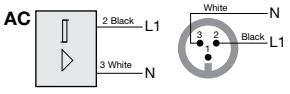
AC

Mini Quick Disconnect

Note: Wiring diagrams show quick disconnect pin numbers.

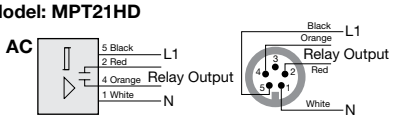
V93 Type

Model: MPT20HD

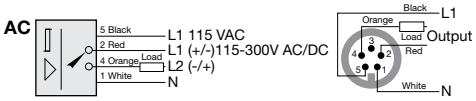


V95 Type

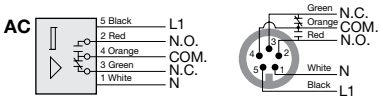
Model: MPT21HD



Model: MPT27HD



Model: MPW21HD



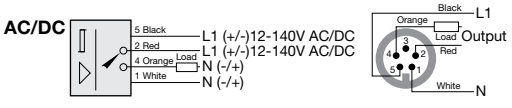
AC/DC

Mini Quick Disconnect

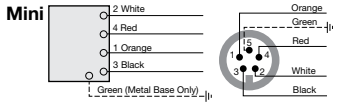
Note: Wiring diagrams show quick disconnect pin numbers.

V95 Type

Model: MPT28HD



Model: MPB22



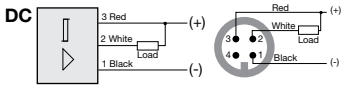
DC

Mini Quick Disconnect

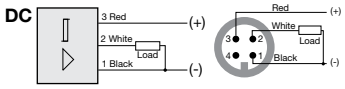
Note: Wiring diagrams show quick disconnect pin numbers.

V94 Type

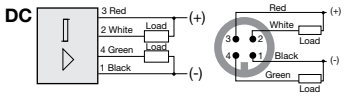
Model: MPT41HD



Model: MPT42HD



Model: MPT43HD



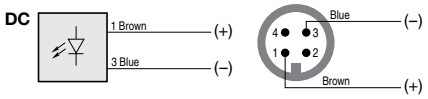
DC

Micro Quick Disconnect

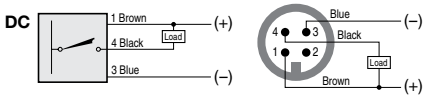
Note: Wiring diagrams show quick disconnect pin numbers.

V1 Type

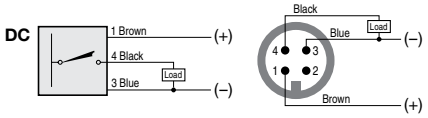
Model: MPT40HD-CM



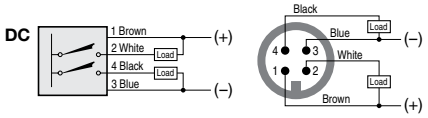
Model: MPT41HD-CM



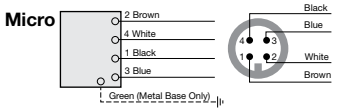
Model: MPT42HD-CM



Model: MPT43HD-CM

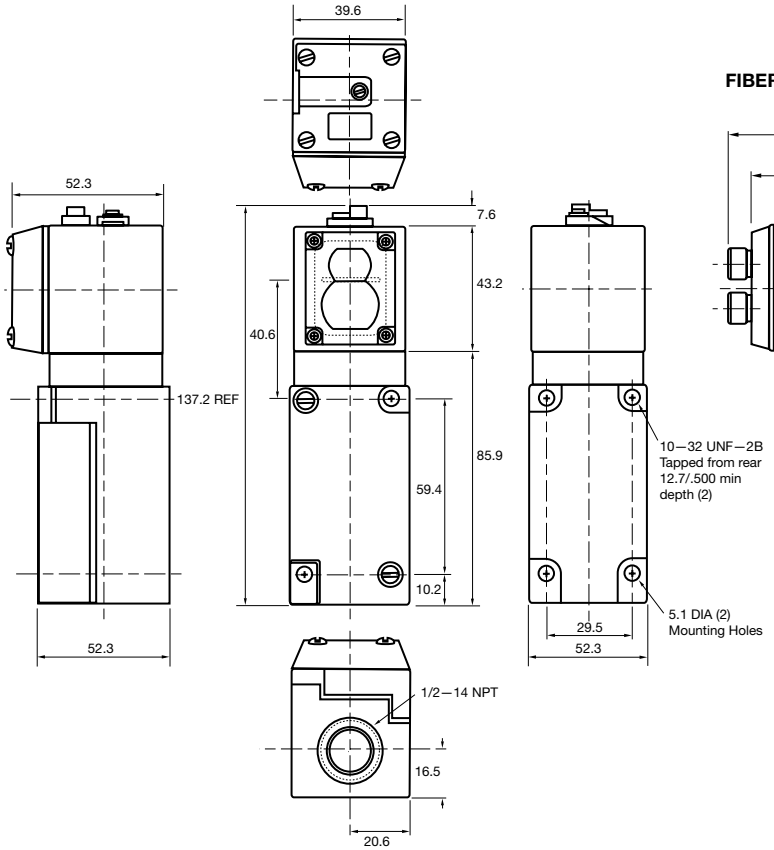


Model: MPB27

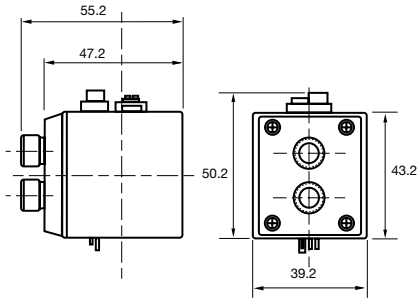


Dimensions (mm)

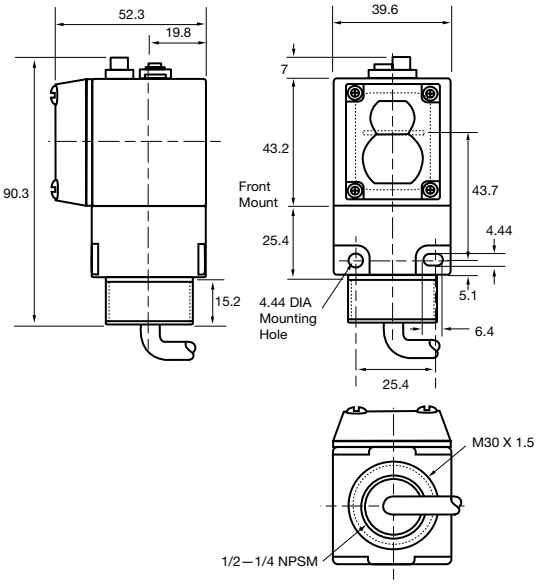
SENSOR HEAD, BASE AND RECEPTACLE DIMENSIONS



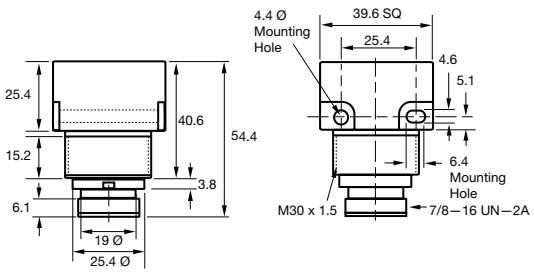
FIBER OPTIC SENSOR HEAD DIMENSIONS



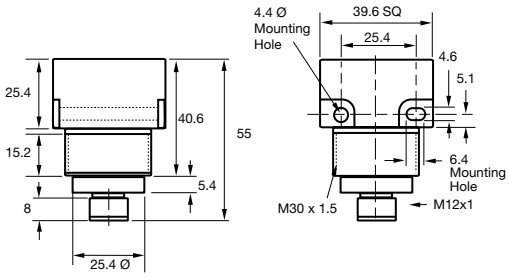
SENSOR HEAD WITH MINI RELAY BASE DIMENSIONS



QUICK DISCONNECT MINI BASE DIMENSIONS



QUICK DISCONNECT MICRO BASE DIMENSIONS



MULTIFUNCTION TIMER/LOGIC CARD

FOR A COMPLETE CONTROL

- **Multifuction Time/logic Card**
- **Photoelectric Sensor Head**
- **Reflector (Retro and Polar Scans)**

CHOICE OF:

- **Plug-in base**
- **Plug-in Receptacle**
- **Mini Base**
- **Relay Base**

Multifunction Logic Cards

Model No.	Description
MPA1HD	0.15 to 15 sec. time adjustment
MPA155HD	1 to 30 sec. adjustment
MPA188HD	0.01 to 1 sec. adjustment

Plug-in timer/logic cards easily convert any ON/OFF MP Series photoelectric into a multifunction control. Seven DIP switches located on the timer card provide the user with a choice of seven delay functions including dual delay and motion detection. In addition, light operated or dark operated sensing can be selected by a switch located on the photoelectric sensor head.

TIME DELAY OPTIONS

The timer/logic cards can be set up to modify the sensor's head output signal. For instance, in thru-scan or reflective scan (L.O. mode), if the logic card is set for OFF delay the sensor does not immediately turn off its output circuit after the beam goes dark or is blocked. Instead it waits until the beam has been dark for a preset time. If set for ON delay, the sensor waits for a preset to time to recognize that the beam is complete.

Each timer/logic card has seven DIP switches to select ON delay, OFF delay, or both. The delays range as shown in the Specifications and Order Guide. The cards also offer totally independent range selection and adjustment for ON and OFF delays.

ONE SHOT OPTIONS

In addition, the timer/logic card offers four modes of operation: 1-shot, a delayed 1-shot, 1-shot drop, and a delayed 1-shot drop. The cards can be adjusted for both the width of the 1-shot pulse and the length of delay before the 1-shot is fired.

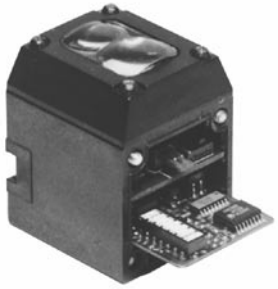
TIMING OPTION SETTINGS

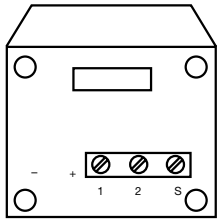
Prior to inserting a multifunction timer card into the photoelectric sensor head, you must properly set DIP switches located on the card. You must also set the L.O./D.O. switch located in the photoelectric sensor head.

TIMING ADJUSTMENTS

On the top of the MP Series photoelectric sensor head is an access cover. When opened with a small blade screwdriver, the multi-turn timer adjustment screws, labeled "1" and "2," are exposed.

Clockwise rotation increases the time range(s). If a single delay option is selected, the other timer adjustment is automatically set to zero. When the sensor head has been set to the desired timing range(s), snap the access cover shut to provide proper head sealing.





MULTIFUNCTION TIMER/LOGIC CARD

DIP SWITCHES 1-7

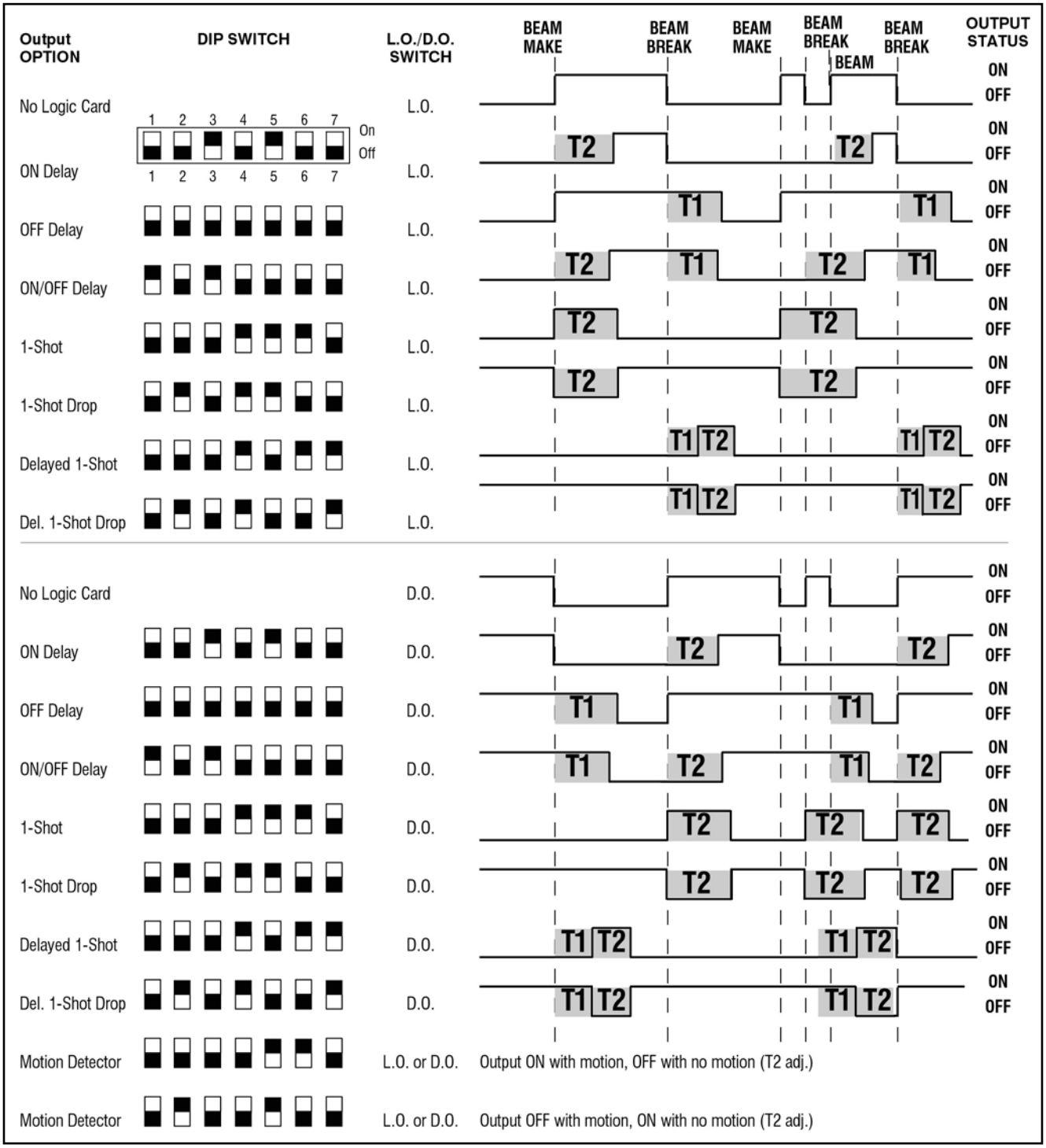
Timing Options Settings

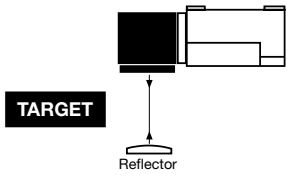
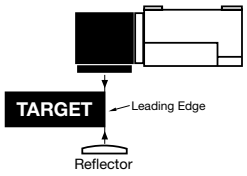
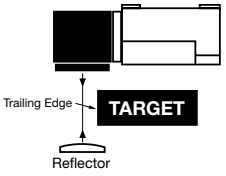
DIP switches on the card are labeled 1-7, with OFF position toward the labels. Refer to the timing chart below for DIP switch settings and their results for a retro-reflective or thru-beam setup.

Timing/Adjustment

T1 denotes screw adjustment 1

T2 denotes screw adjustment 2



				
		NO TARGET	**TARGET PRESENT LEADING EDGE**	**TARGET GONE TRAILING EDGE**
ON Delay	Dark On	Output is OFF	Output doesn't turn on until the time delay period has expired.	Output is OFF
	Light On	Output is ON	Output is OFF	Output doesn't turn back on until the delay period has expired.
OFF Delay	Dark On	Output is OFF	Output is ON	Output remains on for the amount of time set for the off delay. The output turns off when the delay period has expired.
	Light On	Output is ON	Output will not turn off until the time delay has expired.	Output turns back on.
ON/OFF Delay	Dark On	Output is OFF	Output doesn't turn on until the time delay period has expired.	Output doesn't turn back off until the time delay period has expired
	Light On	Output turns on after the time delay period has expired.	Output turns off after the time delay period has expired.	Output turns back on after the delay period has expired.
1-shot	Dark On	Output is OFF	The output turns on as soon as the target is present. The output will remain on only for the amount of time set.	If the time set for the output to turn on has not run out, the output will remain on. If the time set for the output to remain on expired while the target was still in front of the sensor and the output turned back off, the output will remain off.
1-shot Drop	Dark On	Output is ON	Output turns off only for the amount of time set. When that time expires, the output will turn back on.	If the time set for the output to turn off has not expired, the output will remain off. If the time set for the output to remain off expired while the target was still in front of the sensor and the output turned back on, the output will remain on.
	Light On	Output is ON	Output remains ON	Output turns off only for the amount of time set. When that time expires, the output will turn back on.
Delayed 1-shot	Dark On	Output is OFF	Output is OFF	Output turns on after the time delay period has expired. Output remains on only for the time period set, when that time expires the output will turn back off.
	Light On	Output is OFF	Output turns on after the time delay period expires. Output turns on only for the time period set. When that time expires, the output will turn back off.	Output remains off if the one shot time period has expired. If the one shot period hasn't expired, the output will remain on.
Delayed 1-shot Drop	Dark On	Output is ON	Output is ON	Output turns off after the time delay period has expired. Output turns off only for the time period set, when that time expires, the output will turn back on.
	Light On	Output is ON	Output turns off after the time delay period expires. Output turns on only for the time period set. When that time expires, the output will turn back on.	Output remains off if the one shot time period had expired. If the one shot period hasn't expired, the output will remain on.
		TARGET MOVING CONDITIONS	**TARGET NOT MOVING CONDITIONS**	
Motion Detector OFF with no Motion	Light or Dark On	Output is ON	Output is OFF	
Motion Detector ON with no Motion	Light or Dark On	Output is OFF	Output is ON	

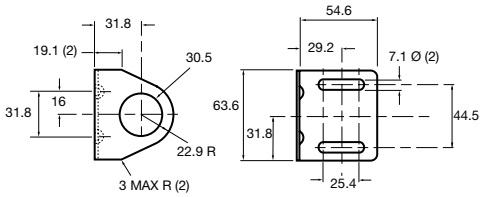
Accessories

(Dimensions in mm)

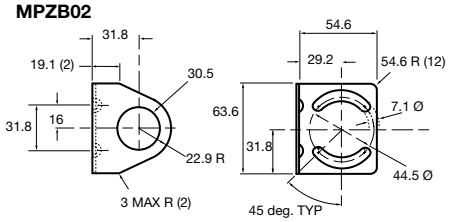
Mounting Brackets

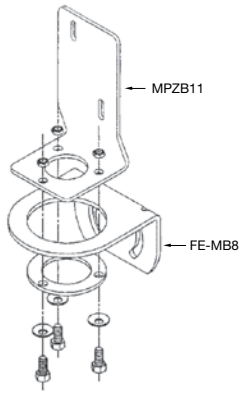
Optional mounting brackets (MPZB01 or MPZB02) can be provided that fit around the threaded portion of the mini base. The brackets allow the base to rotate 360°. A 30 mm mounting nut and lockwasher is included for securing the mini base to the bracket.

MPZB01



MPZB02

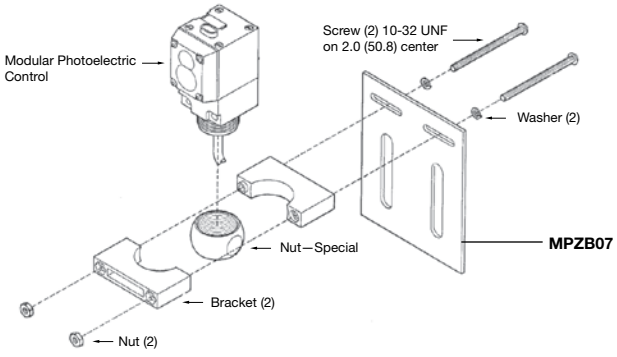




MPZB12

Swivel Mounting Brackets

The basic ball and swivel mounting bracket (360° swivel 10° tilt) consists of two plastic brackets and the spherical plastic swivel nut. The swivel nut has M30 threading for direct installation of the MPT (mini MP base), including the quick disconnect versions. The bracket (MPZB06) can be directly mounted to a surface, or the MPZB07 mounting plate may be used. The MPZB08 adapter allows you to connect the ball and swivel bracket to the MP relay (MPV) and MP plug-in bases (MPS).



Exploded View of MPZB06

Mounting Brackets

Model No.	Description
MPZB01	Mini MP mounting bracket, vertical slots
MPZB02	Mini MP mounting bracket, circular slots
MPZB06	Ball and swivel mounting bracket (fits 30mm mini MP)
MPZB07	Ball and swivel vertical mounting plate
MPZB08	Adapter (use with MPZB06 to fit 1/2" conduit hole)
MPZB12	Photoswitch 4000 (MLS8C) to limit switch style (combination of the MPZB11 and FE-MB8)
MPZB14	Combination of the MPZB06 and MPZB07 bracket

Other Accessories

Model No.	Description
MPZFOADPT	Pair of fiber cable adapters allows use of cutable 1000 micron plastic cable
MPZN01	Mini base steel mounting nut and lockwasher
MPZN02	Mini base plastic mounting nut and lockwasher
MPGKITC	Pair of cable end tips and accessories for universal cables
MPZR01	Replacement relay for MPV series—6A SPDT
MPZR02	Replacement relay for MPSD series—5A DPDT

Notes