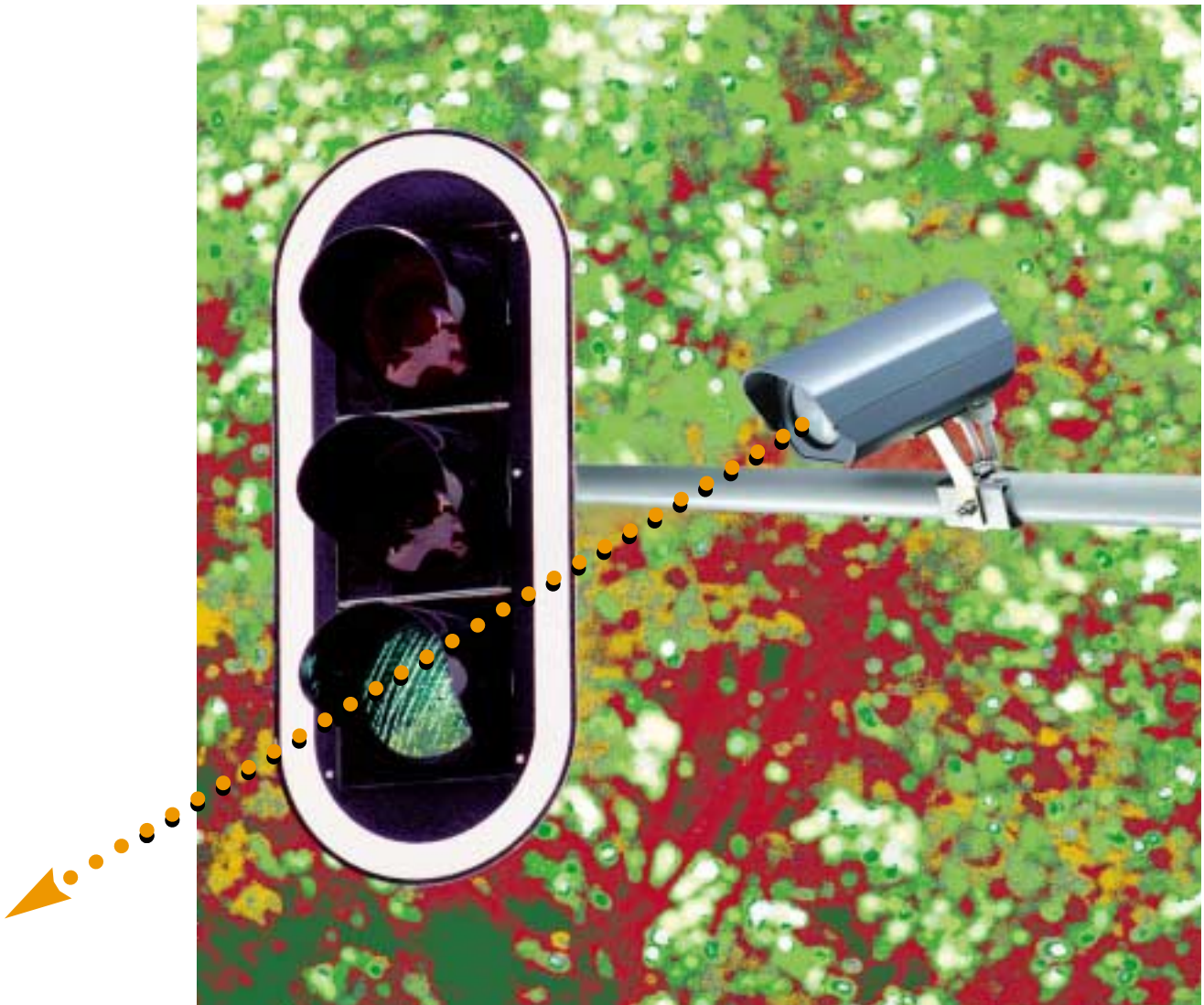


# SIEMENS

## Passive infrared detectors for traffic-actuated signal control



Industrial Projects  
and Technical Services

*Your success  
is our goal*

# Passive infrared detection

Overhead sensors (above ground detectors) enable the detection of vehicles and people without extensive civil engineering works or destroying the carriageway surface. There are various technologies – with diverse advantages and disadvantages – to enable this. Passive infrared technology (PIR) guarantees high reliability, lane selectivity and a long useful life with a good price/performance ratio. PIR detectors offer a good alternative to conventional loop detectors.

Infrared technology (IR technology) embraces a very wide application spectrum. Among other things, it is used in the areas of science (e.g. weather observation), medicine (e.g. temperature measurement and radiation therapy) and industry (e.g. for monitoring machine installations). Remote controls and motion detectors employing IR technology have long been in use in consumer electronics.

We speak of passive IR technology (PIR) when only IR radiation is received, whereas active IR technology is when radiation is also emitted.

## **Passive infrared detectors for traffic regulation and monitoring**

The PIR detectors used by Siemens in traffic-engineering consist of enhancements from the area of security technology. They detect the IR radiation within the wavelength band from 8 – 14  $\mu\text{m}$  (distant infrared). This radiation is not visible to the human eye. It penetrates through mist, fog and steam and is therefore largely independent of atmospheric influences. In this connection, we speak of an atmospheric window. The IR radiation emitted by a human being lies at around 10  $\mu\text{m}$ .

The intensity of the radiation depends on the temperature, the size and structure of a surface, but not on its colour or lighting conditions. A passive infrared detector reacts to radiation changes that correspond to a temperature difference of a fraction of 1°C against the background.

A passive infrared detector only reacts to temperature changes in or through a precisely defined field of vision. Slow changes in road surface temperature, caused by changing weather conditions during the day and year, are ignored. Some detectors feature a microprocessor for electronic signal processing and automatic adaptation to ambient conditions.

The combination of dynamic and static detection as well as the linking of signals from several fields of vision enables the development of detectors for counting, presence signalling and queue detection.

Siemens PIR detectors are approved for connection to Siemens signal controllers. In the case of MSP controllers, the transistor versions (-A3) of the PIR-Stat. Pres. and PIR-Distant detectors must be used.

## **Features of Siemens PIR detectors**

- Precise optical definition of the field of vision permits lane-selective detection up to the nominal range.
- Each object's temperature profile results in positive or negative radiation contrast in comparison with the background. These are strong enough to detect every kind of vehicle as well as persons to a very high level of probability.
- The long wave length of distant infrared radiation penetrates through rain, mist or snowfall much better than the shorter wave length of visible light or the only slightly longer active infrared beams.
- Detection response does not depend on lighting conditions or on the colour of an object.
- No mutual interference between detectors, no any health hazard because passive detectors only receive naturally existing radiation.
- The detectors can be mounted on a mast arm, a bridge or a signal head pole. There is normally no need for costly civil engineering works.

- Compact and sturdy design reduces the risk of vandalism.
- The type and condition of the road surface and base course do not influence the operation of a passive infrared traffic detector. Reliable operation is also guaranteed on bridges and in tunnels.

### Short-range detectors

Two detectors are offered for the short range, with static and dynamic sensors being combined.

The "PIR-Static Presence" detector is particularly suitable for detecting static presence of vehicles at the stop line and for counting vehicles. It has an additional dynamic advance range that can be evaluated separately.

The "PIR-SPL" detector is highly suitable for use in strategic control systems such as TASS (Traffic-Actuated Signal plan Selection) or Motion® (Method for the Optimisation of Traffic Signals in Online controlled Networks) for counting vehicles and for measuring occupancy in the flow range approx. 100 m to 400 m before the junction. A further application emphasis is the monitoring of traffic jams together with the radio solar system, e.g. at motorway exits.

### Long-range detectors

The "PIR-Distant" detector is a purely dynamic approach detector for green time extension via time gaps in traffic signal installations. Multiple Detection Zone Technology enables short output pulses and high lane selectivity coupled with a long range.

The PIR-LPC (Low Power Consumption) detector is a low-cost, purely dynamic detector with a range of up to 50 m. It can be mounted on a mast arm for simple green time control purposes. In conjunction with the radio solar system FSS, the detector is used at the side of the carriageway at a distance of around 30 to 400 m from the stop line (depending on the local situation and the application) for signal demanding and green time extension.

### Pedestrian detector

- The PIR-PED (**P**edestrian) detector is a dynamic PIR detector that has been optimised for the monitoring of pedestrian crossings. It is particularly suitable for green time extension at pedestrian crossings in the proximity of kindergartens, schools, old people's homes and in town centres. The detector covers a wide detection zone and detects objects such as people, animals and vehicles that are in motion within the detection field. Static objects are not detected.

### Radio solar system

- The Radio Solar System FSS is a solar powered short distance radio system with a maximum range of 400 m (free line of sight). Up to 4 PIR-SPL/-LPC/-PED detectors can be connected to an FSS and supplied with power. In many countries, the system can be operated free of licenses and charges

# Short-range detector “PIR-Static Presence”



Short range detector for optimising the traffic flow in traffic-actuated signal installations and for the acquisition of traffic data.

The detector PIR-Static Presence is a good alternative for loops at the stop line with additional possibilities.

Optimum functioning of the detector is achieved when it is mounted over the carriageway (mast arm, boom or bridge). Alternatively, it can be fitted at the side of the carriageway. An alignment tool (accessory) is available for easy adjustment of the detector during installation.

## Main features

- Static presence field with an auxiliary dynamic zone
- Function scope adjustable by DIP switches
- Lane-selective
- Controlled by microprocessor
- Direction discrimination possible
- Signal processing adapts to ambient conditions
- Internal self check with fail output
- Sturdy housing with a sturdy mount
- Additional interface available for indication of functions on a PC (notebook)
- Alignment tool available
- 2 outputs

## Applications

Static detection of vehicles with detector functions that depend on the installation site and the specific application. Suitable for:

- static presence signalling at the stop line,
- signal demanding,
- green time extension,
- vehicle counting at the stop line.

## Technical characteristics

Multiple-channel detection with intelligent logic makes it possible to locate the momentary positions of moving and standing vehicles and also of reporting presence.

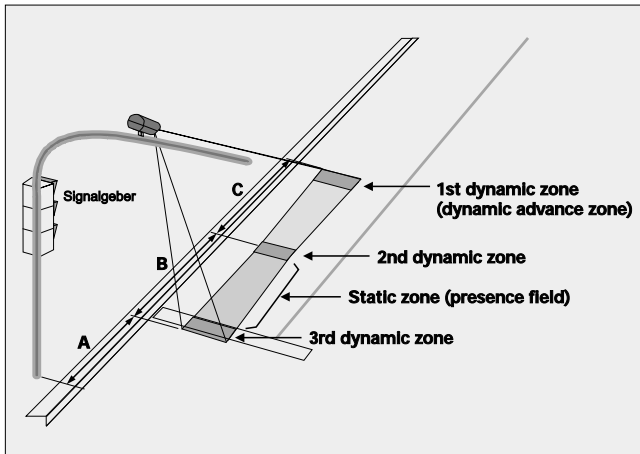
Depending on the specific application, the detector and output configurations are selected locally by setting DIP switches.

Under given conditions, self-monitoring of the detection channels is capable of triggering an error message (adjustable by DIP switches).

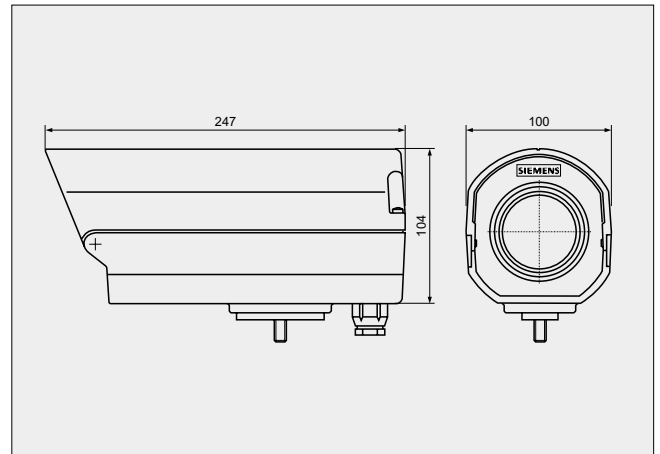
The DetScope interface box (accessory) enables the display of signals on a PC (notebook) during commissioning. Software is included.

## Effective range

The angle between the presence field and the auxiliary dynamic zone is fixed. Distances depend on the installation height and are specified for the recommended height around 5.5 m (see adjacent figure and table).



Detection fields



Dimensions of the PIR-Stat. Pres. in the universal housing

Detector axis at distance	Presence field		Advance zone
	A	B	C
4 m	1.3 m	2.7 m	1.9 m
5 m	1.9 m	3.1 m	2.3 m
6 m	2.5 m	3.5 m	2.9 m
7 m	3.0 m	4.0 m	3.6 m
8 m	3.5 m	4.5 m	4.5 m
9 m	4.0 m	5.0 m	5.5 m

The detector axis aims at the 2nd dynamic zone. Depending on the distance of the detector axis and the considered detection field, the width *W* varies between 0.7 m and 1.7 m.

### Technical data

Housing material	ASA, synthetic
Weight	approximately 1.0 kg
Sensors	static / dynamic
Spectral sensitivity	8 – 14 µm
Ready for operation	typically 60 s after activation
Maximum holding time	adjustable by DIP switches (max. 4 min.)
Supply voltage	230 V AC or 10 ... 26 V DC
Power consumption	AC versions typically 500 mW DC versions typically 35 mA @ 12 V DC
Output options	2 relays 250 V AC / 2 A / 125 VA 220 V DC / 2 A / 60 W
	or
	2 transistors (open coll.) 60 V / 50 mA
Operating temperature	– 40°C ... +70°C
Humidity	max. 95 % relative humidity
Type of protection	<b>IP 54</b> with existing PU threaded joints for improved housing ventilation <b>IP 64</b> resistant to water splashes by the replacement of PU threaded joints

# Short-range detector "PIR-SPL"

(Static presence low power consumption)



The detector is aligned visually by direction finding via the housing.

## Technical characteristics

Multiple-channel detection with intelligent logic makes it possible to locate the momentary positions of moving and standing vehicles and also reporting presence for a short time.

A serial interface cable (accessory) enables the display of signals on a PC (notebook) during commissioning.

## Main features

- Strip-like detection field
- Lane-selective
- Controlled by microprocessor
- Adaption of signal evaluation to ambient conditions
- RS485 interface for connecting to the Traffic Eye system
- Sturdy housing with a sturdy mount
- Additional cable and program available for function display on a PC (notebook)
- 1 output

## Effective range

The size and the distances of the effective range depend on the installation height and are specified for the recommended height of around 5.5 m (see table "detection field dimensions" and graphic "detection field").

Distance D [m]	A x B [m]
2	0.5 x 2.0
4	0.6 x 2.5
6	0.7 x 3.0
8	0.8 x 3.5

Table Detection field dimensions

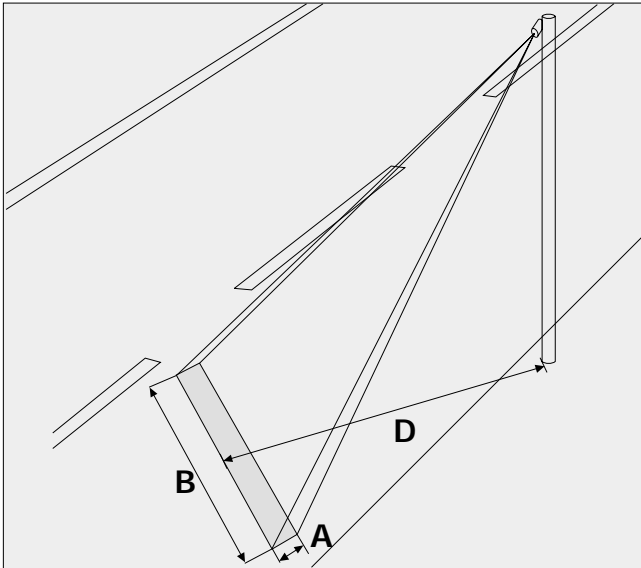
## Applications

This detector is particularly suitable for TASS and MOTION® applications for:

- vehicle counting,
- occupancy signalling.

A further application emphasis is the monitoring of traffic jams together with the Radio Solar System FSS (see Page 14), e.g. on motorway exits.

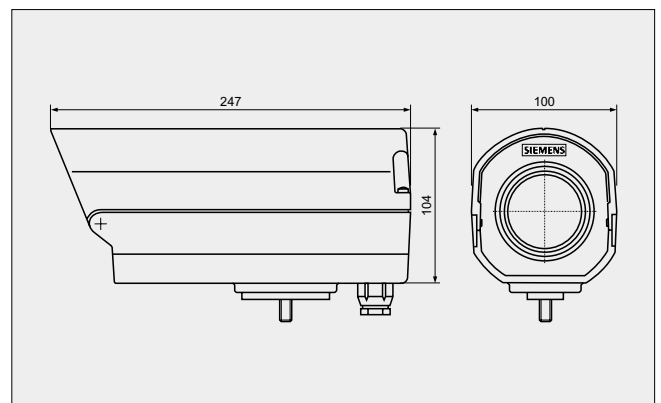
Optimum functioning of the detector is achieved when it is installed above the carriageway (signal mast arm, boom or bridge). Alternatively, it can be attached at the side of the carriageway.



Detection field

### Technical Data

Housing material	ASA, synthetic
Weight	approx. 780 g
Sensors	static/dynamic
Spectral sensitivity	8 – 14 $\mu\text{m}$
Ready for operation	typically 60 s after activation
Holding time	1, 2, 3 and 4 minutes
Supply voltage	10 ... 26 V DC
Power consumption depending on operating mode	
FSS	typically 1 mA @ 12 V DC
Normal	typically 7 mA @ 12 V DC
SiTOS	typically 1 mA @ 12 V DC
SiAM	typically 1 mA @ 12 V DC
Output options	
1 relay	125 V AC / 1 A / 30 W
1 transistor (open coll.)	60 V / 80 mA
1 serial interface	RS232
1 serial interface	RS485
Ambient influences	
Operating temperature	-40°C ... +60°C
Humidity	95% RH max.
Type of protection	<b>IP 54</b> with existing PU threaded joints for improved housing ventilation <b>IP 64</b> resistant to water splashes by the replacement of PU threaded joints



Dimensions of the PIR-SPL in the universal housing

# Long-range detector "PIR-Distant"



## Main features

- Dynamic proximal, main and auxiliary zones
- Lane-selective
- Controlled by microprocessor
- Adaption of signal evaluation to ambient conditions
- Internal self-monitoring with error output
- 3 dynamic sensors, 2 outputs
- Sturdy housing with a sturdy mount
- Additional interface available for indicating functions on a PC (notebook)
- Alignment tool available
- Functional scope adjustable by DIP switches

## Applications

Dynamic detection of vehicles with detector functions that can be adjusted depending on the specific application, for example:

- demanding signals,
- green time extension,
- time gap detection

for optimising the traffic flow at traffic-actuated signal installations.

Optimum functioning of the detector is achieved when it is installed above the carriageway (signal mast arm, boom or bridge). Alternatively, it can be installed at the side of the carriageway.

An alignment tool is available for easy adjustment of the detector during installation.

The logic enables reliable resetting of the output in the event of gaps between vehicles and premature cancellation of prolongation.

The detector PIR-Distant is an attractive alternative to induction loops for the detection of time gaps over a larger distance. Standing vehicles are not detected.

## Technical characteristics

Multiple-channel detection with intelligent logic makes it possible to locate the momentary positions of vehicles and thus to switch the output more precisely.

Depending on the specific application, the detector and output configurations are selected locally by setting DIP switches.

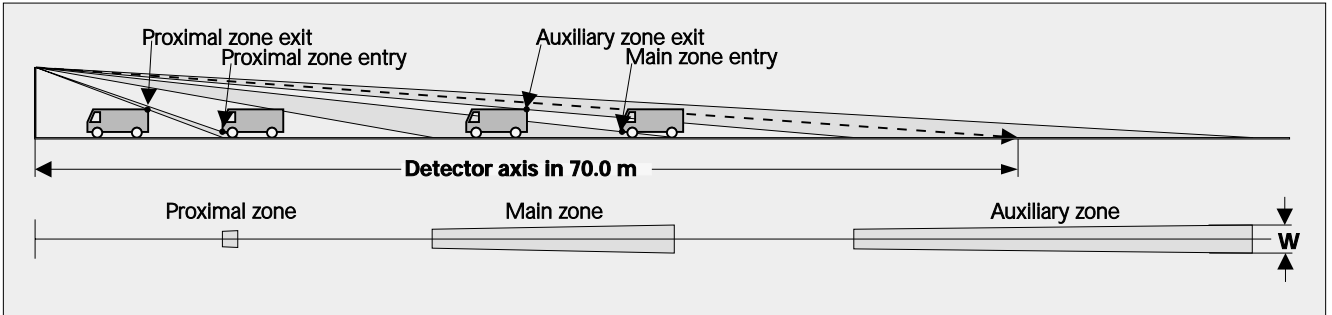
Under given conditions, self-monitoring of the detection channels is capable of triggering an error message (adjustable by DIP switches).

The DetScope interface box (accessory) enables the display of signals on a PC (notebook) during commissioning. Software is included.

## Effective range

The angle between the main and auxiliary zones is fixed. Distances depend on the installation height and are specified for the recommended height of around 5.5 m (see table "detection field dimensions" and graphic "detection fields").

From Version VS 1.5 onwards, the PIR-Distant detector possesses an additional proximal zone and a second output. Above all, the proximal zone offers the possibility of early detection of movements behind the stop line at the beginning of green time in congested situations.



Detection fields

Detector axis aims at	40 m	60 m	80 m	100 m
Proximal zone	0.9 m	1.1 m	1.3 m	1.5 m
Main zone	1.4 m	1.9 m	2.3 m	2.6 m
Auxiliary zone	1.2 m	2.0 m	2.8 m	3.8 m

Table Detection field dimensions

### Technical Data

Housing material	ASA synthetic
Weight	approx. 1 kg
Detector	multi-channel, dynamic
Nominal range	50 m
Spectral sensitivity	8 – 14 $\mu\text{m}$
Ready for operation	typically 60 s after activation
Supply voltage	230 V AC or 10 ... 26 V DC

### Power consumption

AC versions

typically 500 mW

DC versions

typically 25 mA @ 12 V DC

### Output options

2 relays

250 V AC / 2 A / 125 VA

220 V DC / 2 A / 60 W

or

2 transistors (open coll.) 60 V / 50 mA

### Ambient influences

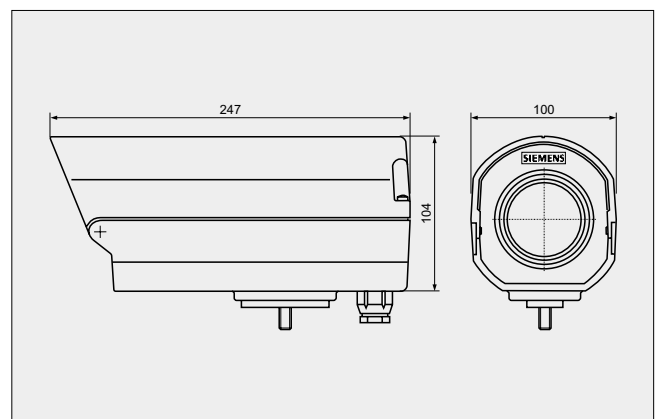
Operating temperature  $-40^{\circ}\text{C} \dots +70^{\circ}\text{C}$

Humidity 95% RH max.

Type of protection

**IP 54** with existing PU threaded joints for improved housing ventilation

**IP 64** resistant to water splashes by the replacement of PU threaded joints



Dimensions of the PIR-Distant in the universal housing

# Current-saving detector PIR-LPC (Low power consumption)



The detector can be mounted above or next to the carriageway.

## Technical features

Single-channel detection with an optional sensitivity for use as a long-range detector or as a short-range detector.

The detector has particularly low power consumption and is therefore ideally suitable for use as a remote detector together with the radio solar system FSS.

## Main features

- Very low power consumption
- Lane-selective
- Long range
- Sensitivity can be selected in two steps
- Simple mounting
- 1 output

## Applications

When the detector is mounted at the stop line, it is suitable for

- signal demanding and
- extending the green time.

Together with the radio solar system FSS, it can be used as a remote detector at a distance of 30 to 400 m ahead of the intersection for

- signal demanding and
- extending the green time.

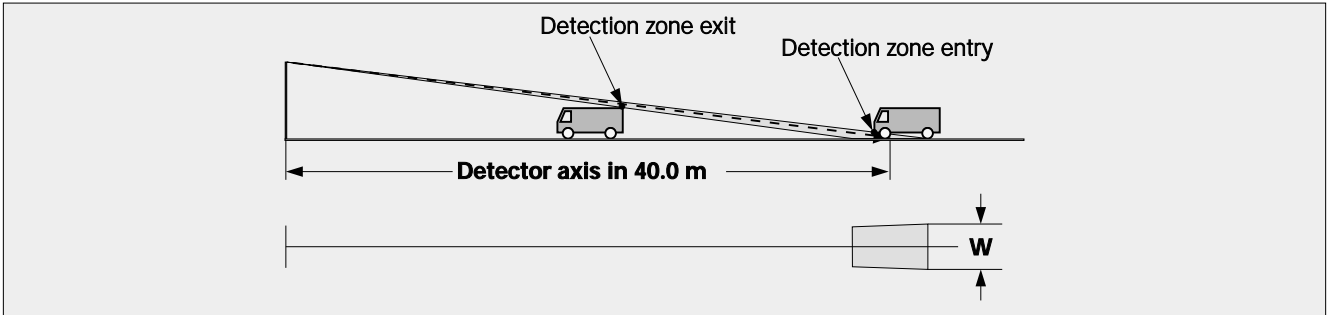
The data gathered in this way can be used to optimise the traffic flow at traffic signal installations featuring traffic-actuated control.

## Active zone

The size of the active zone depends on mounting height, the detection range and radiation contrasts. It is possible to switch between the short range setting (2 – 12 m range) for mounting next to the carriageway and long range setting (12 – 50 m range) for use as a long range detector and for mounting at the stop line. The values specified in the table are average values and refer to a mounting height of 5.5 m. As the detector is a single-beam detector, when used as a long range detector for green time extension (depending on vehicle height), it outputs a considerably longer occupancy than the PIR-fan or a loop, for example.

Distance D [m]	Width W [m]
5	0.4
10	0.7
15	1.0
20	1.4
30	2.0
40	2.7
50	3.5

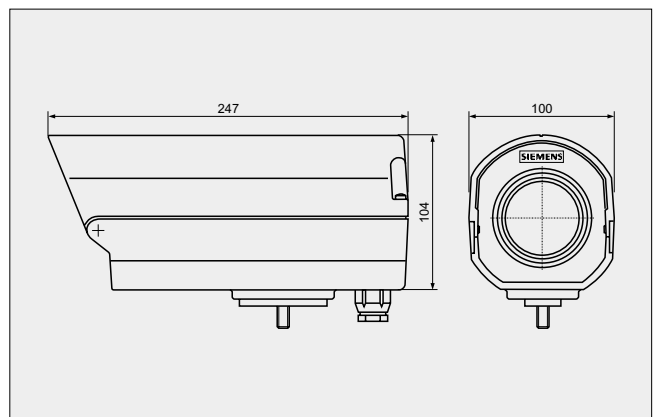
Table Detection geometry



Detection zone

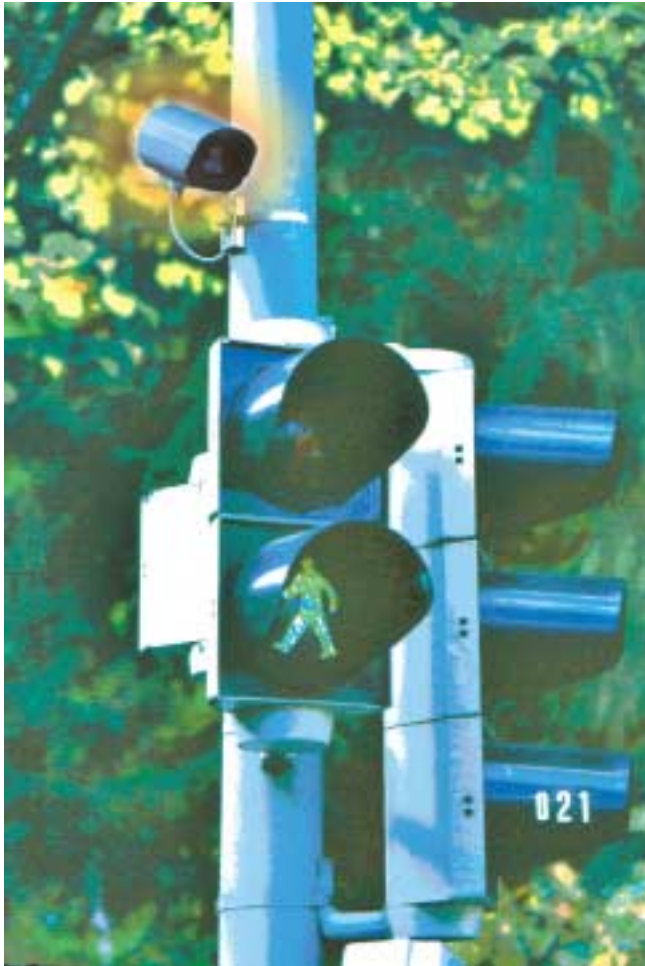
### Technical Data

Housing material	ASA, synthetic	Output options	
Weight	approx. 0.7 kg	relay (changeover contact)	150 V / 1 A / 30 W
Detector	single-channel, dynamic	transistor (open coll.)	60 V / 80 mA
Nominal range	50 m	Range optionally	
Spectral sensitivity	8 – 14 $\mu\text{m}$	proximal plug position	2 ... 12 m
Supply voltage with solar supply	8 ... 16 V DC	distant plug position	12 ... 50 m
Supply voltage with DC supply	10.5 ... 37 V DC	Acceptance angle	4°
Power consumption		Ambient influences	
transistor output	typically 150 $\mu\text{A}$ @ 12 V DC	Operating temperature	-40°C ... +70°C
relay output	typically 6 mA @ 12 V DC	Type of protection	<b>IP 54</b> with existing PU threaded joints for improved housing ventilation <b>IP 64</b> resistant to water splashes by the replacement of PU threaded joints



Dimensions of the PIR-LPC

# Pedestrian detector PIR-PED



## Main features

- Optimised optical system for detecting pedestrians
- Low power consumption
- Sensitivity can be set in two steps
- Simple mounting
- 1 output

## Application

The detector is particularly suitable for

- prolonging the green time for pedestrians.

It is mounted above the pedestrian signal head and views the pedestrian crossing. An occupied signal is output as long as objects such as people, animals or vehicles are moving within the detection field. Objects are detected regardless of the direction of motion.

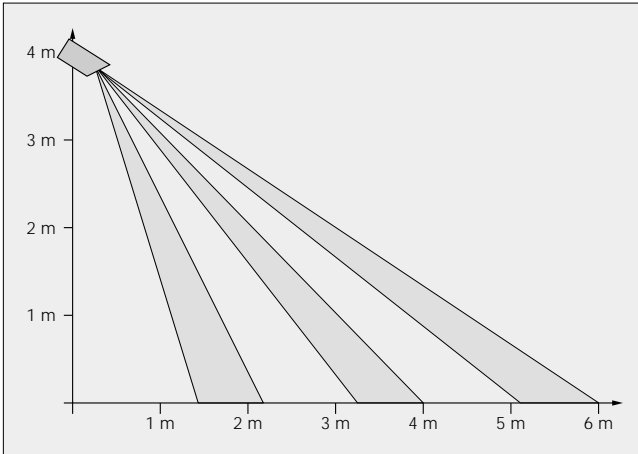
## Technical features

Single-channel detection with optional sensitivity for use as a pedestrian detector with a large area detection zone. The detector has a range of approximately 8 m with a detection field width of around 4 m.

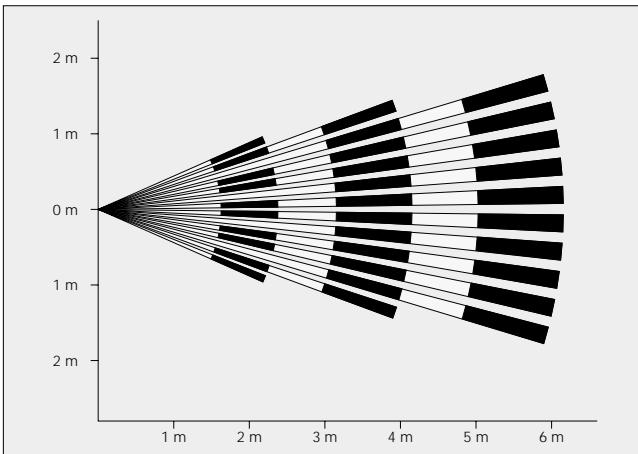
The detector requires very little energy and is therefore also suitable for use together with the radio solar system FSS.

## Active zone

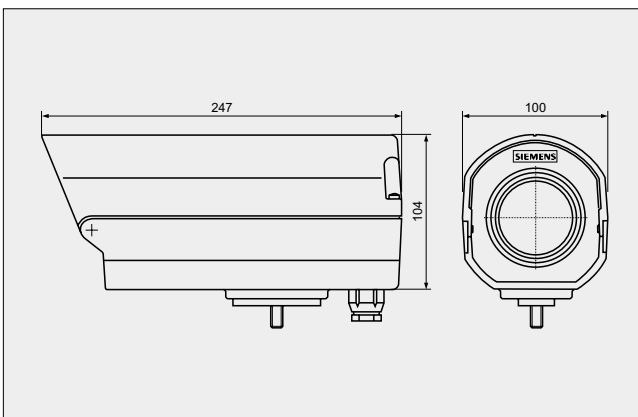
The geometry of the active zone depends on mounting height, the distance involved and radiation contrasts. By means of a switch, it is possible to choose between a short range setting (1 to 4 m range) and a long range setting (1 to 8 m range). The range values specified consist of average values.



Detection zone, side view



Detection zone, horizontal projection



Dimensions of the PIR-PED

### Technical data

Housing material	ASA, synthetic
Weight	Approximately 0.7 kg
Detector	Single-channel, dynamic
Spectral sensitivity	8 – 14 $\mu\text{m}$
Power supply voltage	
Solar power supply	8 ... 16 V DC
DC power supply	10 ... 37 V DC
Power consumption	
Transistor output	typ. 150 $\mu\text{A}$ @ 12 V DC
Relay output	typ. 6 mA @ 12 V DC

### Output options

Relay	150 V / 1 A / 30 W
Transistor (open collector)	60 V / 80 mA

### Range optionally

Short range connector setting	1 m ... 4 m
Long range connector setting	1 m ... 8 m

### Aperture angle

Horizontal	$-35^\circ$ ... $+35^\circ$
Vertical	$-35^\circ$ ... $+0^\circ$

### Ambient influences

Operating temperature	$-40^\circ\text{C}$ ... $+70^\circ\text{C}$
-----------------------	---

### Type of protection

**IP 54** with existing PU threaded joints for improved housing ventilation

**IP 64** resistant to water splashes by the replacement of PU threaded joints

# Radio solar system FSS



## Applications

The radio solar system serves the purpose of wireless transmission of detector messages to a controller. It consists of an independent transmitter FSM and the receiver FEM.

Particularly the power-saving PIR-SPL/-LPC/-PED, whose signal outputs are connected to the input of the transmitter, are suitable as detectors. The detectors can be powered via the solar panel and the rechargeable battery of the transmitter. Up to four detectors can be connected to one FSS. The power supply has sufficient capacity to ensure that a period of around 6 weeks without sunshine can be bridged, even if four PIR-SPL/-LPC detectors are powered.

To enhance transmission reliability, the receiver features error monitoring. It detects transmission errors and lasting transmission disturbances. Transmission errors are partly compensated.

Data is transferred at adjustable frequencies in the 433 MHz ISM band with a power of 10 mW, thus covering distances of up to 400 m (no obstructions). The system is generally approved in Germany and in various other European countries (see section entitled Technical data). Therefore, no additional approval is required in these countries and no charges are incurred either.

## Technical data

### Transmitter and receiver

Frequency	433.90 MHz ... 434.65 MHz
Range	350 to 400 m with a free line of sight
Single system	< 250 m with a free line of sight
Several systems simultaneously	
Operating mode	Simplex, point-to-point, event-controlled
Shortest occupancy pulse that can be detected	150 ms
Shortest output occupancy pulse	150 ms
Temperature range	-20°C to +50°C
Seal (type of protection)	IP 54 splash waterproof

### Transmitter

Output power per input	10 mW EIRP
Type of rechargeable battery	Lead gel/fleece, 12V/6.5 A/h
Current that can be additionally extracted to power detectors	3 mA (with 5 W panel) 8 mA (with 10 W panel)
	- 20,000 veh./day (weekly average) Unfavourable weather conditions (All terminals together)
Weight	app. 7 kg

### Receiver

Operating voltage	11 to 30V DC or peak 100 Hz half waves
Current consumption	Typically 60 mA (12 V) or 90 mA (24 V)

For test purposes as a test receiver:

- Operating voltage +UA 9 to 30V DC (12 V) (local power supply from battery, LED only, no outputs)
- Current consumption

Number of output switching contacts (potential-free)	Typically 35 mA (12 V)
Detector outputs	4
Weight	app. 0.8 kg

# Ordering information

## **PIR-Static Presence short-range detector**

**Order No.: V24764-Z1011-A1**

Static detector for presence at the stop line with a dynamic advance zone, for a 230 V AC supply voltage with one relay output (potential-free) and one optocoupler output including universal securing elements.

## **PIR-Static Presence short-range detector**

**Order No.: V24764-Z1011-A2**

Static detector for presence at the stop line with a dynamic advance range, for a 10.5 ... 26 V DC supply voltage with one relay output (potential-free) and one optocoupler output including universal securing elements.

## **PIR-Static Presence short-range detector**

**Order No.: V24764-Z1011-A3**

Static detector for presence at the stop line with a dynamic advance range, for a 10.5 ... 26 V DC supply voltage with two transistor outputs (open collector) including universal securing elements.

## **PIR-Distant detector**

**Order No.: V24764-Z1000-A1**

Dynamic detector for time gap, nominal range 50 m, for 230 V AC supply voltage, with relay output (potential-free), including universal securing elements.

## **PIR-Distant detector**

**Order No.: V24764-Z1000-A2**

Dynamic detector for time gap, nominal range 50 m, for a 10.5 ... 26 V DC supply voltage, with relay output (potential-free), including universal securing elements.

## **PIR-Distant detector**

**Order No.: V24764-Z1000-A3**

Dynamic detector for time gap, nominal range 50 m, for a 10.5 ... 26 V DC supply voltage, with transistor output (open collector) including universal securing elements.

## **FSS with SM6**

**Order No.: L24730-E0312-A903**

Radio solar system FSS (transmitter unit + receiver unit), panel SM6, 6.5 A/h rechargeable battery, complete including mounts

## **FSS with SM10**

**Order No.: L24730-E0312-A904**

Radio solar system FSS (transmitter unit + receiver unit), panel SM10, 6.5 A/h rechargeable battery, complete including mounts

## **DetScope for PIR detectors**

**Order No.: V24764-Z1070-A1**

Interface including software of detector signals on a PC (notebook) for PIR-Static Presence and PIR-Distant.

## **PIR-Distant/Static Presence alignment tool**

**Order No.: V24764-Z1070-A2**

For easy detector adjustment during installation

## **Detectors suitable for the radio solar system**

### **Short-range detector PIR-SPL**

**Order no.: S24764-B34-A2**

Static detector for vehicle counting and occupancy measurement, for a supply voltage of 10 ... 26 V DC with 1 relay and 1 transistor output including securing elements.

### **PIR-LPC**

**Order No.: S24764-B29-A4**

Passive infrared detector - low power consumption

### **PIR-PED**

**Order No.: S24764-B30-A4**

Passive infrared detector – pedestrian, for detecting pedestrians

Further information:  
Siemens AG  
Industrial Projects and  
Technical Services  
Traffic Control Systems (ATD SV)  
Hofmannstr. 51  
D-81359 Munich

This document may not be duplicated nor its  
contents used or communicated to others  
without express authority.

Delivery subject to availability; right of techni-  
cal modifications reserved.

