ISF: Heavy Duty Photoelectric Sensors

Key features of the ISF include:

- Rugged, waterproof photoelectric sensors with universal voltages
- 24–240V AC/ 12-240V DC or 10–30V DC; both available with time delay
- Featuring through-beam sensing between the projector and receiver, with **sensing range up to 50m**.
- Diffuse-reected light sensing, as well as retro-reected — with or without polarization
- All sensors are available with three time delay modes (one-shot, on-delay, or off-delay) selectable from 0.1 to 5 seconds
- DC sensors have dual NPN/PNP transistor outputs
- Universal-voltage sensors have one NO relay contact
- Diffuse-reected light sensors feature a sensitivity adjustment control
- All units are selectable: light on or dark on
- Unique touch-down terminals reduce wiring time
- Protection rated IP66

UL Recognized
File No. E55996

CSA Certified
File No. LR21451

General Specifications

Power Voltage	Universal voltage type: 24V to 240V AC (12V to 240V DC compatible) DC type: 10V to 30V DC (ripple 10% maximum)
Operating Voltage	Universal voltage: 21.6V to 264V AC, 50/60Hz (9.6V to 264V DC compatible)
Dielectric Strength	Between power and output terminals: 1,500V AC, 1 minute (universal-voltage type) Between output terminals: 1,000V AC, 1 minute (universal-voltage type) Between live and dead parts: 1,000V AC, 1 minute (DC type)
Insulation Resistance	Between power and output terminals: 20 MΩ (minimum) with 500V DC megger (universal-voltage) Between live and dead parts: 20 MΩ (minimum) with 500V DC megger (DC type)
Operating Temperature	–10 to +60C (avoid freezing)
Operating Humidity	35 to 85% RH (avoid condensation)
Storage Temperature	–20 to +70C
Vibration Resistance	Damage limits: 10 to 55Hz, amplitude 1.5mm p-p, 2 hours in each of 3 axes
Shock Resistance	Damage limits: 500m/s^2 (approximately 50G), 3 shocks in each of 3 axes
Extraneous Light Immu-nity	Sunlight: 10,000 lux at receiver, Incandescent light: 3,000 lux at receiver — dened as incident or unwanted light received by a sensor , unrelated to the presence or absence of the intended object
Material	Housing: PBT; Lens: acrylic resin; Cover: polycarbonate
Degree of Protection	IP66 — IEC Pub 529, sensors rated IP66 are dust-tight, water-resistant, and perform best when not subjected to heavy particle or water blasts (JIS C 0920 watertight)
Applicable Cable (not included)	Cable: Ø 0.31" to 0.39" (8 to 10mm), Core: #18 to #24 AWG (0.25 to 0.75mm^2); Extension: 328' (100m) maximum using #22 AWG (0.3mm^2) cabtyre cable or better (not included – must be purchased separately)
Weight	Through-beam: 75g (projector), 100g (universal voltage receiver), 90g (DC receiver) Reected light: 100g (universal voltage), 90g (DC)
Dimensions (HxWxD)	2.66" x 1.02" x 3.62" (67.5 x 26 x 92mm)

Part Numbers: Universal Voltage Types

Part Number	Time Delay	Detects by	Sensing Range	Detects	Power Voltage
ISF-T10MU	No	Through-Beam	10m	Opaque Objects 16mm Minimum	Multivoltage Range 24 to 240V AC and 12 to 240V DC Compatible
ISF-T10MTU	Yes				
ISF-T10M30M	No		30m	30mm Minimum	
ISF-R05MU	No	Retro-Reected Light	5m	Opaque Objects 60mm Minimum	
ISF-R05MTU	Yes				
ISF-P03MU	No	Polarized Retro-Reected Light	3m	Opaque or Mirror-Like Objects 60mm Minimum	
ISF-P03MTU	Yes				
ISF-D500U	No	Diffuse-Reected Light with Sensitivity Adjustment	0.5m	Opaque or Transparent Objects	
ISF-D500TU	Yes				

Part Numbers: DC Types

Part Number	Time Delay	Detects by	Sensing Range	Detects	Power Voltage
ISF-T10MW	No	Through-Beam	32' – 9-3/4" (10m)	Opaque Objects Ø 0.63" (16mm) Minimum	10 to 30V DC with 10% ripple (maximum)
ISF-T10MWT	Yes				
ISF-R05MW	No	Retro-Reected Light	16' – 4-7/8" (5m)	Opaque Objects Ø 2.36" (60mm) Minimum	
ISF-R05MWT	Yes				
ISF-P03MW	No	Polarized Retro-Reected Light	9' – 10-1/8" (3m)	Opaque or Mirror-Like Objects Ø 2.36" (60mm) Minimum	
ISF-P03MWT	Yes				
ISF-D500W	No	Diffuse-Reected Light with Sensitivity Adjustment	19.69" (0.5m)	Opaque or Transparent Objects	
ISF-D500WT	Yes				

1. All sensors come with mounting brackets. Retro-reected light sensor s (with or without polarization) come with a rectangular reective bac kplate. Diffuse-reected light sensor s and sensors with time delay include a screwdriver for the adjustment dial.

Function Specifications

Output	Universal voltage: One NO contact, electromechanical relay, 250V AC/1A, 30V DC/2A (resistive load) DC: NPN/PNP transistor open collector, 100mA (maximum) with short circuit protection Maximum residual voltage: 1.0V (NPN), 2.4V (PNP)
Light Source	Diffuse and retro-reected sensors: Infrared LED Polarized retro-reected sensors: Red LED
Indicator	On: Turns on when output is on (red LED)
Response	Universal voltage: 20ms (maximum); DC: 3ms (maximum)
Hysteresis	Universal voltage and DC diffuse-reected sensors: 15% at 19.69" (0.5m)
Power Consumption	Universal voltage: 3VA (maximum); Through-beam: 3VA *each* for the projector and the receiver DC: 30 mA (maximum); Through-beam: 15 mA (projector), 20 mA (receiver)
Time Delay	0.1 to 5.0 seconds (adjustable)
Time Delay Modes	Selectable: One-shot, on-delay, or off-delay, using DIP switches
Temperature Error	±10% (maximum) over –10 to +60C (reference temperature: +20C)
Repeat Error	±1.0% (maximum) for repeat inputs at intervals of 10 seconds or more

2. Delay time is decreased by 5% when another object is detected during timedown.

Operation Principle

Through-beam sensors transmit an infrared LED from the projector to the receiver. Since the receiver detects a well-dened beam (or the lack of it), this type of sensor is ideal for precise leading-edge detection. The transistor or relay output turns on:

- In the presence of an object → dark on
- In the absence of an object → light on

Diffuse-reected light sensors feature a built-in projector and receiver . The sensor receives scattered light reected from an object, making it possible to detect transparent objects. Since a separate receiver or reective backplate is not required, wiring is reduced and installation is simplied. The transistor or relay output turns on:

- In the presence of an object → light on
- In the absence of an object → dark on

ISF: Retro-Reect ed Light Sensors

The ISF series offers a choice of through-beam, diffuse-reected, and retro-reected light sensors, with or without polarization. Reected light sensors feature a built-in projector and receiver. Since a separate receiver is not required, wiring is reduced and installation is simplied.

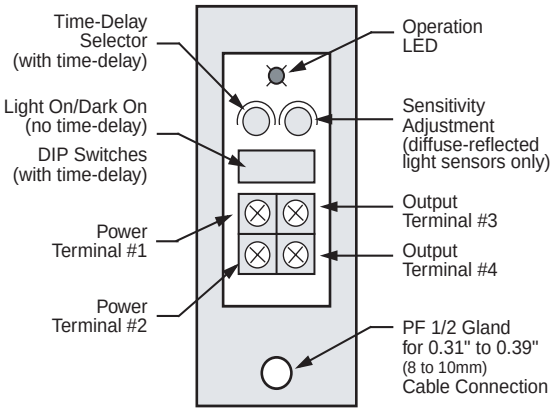
Retro-reected light sensors continually collect light from a reective back-plate. Similar to through-beam sensor detection, an object is detected when collected light is interrupted. The sensor receives a direct reection of focused light from the reective backplate, making it ideal for conveyor appli-cations. The receiver ignores unwanted diffuse-reected light. An infrared LED is used for the light source.

1. The retro-reected light sensor is not r ecommended for sensing mir-ror-like surfaces. See polarized retro-reected light sensor s, below.

Polarized retro-reected light sensors continually collect light from a reective backplate. The reective backplate changes the angle of sensor light waves by 90. The polarizing lter accepts only rotated light, providing precise differentiation between retro-reected light collected by the receiver and undesirable mirror-like reections or unwanted light shining directly from nearby sources. A red LED is used for the light source.

Operation

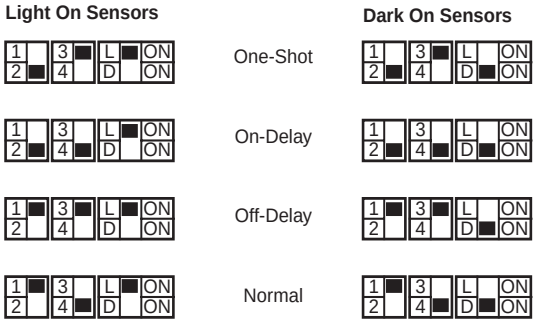
Below are considerations specic to ISF photoelectric sensors.



2. Only sensors with time delay have time-delay selector and DIP switches (see below for setting DIP switches).

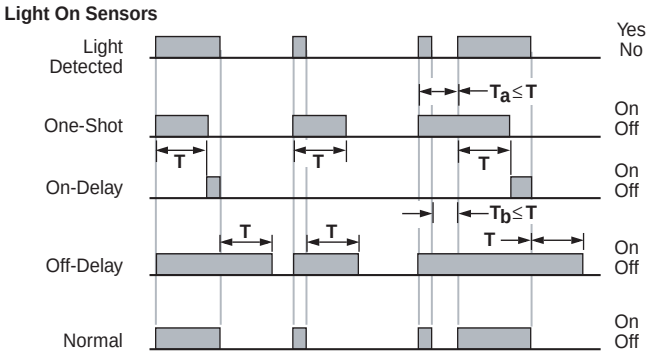
The output is off for 200ms (universal voltage type) or 150ms (DC type) upon power up. This delay is normal; it prevents a transient state.

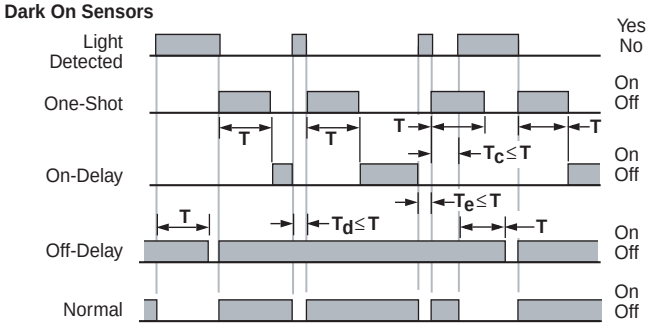
DIP Switches



3. All sensors include selectable light on or dark on output (detects presence or absence of object).

Timing Diagrams





4. Sensors without time-delay operate in the normal mode.

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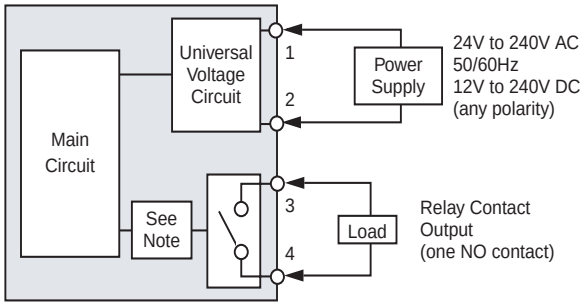
Installation

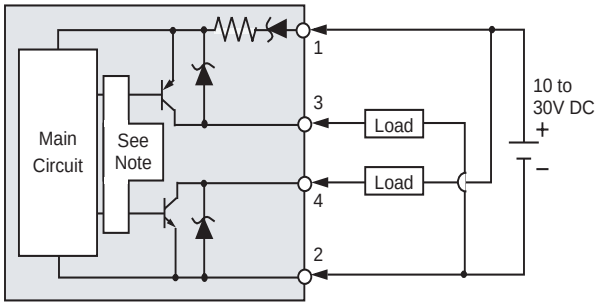
Below are considerations specic to ISF photoelectric sensors.

Schematics

Universal Voltage

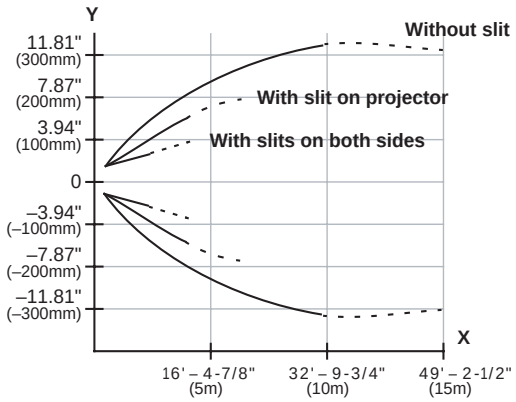


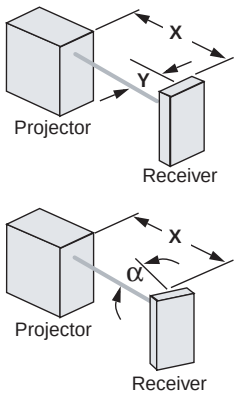
DC



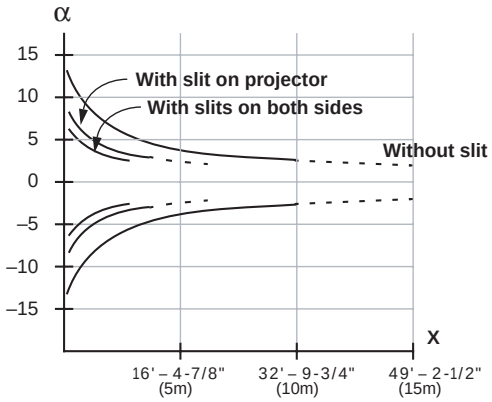
Sensing Characteristics

Alignment: Through-Beam (ISF-T10M..)

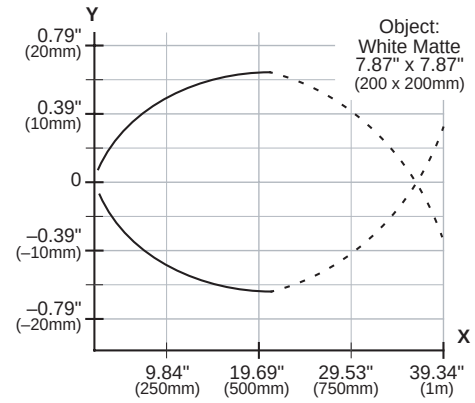


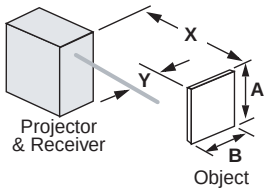


Sensing Angle: Through-Beam

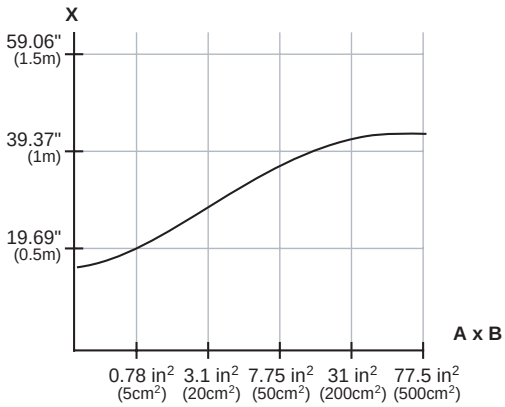


Sensing Range: Diffuse-Reflected Light

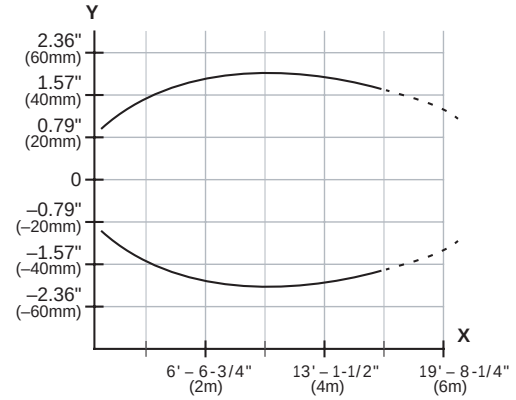


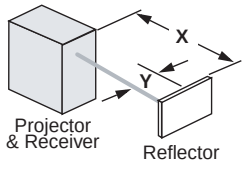


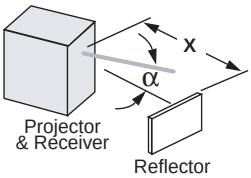
Object Size: Diffuse-Reflected Light



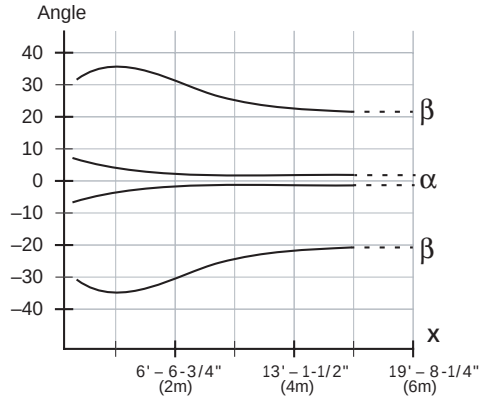
Alignment: Retro-Reflected Light



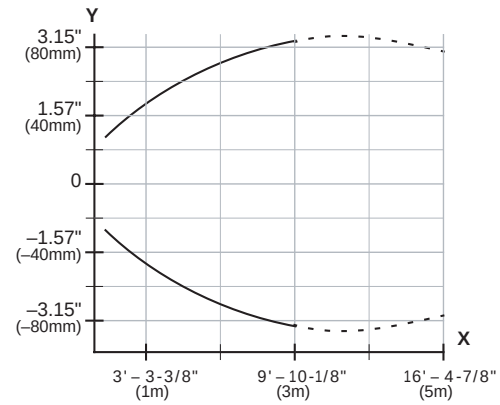


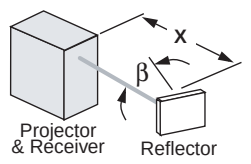


Sensing Angle: Retro-Reflected Light

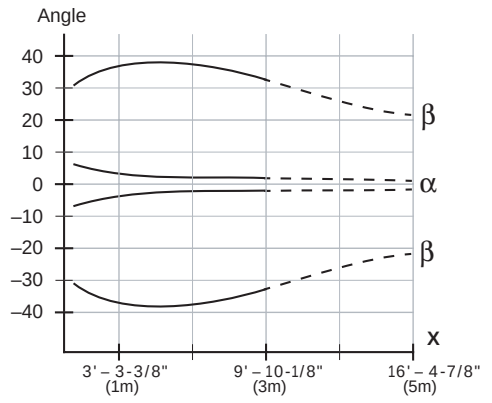


Alignment: Polarized Retro-Reflected

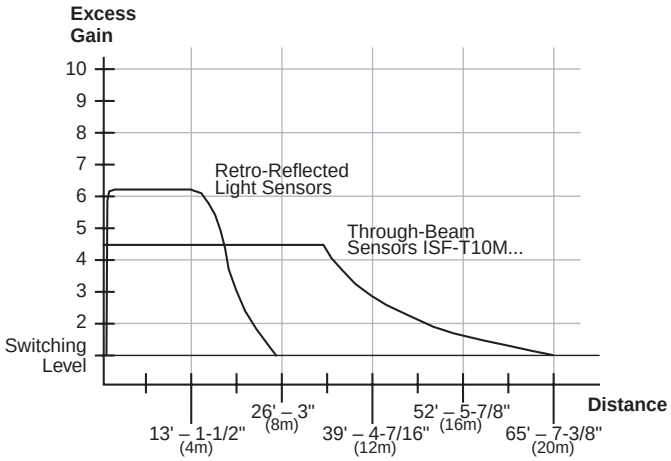


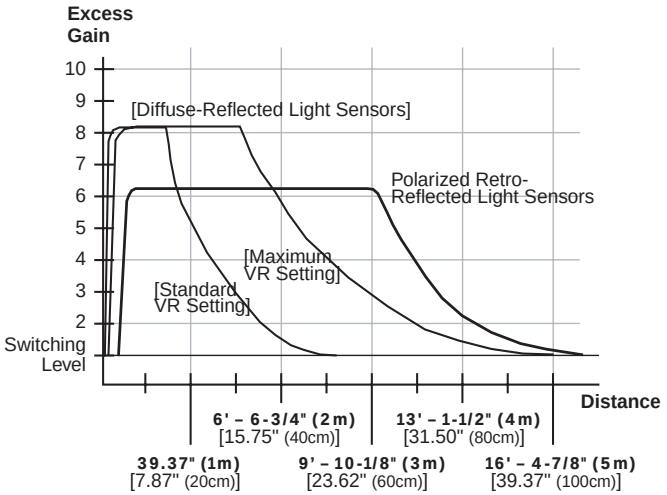


Sensing Angle: Polarized Retro-Reflected



Excess Gain

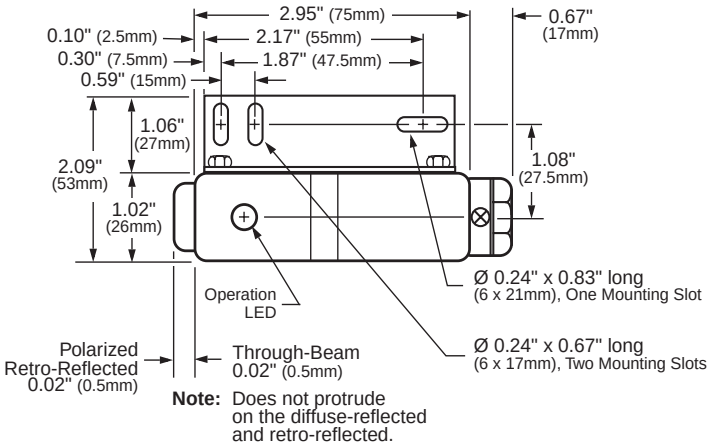




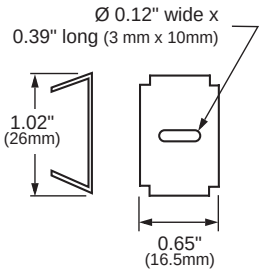
1.In all cases, excess gain is measured at the second stage amplier output.

2. Items in brackets pertain to diffuse-reected light sensors.

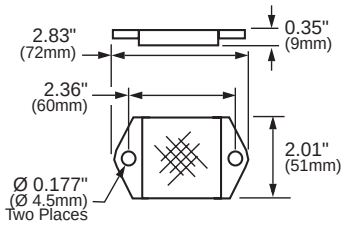
Dimensions

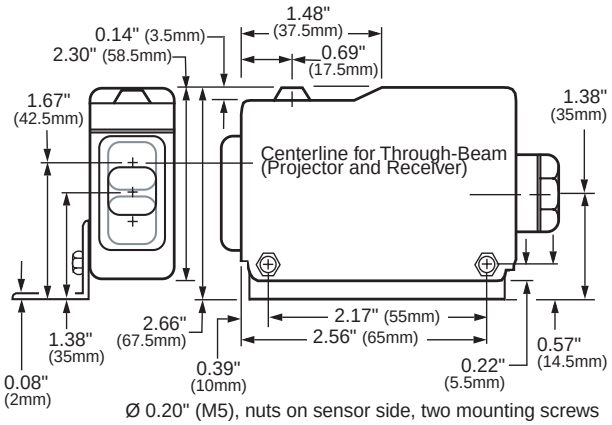


Slit for Through-Beam
(option) Part Number IAC-S1



Square Reflective Backplate
(replacement) Part Number IAC–R5





Reflector Bracket
(option) Part Number IAC-L2