

## Microwave Sensors – Precautions for Product Installation and Operation

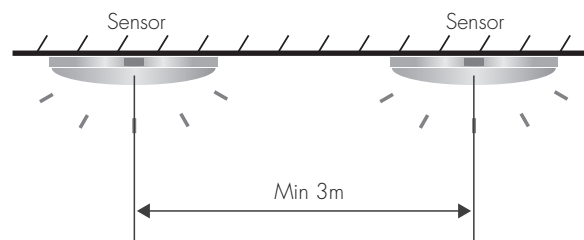
Microwave motion sensor implements occupancy detection by use of High Frequency (HF). The technology is based on the Doppler effect principle which can be used to determine the size, speed and direction of an object. Understanding the basic principle is to consider it as a radar, in which a signal is sent and received by an antenna.

1) **When using microwave motion sensors, there are a few aspects that should be taken into consideration in order to ensure stable microwave performance:**

a) Please always check the application environment before mass installation and also conduct field test as the performance of microwave sensors can be affected by:

- i) Wireless signals interference: strong Wi-Fi signals, GSM towers etc.
- ii) Metals: iron, steel, concrete etc.
- iii) Moving objects: ventilation fans, water pipe, wind/air movement, elevator, animals etc.
- iv) Vibration: such as caused by air traffic, machines around, swinging as a result of installing sensor in suspended state etc.
- v) Back wave reflection by walls.
- vi) Confined spaces such as toilet cubicles (HF signals will 'see' through wood or gypsum partition materials).

b) When installing luminaires with microwave sensor fitted, avoid installing two neighbouring luminaires too close to each other as they can collect each other's signals and confuse each other, hence resulting in false triggering. We recommend the mounting distance between sensors to be more than 3m to avoid sensors being false triggered. Similarly, two opposite walls mounted with microwave sensors looking directly at each other could cause the same result as well.

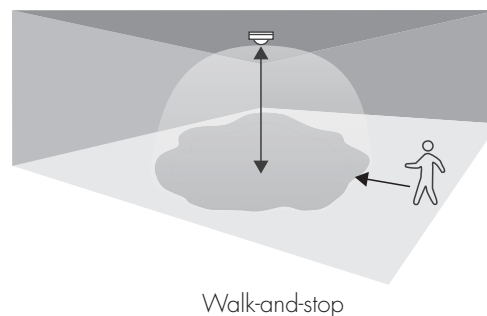
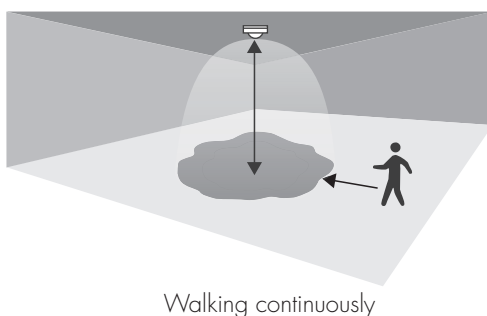


c) Due to the reason that the microwave system requires a stable reference and is subject to environmental influences, outdoor mounting of microwave sensors is not recommended as factors such as wind or heavy rain could cause false triggering of the microwave sensor.

2) **Due to the nature property of the HF module, please kindly take note that the actual detection range/distance for microwave sensors can vary depending on the following factors:**

a) Testing methods of walking continuously or walk-and-stop:

- The detection distance for walk-and-stop is longer than that of walking continuously.
- This is because the microwave detecting ability will tend to regard that there are no changes in the microwave frequency when people are walking continuously at constant speed towards the sensor, so the sensor would appear to respond rather slowly. Vice versa, when people walk and stop during the testing, microwave responds swiftly and the detection distance tends to be 1m to 3m more as compared to that of walking continuously.
- On all of the microwave sensor data sheet, please kindly take note that walk-and-stop test is applied to determine the detection distance.



b) The size of the person during detection distance testing and his walking speed:

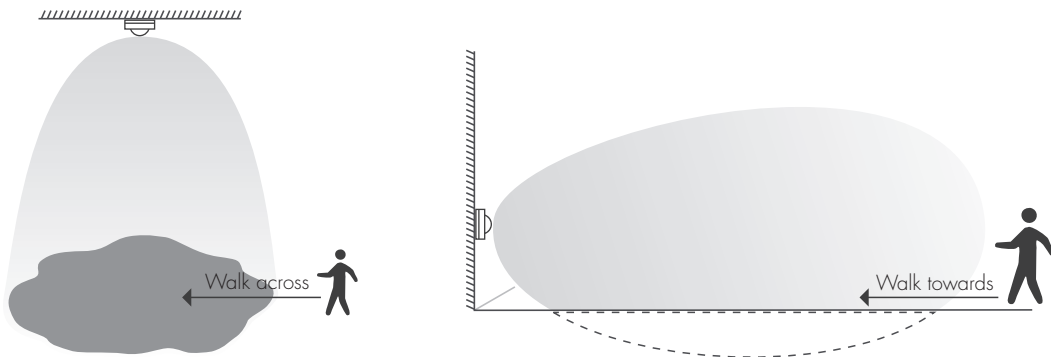
- The detection distance shown on the data sheet is based on the same testing worker of 170cm in height with walking speed at 0.5m/s to 1.0m/s.

c) Different testing field:

- To provide a more reliable reference in real application, detection distance testing has to be carried out at the same testing field with ceiling and spacious area.

d) Walking towards or walking across the sensor:

- For these two movements, the detection distances are different. An indication regarding walking towards and walking across the sensor is as follows:



e) Detection pattern:

- The detection pattern of a microwave sensor is not a perfect circle/round shape of which there is one direction with relatively shorter detection radius (e.g. Direction 4 shown below), this is actually the nature and characteristic of the microwave module. The max. detection range info shown on the data sheet is based on the more sensitive direction (e.g. Direction 1 & 2 shown below).
- An indication for the detection pattern is as follows, please kindly take note that the actual detection pattern may vary from one to another, causing slight inconsistency between sensors:

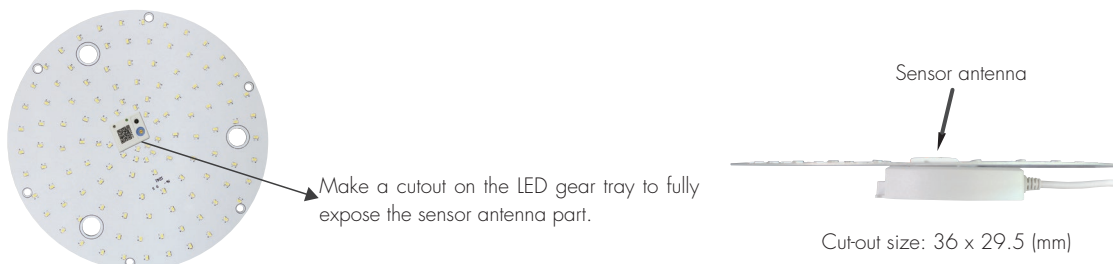


f) Reflections within different structure/shape/material of luminaire, and from different types of ceiling:

- Different types of luminaires and ceilings could result in HF signal reflection and attenuation. E.g. Metallic parts of luminaires reflect HF signals; microwave signal sometimes appears to be reduced when placed behind materials such as thick polycarbonate.

g) Sensor installation:

- When fitting the sensor body in a luminaire, please also kindly pay attention that when a motion sensor is installed at or well below the LED gear tray level, the detection range can be affected. It is always highly recommended to expose the antenna part:



h) Different soft-on period for different types of LED drivers:

– When the sensor is triggered to turn on the lights, some driver models may take longer time to respond, which in turn causes the lights to be slow in turning on and the user could misinterpret as the sensor having sensitivity problem with short detection distance.

Please kindly note that in real application, all these factors can produce a certain degree of variation in terms of detection range, so it is not possible to determine a universal standard in all circumstances. Therefore, in order to determine the actual detection pattern for a specific installation/project, we always recommend customers to carry out a small field test before going for mass installation.

### 3) Ta and Tc:

Ta refers to the max. ambient temperature, to be more precise, it refers to the air surrounding the motion sensor inside the luminaire. Tc refers to the max. temperature of a reference point on the motion sensor housing. However, there are a few aspects to be taken into consideration about Ta and Tc points:

a) Please kindly take note that the reference point of Tc is defined by Hytronik. Usually, the Tc reference point can be defined freely by a manufacturer, there is no agreed rule for that.

b) Generally, as long as the temperature of Ta and Tc points on microwave motion sensor housing after being fitted inside the luminaire does not exceed the max. predefined values mentioned on the data sheet, the lifetime of 5 years is guaranteed. However, for application of which the temperature of Ta and Tc points are well above the max. predefined values, the lifetime of the microwave sensor will be reduced (the sensor can still work normally). For such application, Hytronik standard guarantee is not applicable as the product is not used according to the specifications.

### 4) Sensor working under extremely low temperature:

The rated minimum working temperature of Hytronik microwave motion sensor is generally -20°C (For exact value, please kindly refer to the specific product data sheet). However, in special application, the microwave motion sensor is intended to work in an environment with temperature lower than -20°C, such as in a cold storage. In this case, there are a few aspects which require special attention:

a) To enable the sensor working in such environment, some users may start up the microwave sensor under normal temperature level first, i.e. more than -20°C. After starting up, the user will need to keep the sensor working under this normal temperature range for at least 30 minutes to fully warm up the sensor internal parts. After warm-up, user can further decrease the operation temperature to a lower level. However, please kindly take note that the lowest temperature level it can go is -40°C.

b) In case of power outage, the user has to re-power on the sensor under normal temperature level again. Before further decreasing the operation temperature of the cold storage to below -20°C, the sensor has to keep working under normal temperature for at least 30 minutes to totally heat up the sensor internal parts again.

c) For such special application, the lifetime of the sensor will be reduced. Hytronik standard guarantee is not applicable as the product is not used according to the specifications.

### 5) Remote control:

For some microwave motion sensors, they have to be commissioned via a remote control. There are a few aspects to be aware of when commissioning with a remote control:

a) Make sure that the remote control is loaded with two AAA batteries. Under normal use, batteries last about a year. However, replace them whenever the LED indicator of the remote control and the microwave sensor appears to not respond to commands.

b) To commission the sensor with the remote control (especially for high bay microwave sensors), direct the transmitting part of the remote control to the sensor within vertical angle of +/-15° and at installation height of 10m to 15m. The flashing of LED indicator from the remote control and lights controlled by the sensor flashing indicate that the transmission is properly done.

c) It is possible that signals from the remote control will not be received in spaces that have fluorescent lighting, incandescent lighting and other light sources which contain high level of infrared light around or near the sensor, or when the sensor is installed

outdoor whereby there are sunlights.

#### 6) Inrush current:

When an LED driver is turned on, instant high current flows into the circuit of a microwave motion sensor, of which it can be as high as 50 times of the steady state currents. In order to protect high inrush current from damaging the microwave sensor, please kindly make sure that the total inrush current from the LED driver is less than the limit a sensor can withstand.

a) For example, to enable synchronization control of a group of microwave sensors, an installer can connect the L' terminal in parallel. In this way, whichever sensor is triggered, the whole group of microwave sensors will turn on. There are two limitations that have to be taken into consideration:

i) The inrush current from the LED driver has to be less than the limit a microwave sensor can withstand;

ii) The total loading of the whole group of microwave sensors connected together in parallel should not exceed the rated loading of a single sensor. E.g. with luminaire of 30W, an installer can connect 13 pieces of HC009S together via L' terminals in parallel because the rated loading of a single HC009S is 400VA (capacitive), i.e.  $30W \times 13 \text{ pieces} = 390VA < 400VA$ .

b) Before applying such wiring to allow synchronization control, it is strongly recommended to run a field test in real life to ensure that all of the microwave sensors in that group work well in such L' connection. In case of using an LED driver which has compatibility problem with the sensor, it could cause interference, e.g. when the first sensor switches off after hold time or standby time, the other sensors in the same group do not turn off due to interference caused by the LED driver.

c) Please kindly note that if the inrush current from the LED driver exceeds the limit a microwave sensor can withstand, the sensor can still work; however, the lifetime of the sensor will be reduced. For such case, Hytronik standard guarantee is not applicable as the product is not used according to the specifications.