

## GLOSSARY OF TERMS

### Aperture

An aperture, also known as a light shutter, is a mechanical piece mounted to restrict the size of a transmitter or receiver lens. Apertures are used to limit the amount of light received by a photoelectric receiver in thru beam mode, thereby allowing reliable and precise detection of objects with the same profile as the opening.

### Bifurcated Fibre Optics

Bifurcated fibre optics are fibre optic cables that combine the transmitted and received light in the same cable achieving diffuse proximity operation mode. An object is detected when the beam of light is reflected back to the receiving part of the cable.

### Beam Spacing

Beam spacing is the distance between the centre of two adjacent channels in a light curtain detector rail. The channels consist of receiver elements in the receiver light curtain detector rail and transmitter diodes in the transmitter light curtain detector rail.

### Control Input

Control input is a wire input used to control a sensor's transmitting power. The control input can also be used as a test input to test the function of a sensor system by switching off and on to check whether the output status changes.

### Current Consumption

The maximum current consumption for a unit when used at a specified voltage supply or at the maximum rated supply voltage.

### Dark Operated

Output is activated when no light is received from the transmitter.

### Electromechanical Relay

An electromechanical relay is a switching relay consisting of physical contacts, which is switched to an open or closed position by applying voltage to an electromagnetic coil.

### Fibre Optics

Transparent glass or plastic fibres used to conduct and guide light energy. Glass fibre optic assemblies consist of a bundle of small glass optical fibres housed in a flexible cable sheath. Glass fibre optics can withstand corrosive and high temperature environments, and enable detection in limited spaces. There are two models of fibre optic assemblies: bifurcated fibre optics and individual fibre optics.

### Hysteresis

Hysteresis is the difference between the sensing distance of the switch on point when a target is moving towards the sensor and switch off point when the target is moving away from the sensor. The hysteresis is expressed as a percentage of the switch on point sensing distance.

### IP Rating

IP is an abbreviation of "Ingress Protection" which is a classification system that designates, by a means of numbers, the degree of protection provided by an enclosure against penetration of solid objects and dust, and penetration of water. The rating system is established by IEC Publications 60529.

### Individual Fibre Optics

Individual fibre optics are fibre optic cables that are used in pairs and mounted opposite of each other so that the transmitting light is directed towards the receiving cable achieving thru beam operation mode. An object is detected when the beam of light is interrupted between the transmitting and receiving cable.

### Inductive Load Protection

Protection of a transistor output against voltage peaks occurring when an inductive load is switched off.

### Light Operated

Output is activated when light is received from the transmitter.

### Light Immunity

The light immunity of a sensor unit is the maximum ambient illuminance that can be tolerated without interfering with the input signal.

### Minimum Cable Bending Radius

The minimum recommendable radius that a cable can be bent.

### NPN

Transistor DC output with load connected to common positive supply (sinking).

### Optical Cross Talk

Optical cross talk occurs when a photoelectric receiver responds to light from an adjacent transmitter. Cross talk can be resolved by re-positioning of the sensors or multiplexing of the sensors.

### Optical Angle

The optical angle is a measure of the emission angle of the transmitter and the opening angle of the receiver. The emission angle is measured from the optical centre axis to 50% of the light intensity. The opening angle is measured from the optical centre axis to 50% of the sensitivity. The optical angle is expressed as +/- angle.

### Opto Isolated Output

Opto isolated output is an output circuit that is separated from the main electronics via an optical switch IC.

### Operation Frequency

Operation frequency is the measure of the speed at which a sensor can trigger. The frequency is measured by the number of times that a sensor can trigger per second. The operation frequency is expressed as hertz (Hz).

### On Delay

On delay is a timing logic in which timing begins at the start point of an input signal. An output is only activated if the input signal is continuous for the pre-set on delay time period. If the input signal is not continuous for the pre-set on delay time period, no output is activated.

### Off Delay

Off delay is a timing logic in which timing begins after the finish point of an input signal. An output is activated and remains activated for the pre-set off delay time period.

**PNP**

Transistor DC output with load connected to common negative supply (sourcing).

**Retro Reflectors**

A retro reflector is a reflective target used in retro-reflective operation mode to reflect the transmitter light back to the receiver.

**Response Time**

Response time is the time delay between the input signal and output trigger. The response time is expressed as milliseconds (ms).

**Sensing Range**

The sensing ranges of photoelectric sensors are measured differently according to the operation modes of the sensors.

- **Thru Beam:** measured with transmitter and receiver sensors aligned directly opposite of each other.
- **Diffuse Proximity:** measured against white matt A4 size paper.
- **Background Suppression:** measured against white matt A4 size paper.
- **Retro Reflective:** measured against circular retro reflector with 84 mm diameter (Telco retro reflector type: ILR 3)
- **Polarised Retro Reflective:** measured against circular retro reflector with 84 mm diameter (Telco retro reflector type: ILR 3)
- **Fibre Sensor:** dependent of length, light conductive material and operation mode of fibre optic cables.
- **Light Curtains:** measured with transmitter and receiver sensors aligned directly opposite of each other.

**Test Input**

Test input is a wire input used to test the function of a sensor system by switching off and on to check whether the output status changes.

**Time-Out**

Time-out is a timing logic (in light curtain systems) that allows one or more light beams if interrupted (or failed) for more than a pre-set time period, to be ignored and resume operation with the remaining light beams. If the timed-out light beams resume operation, the time-out function will automatically be cancelled.

**Transistor Output**

A transistor output is a solid state switch used in DC voltage sensors for switching the negative potential (NPN) or positive potential (PNP).

**Voltage Ripple**

Voltage ripple (100 to 120 Hz) is a variation of the voltage supply. The voltage ripple is expressed as percentage of the nominal supply voltage.

## OPERATION MODES



### Thru Beam

Thru Beam requires a separate transmitter and receiver sensor that are mounted and aligned opposite of each other so that the transmitter directs its light towards the receiver. An object is detected when the beam of light is interrupted between the transmitter and receiver sensors. Thru beam is the most effective use of infrared light enabling the highest level of excess gain for reliable sensing through contaminated environments.



### Diffuse Proximity

Diffuse Proximity requires a transmitter and receiver that are mounted adjacent to each other, in the same or separate housing, so that the transmitter directs its light towards the object to be detected. An object is detected when the beam of light is reflected back to the receiver. The sensing range is dependent of the reflectivity of the object.



### Background Suppression

Background suppression requires a transmitter and receiver that are mounted adjacent to each other, in the same housing, so that the transmitter directs its light towards the object to be detected. An object is detected when the beam of light is reflected back by an object, within the defined detection area, back to the receiver. The object is detected independently of the reflectivity of its surface, which ensures that the background can remain undetected.



### Retro Reflective

Retro Reflective requires a transmitter and receiver that are mounted adjacent to each other, in the same housing, so that the transmitter directs its light towards a retro reflector mounted opposite that reflects light back to the receiver. An object is detected when the beam of light is interrupted between the sensor and retro reflector.



### Polarised Retro Reflective

Polarised retro reflective requires a transmitter and receiver that are mounted adjacent to each other, in the same housing, so that the transmitter directs its light towards a retro reflector mounted opposite that reflects light back to the receiver. An object is detected when the beam of light is interrupted between the sensor and retro reflector. Special polarising filters ensure that the receiver only senses light reflected by a retro reflector, which ensures that shiny and reflective objects are reliably detected.



### Fibre Sensor

Fibre Sensor requires a transmitter and receiver, in the same or separate housing, to which fibre optic cables are connected to conduct and guide light from the transmitter and to the receiver. Individual fibre optic cables are used in pairs for thru beam sensing mode. Bifurcated fibre optic cables combine both the transmitted and received light in the same assembly for diffuse proximity sensing mode. Glass fibre optics are able to withstand corrosive and high temperature environments, and enable detection in limited space.



### Light Curtains

Light curtain systems require a separate transmitter and receiver detector that are mounted and aligned opposite of each other so that multiple light beams are established between the detectors. An object is detected when one or more light beams are interrupted between the transmitter and receiver detectors.



### Fork Sensors

Fork sensor requires a transmitter and receiver that are mounted in a fixed position, opposite of each other in the same housing, so that the transmitter directs its light towards the receiver. An object is detected when the beam of light is interrupted between the transmitter and receiver.

## REFERENCE TABLES

IP Ingress Protection Rating			
1st Characteristic – Protection against ingress of solid objects		2nd Characteristic – Protection against ingress of water	
Numeral	Description	Numeral	Description
0	No protection	0	No protection
1	Protected against solid objects larger than 50 mm	1	Protected against vertically falling water drops
2	Protected against solid objects larger than 12.5 mm	2	Protected against vertically falling water drops when enclosure tilted up to 15 °
3	Protected against solid objects larger than 2.5 mm	3	Protected against spraying water
4	Protected against solid objects larger than 1.0 mm	4	Protected against splashing water
5	Protected against dust	5	Protected against water jets
6	Dust tight	6	Protected against powerful water jets
		7	Protected against the effects of temporary immersion in water

Relative Reflectivity of Materials	
Material	Relative Reflectivity
Stainless steel, micro finish*	500 %
Natural aluminium, unfinished*	175 %
Stainless steel, brushed	150 %
Black anodized aluminium*	144 %
Opaque white plastic*	110 %
White paper	100 %
Dimension lumber (pine, dry, clean)	94 %
Beer foam	88 %
Kraft paper cardboard	88 %
Newspaper with print	69 %
Tissue paper, 2 ply	60 %
Clear plastic*	50 %
Tissue paper, 1 ply	44 %
Rough wood pallet (clean)	25 %
Opaque black plastic*	17 %
Black neoprene	5 %
Black rubber tyre wall	2 %

Note: Shiny materials marked with \*, the reflectivity value represents the maximum light return with the sensor beam exactly perpendicular to the material surface.

Unit Measurements		
Unit	Symbol	Measurement
Volt AC	V ac	Electrical potential – alternating current
Ampere	A	Electrical current
Volt DC	V dc	Electrical potential – direct current
Degrees Celsius	° C	Temperature
Hertz	Hz	Frequency (cycles per second)
Lux	lux	Illumination (lm/m <sup>2</sup> )
Metre	m	Length
Microsecond	µs	Time (10 <sup>-6</sup> s)
Milliampere	mA	Electrical current (10 <sup>-3</sup> A)
Millimetre	mm	Length (10 <sup>-3</sup> m)
Millisecond	ms	Time (10 <sup>-3</sup> s)
Nanometer	nm	Length (10 <sup>-9</sup> m)
Second	s	Time
Volt	V	Electrical potential
Volt Ampere	VA	Power
Watt	W	Power