

Knowledges & Precautions for Microwave (HF) Sensor Usage:

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

Hytronik's microwave sensor provides multiple sensitivity range settings (100% / 75% / 50% / 30% / 10%). Here we only put detection distance data for 100% sensitivity level. Please kindly take note that 100% / 75% / 50% / 30% / 10% is for easier understanding purpose only, in other sensitivity levels the detection distance on the ground does not reflect a proportional mathematic calculation (e.g. the distance data on 30% sensitivity level is not equal to 0.3 * table data).

3

The actual detection range/distance for microwave sensor can vary depending on the following factors:

- With multiple persons walking in the area, the detection distance will be longer than one person walking.
- Different size of the person, different walking pace of the person, and different height of the person can all result in slight differences in testing result.
- Different testing field can also provides different testing result, so please make sure to always carry out distance testing at the same testing field with ceiling and spacious area.
- Hytronik's typical testing data is based on radial movement (walking towards). If walking direction is different, the result will also be different.
- The detection pattern of a microwave sensor is not a perfect circle/round shape. Hytronik's detection statistics are based on the longest direction to provide max. detection range data.
- 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.
- The distance data is tested under the condition that the sensor is not installed in any light fixtures. In real case when there is LED driver, sometimes the detection distance tend to be shorter because different LED drivers may have different soft-on period.

2

Due to the nature property of microwave detection technology, the microwave sensor's performance also depends on the ambient environment.

Wireless signal interferences or strong electro-magnetic wave interferences in the air such as strong Wi-Fi signals and nearby GSM tower. (Thanks to Hytronik's robust antenna technology, this concern has been eliminated now and Hytronik's latest robust antenna sensors can perform stably and normally even if placed in unfriendly wireless applications)

- Microwave detection can be affected by metals such as iron, steel, concrete etc.
- Microwave signal can penetrate through wood or gypsum partition materials, and tend to pick up motion outside of a confined space.
Moving objects such as ventilation fans, fast wind/air movement, elevators, animals etc could potentially false trigger microwave sensor.
- Vibrations caused by air traffic, big power machines around, swinging as a result of installing sensor in suspended state etc could potentially false trigger microwave sensor.
- Microwave detection is not recommended in outdoor usages, because it requires a stable reference and is subject to environmental influences such as wind or heavy rain, which could potentially cause false triggering.

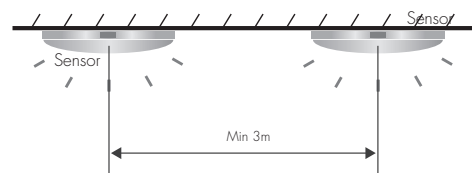
4

Sensor installation: Expose the antenna above the gear tray level for optimal detection range. If the sensor is installed at or well below the LED gear tray level, the detection range could be reduced.



5

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 potential false triggering. We recommend the mounting distance between sensors to be more than 3m to avoid sensors being false triggered.



6

About True Presence

For motion sensors with True Presence detection technology, there are two aspects to be aware.

- Different people's breathing frequency, breathing rate, breathing strength varies could cause difference in actual presence detection distance.
- Our presence detection test data is based on sitting towards the sensor. Sitting back to the sensor or sitting tangentially to the sensor could cause difference in actual presence detection distance.

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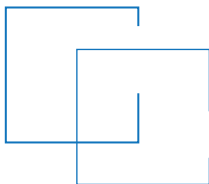
Sensor working under extremely low temperature:

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 repower 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.



Kind Reminder: Please always make sure that field testings are conducted before applying to mass installations, this is to make sure that the performance of the sensor are tested ok on-site, otherwise if the installation environment is not friendly to microwave technology, then the sensor may not work normally and could behave strangely or become false triggered on the project site.

8

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.

9

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.

Knowledges & Precautions for PIR Sensor Usage:

PIR motion sensor is based on the principle of which the detection of heat movement across 'windows' or 'planes' created by the optic in front of the passive infrared detector. The optic design is fundamental to the detection area and can be controlled by the use of 'blind', usually in the form of a plastic attachment or stickers to cover the segments of the optic.



1

When using PIR motion sensors, there are a few aspects that should be taken into consideration in order to ensure stable PIR performance. Before installation, it is a must to carry out a performance evaluation test under representative conditions as the sensitivity of PIR motion sensors is influenced by environmental conditions:

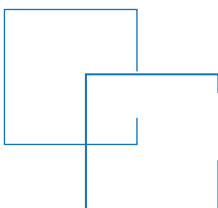
A) PIR motion sensor requires line-of-sight. When building the sensor into a luminaire, please make sure that the PIR must be visible with the optic directed towards the flow of traffic; it will not work behind any diffuser or lens. The PIR optic needs to be exposed.

B) The PIR motion sensor must be kept away from strong sources of heat, such as LED lamps, heatsinks and any control gears such as LED driver. Particularly, when the ambient temperature is close to that of the human body, the PIR would be not able to work properly and react rather slowly, such as during summer season. Vice versa, during winter season, the PIR sensor works better and picks up movements more swiftly. So, please kindly pay attention to the thermal management of the luminaire and ambient temperature of the environment.

C) On the other hand, the cool air from the air conditioner (or other sources) could also cause false triggering, especially when turning on the air conditioner (or other sources) under a warm environment which causes sudden change in ambient temperature. Vice versa, when turning on the heater under a cool environment, this could likewise cause false triggering due to the sudden change in ambient temperature.

D) When the optic of PIR motion sensor is exposed to dust or other kinds of contamination, the PIR performance can degrade.

E) PIR sensor needs a stable installation to perform normally. Avoid installing a PIR sensor in an environment with vibration or swinging. Vibration or swinging may cause the PIR to become false-triggered.



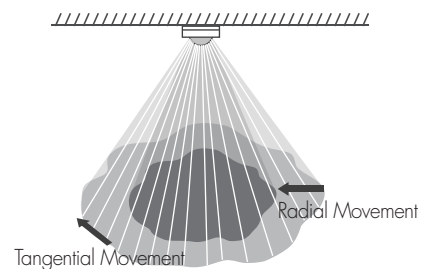
2

Due to the nature property of PIR, please kindly take note that the actual detection range/distance of PIR motion sensor can vary depending on the following factors:

A) Walking towards or walking across the edge of the detection area:

- PIR motion sensor is sensitive to tangential rather than radial movements. Hytronik's testing data is based on tangential movement (walking across). If walking direction is different, the result will also be different.

- PIR tends to feel to be slow to react, especially in traffic approaching/towards the sensor (radial), rather than crossing it (tangential). An indication regarding tangential and radial movement is as follows:



B) Different size of the person, different walking pace of the person, and different height of the person can all result in slight differences in testing result.

C) Different testing field can also provides different testing result, so please make sure to always carry out distance testing at the same testing field with ceiling and spacious area.

D) The distance data is tested under the condition that the sensor is not installed in any light fixtures. In real case when there is LED driver, sometimes the detection distance tend to be shorter because different LED drivers may have different soft-on period.

3

Remote control:

For some PIR 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 PIR sensor appears to not respond to commands.

B) To commission the sensor with the remote control (especially for high bay PIR sensors), direct the transmitting part of the remote control to the sensor within vertical angle of $\pm 15^\circ$ 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.

Kind Reminder: Please always make sure that field testings are conducted before applying to mass installations, this is to make sure that the performance of the sensor are tested ok on-site, otherwise if the installation environment is not friendly to PIR technology, then the sensor may not work normally and could behave strangely or become false triggered on the project site.

4

Inrush current:

When an LED driver is turned on, instant high current flows into the circuit of a PIR 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 PIR sensor, please kindly make sure that the total inrush current from the LED driver is less than the limit a sensor can withstand.

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

ii) The total loading of the whole group of PIR 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 HIR28 together via L' terminals in parallel because the rated loading of a single HIR28 is 400VA (capacitive), i.e. $30W \times 13 \text{ pieces} = 390VA < 400VA$.

Please kindly note that if the inrush current from the LED driver exceeds the limit a PIR 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.

Knowledges & Precautions for Bluetooth Products Usage:

1

Due to the nature of Bluetooth mesh network, the number of smartphones/tablets should not exceed the number of Bluetooth devices when entering to the mesh network to control the device. E.g. If there are three smartphones attempting to control two Bluetooth products at the same time, there will be only two of the three smartphones which are able to search for Bluetooth devices and enter the mesh network when opening the app. Put it simply, the max. number of smartphones/tablets controlling the network at the same time should be no more than the max. number of Bluetooth devices.

2

We recommend the distance between a smartphone and a Bluetooth device to be around 10m. However, please kindly take note that it is very much dependent on the Bluetooth capability of a smartphone or a tablet and environmental factors.

3

The communication range between two Hytronik Bluetooth units can be affected by the surroundings and obstacles such as metals, concrete walls and sheet steel. For example, when Bluetooth dimmer (HBT8200 series) is installed inside a junction box behind a concrete wall, the Bluetooth transmission range would be reduced. Also, the range could also be affected adversely if a Bluetooth device is installed in a metal enclosure. Other forms of interference which may affect the range include Wi-Fi routers, microwave ovens and other such sources which emit strong wireless signals should be taken into consideration when installing. The Bluetooth transmission range can be up to 30m indoor and 50m outdoor. We recommend to always carry out communication tests under conditions with various signal disturbing sources. Due to the nature of Bluetooth mesh network, communication between Bluetooth devices can be relayed to extend end-to-end communication range. Meanwhile, we still recommend the distance between Bluetooth units to be around 5m to 6m to ensure network reliability with good user experience.

4

For Bluetooth products, we highly recommend to calibrate device real time every 6 to 12 months by simply accessing to the app and connecting to the Bluetooth network. The main purpose is to eliminate accumulating time deviation error and make sure that all time-related functions to work well.

5

The maximum number of Hytronik Bluetooth devices per network should not exceed 100 units, while the number of networks does not have to be considered. Meanwhile, we have a few tips to enhance the network's performance and efficiency:

- Try to use as much dedicated light sensor as possible to reduce data transmission.
- In case of external daylight sensor is required, we suggest to be less than 20 external daylight sensors within one network.
- Try to disable the relay feature of some nodes. However, please kindly take note that in real application, it depends on the distance between Bluetooth nodes to determine how many pieces of relay nodes are needed for the space.

Kind Reminder: Please always make sure that field testings are conducted before applying to mass installations, this is to make sure that the performance of the Bluetooth products are tested ok on-site, otherwise if the installation environment is not friendly to Bluetooth, then the product may not work normally on the project site.

RF Sensors – Precautions for Product Installation and Operation

This is a combination of motion sensor and RF radio wave wireless transmission, meaning that the motion detected by one sensor (master unit) can pass on to other pre-defined sensor units (slave unit) through RF signal transmission.



1

When using motion sensor with RF transmission, please pay attention that the RF signal could be affected by metal and wireless devices such as GSM mobile antenna, strong Wi-Fi signal, ultra-high-voltage cables which emit frequent electromagnetic wave radiation, which in turn interferes with the RF transmission and communication. Hence, it is highly recommended to conduct a field test and check the application environment before mass installation.

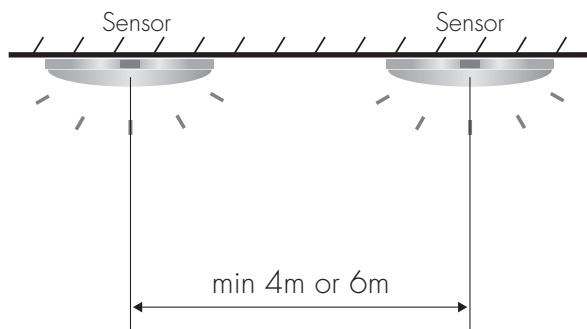
3

When installing large number of RF motion sensors in a complex environment with metals, wireless device such as Wi-Fi router and other types of obstacles such as concrete walls (e.g. in a large warehouse with over hundreds of luminaires installed), it is highly recommended to install more slave units to improve RF signal transmission efficiency for better user experience.

2

When installing luminaires with RF microwave motion sensor fitted, avoid installing two neighbouring luminaires too close to each other as microwave and RF can affect each other, resulting in false triggering, failed RF signal transmission and reception, and sensors failing to switch off properly. Thus, we recommend the mounting distance between RF microwave motion sensors to be at least 4m to 6m.

Kind Reminder: Please always make sure that field testings are conducted before applying to mass installations, this is to make sure that the performance of the RF 433/868MHz are tested ok on-site, otherwise if the installation environment is not friendly to RF 433/868MHz, then the sensor may not work normally on the project site.



4m for Low Bay: HC028V/RF, HC018V/RF, HC023RF, HC024RF, SAM8, SAM11

6m for High Bay: HMW38/RF, HMW39/RF, HIM38/RF, HIM39/RF

Precautions for Photodiode/Photocell Usages

1

The lux reading from Hytronik's products are based on the surrounding lux value around the physical location of the product, rather than the lux value on the floor/ground. In real applications, user's experience is based on the floor/ground, therefore user needs to adjust the lux setting parameters according to the real installation environment in order to avoid lux setting parameters not operating as expectation.

Please note that the photodiode/photocell operation is affected by localised environmental conditions to the device (typ. within 2 to 3m), including reflected light, furnishing and floor coverings, wall and surface colours etc.

2

Season and weather: In different seasons and different weathers, the location of sun and the spectrum of sun element are also different. As a result, the direct light element that goes to photodiode/photocell will be different, which could cause differences to the user experience.

3

In daylight harvesting applications, user needs to place the photodiode/photocell on a "moderate location" – it cannot be too close to the fixture (this is to prevent very strong feedback from fixture to photodiode/photocell when dimming), nor too far from the fixture (this is to prevent very weak feedback from fixture to photodiode/photocell when dimming). There is no standard answer as to "how far" would be most moderate, because it is highly associated with different fixture wattage power, different fixture structure design, and different reflections from ambient environment (typically reflected from floor/ground, window & wall etc, and the smoothness of the surface, color, reflection distance, and reflection angle will all make some differences). So, this has to be evaluated case by case.

4

Any dimming or lux switching applications must be fully completed and furnished where necessary before target lighting levels can be set. If the area is incomplete or unfurnished, the product or system will be demonstrated to be capable of dimming and/or lux switching, but additional attendance may be needed in order to set desired lighting levels.

Kind Reminder: Please always make sure that field testings are conducted before applying to mass installations, this is to make sure that the performance of the photodiode/photocell are tested ok on-site, otherwise if the installation environment is not friendly to photodiode/photocell, then the sensor may not work normally on the project site.

Precautions for Using Emergency LiFePO4 Batteries

1

For LiFePO4 battery (BPC81 and BPC82) used for emergency lighting control gear:

- Please kindly note that the optimal storage temperature should be 22°C to 28°C.
- The relative humidity (RH) for battery storage should be 45% to 85%.
- Keep the battery wires unconnected if the battery is intended to be stored for more than 3 months.
- The maximum battery cycles under 55°C should not exceed 80 times.
- Please kindly charge battery for 24 hours before using.
- Do not short-circuit the battery pack.

2

Season and weather: In different seasons and different weathers, the location of sun and the spectrum of sun element are also different. As a result, the direct light element that goes to photodiode/photocell will be different, which could cause differences to the user experience.

3

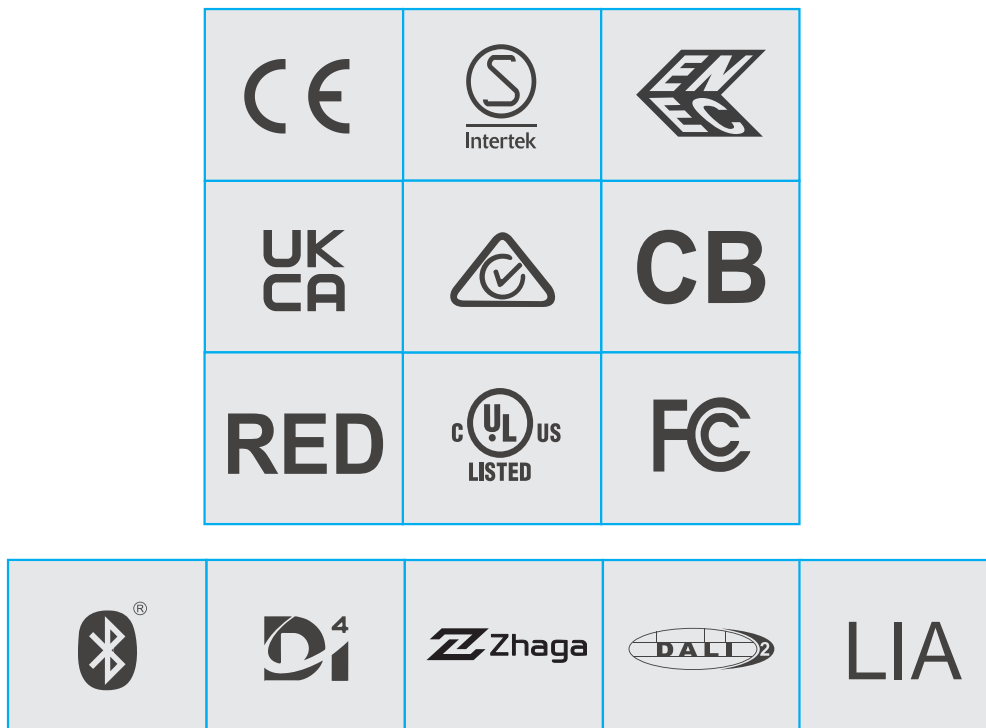
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Approvals ►►



Hytronik products are designed to international safety and performance standards as applicable and are manufactured in our ISO9001 factor to our own stringent requirements.

It is our policy to seek 3rd party certification with a recognised international body on our standard product range so you can supply with confidence.

5-Year Warranty ►►



All Hytronik products are supplied with a 5-year warranty against defect in design or manufacture. The warranty applies to all electronic control gears supplied by Hytronik and is applicable to the party to which the sale was made. The warranty is not transferable to a 3rd party and compatibility with external components are the responsibility of the finished goods manufacturer.

With today's multi-national sourcing strategies, we offer an unrivalled universal warranty with support available in regions where Hytronik has its own office or authorized representation, regardless of where the Hytronik product was purchased. Furthermore, we operate a 24-hour response policy to any claim.

The full warranty policy is available upon request or from our website.

HYTRONIK®

SENSORS & LIGHTING CONTROL



GLOBAL HQ --- HYTRONIK INTERNATIONAL LTD



United Kingdom

Address: Units 5 Marshgate Centre, Parkway, Harlow CM19 5QP

Tel: +44(0)1992 504 111

E-mail: info@hytronik.com

Website: www.hytronik.com