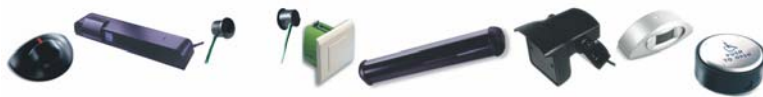


APPLICATION NOTE



How to install a radar sensor on swing doors?

1

Why is it difficult?

Radar-sensors can not be used on swing-doors because they 'see' the movement of the door leaves when they open and close (bidirectional sensor) or only when they close (unidirectional sensor).

This problem is amplified by the fact that most swinging doors are equipped with a lever to open and close the door, which are found on the top of the door leave and therefore in proximity to the sensor.

2

Our solution

Place the sensing-field outside of the area where moving parts of the door could be 'seen':

Place the sensor on the axis of rotation of the door leave!

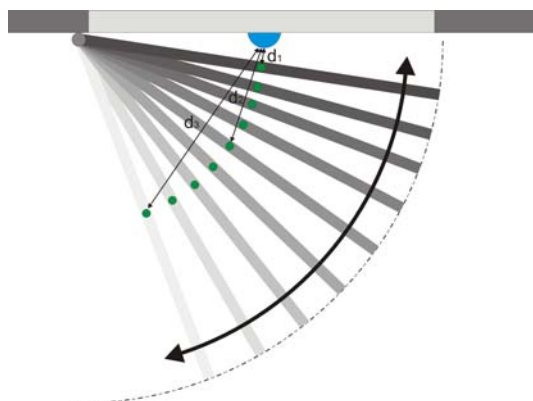
This solution is a little bit tricky to install on a single swing door and even trickier on a double swing door. But it still remains possible and works very well.

2.1 SINGLE SWING DOORS

Motion detection sensors based on radar technology use the Doppler principle.

An example to illustrate the **Doppler-effect** is the whistle of a moving train. As the train approaches a stationary listener, the pitch (frequency) of the whistle sounds higher than when the train passes by, at which time the pitch sounds the same as if the train were stationary. As the train moves away from the listener, the pitch decreases.

This effect is used in radar technology to detect motion. A stationary object can not be seen with the radar technology because its principle is based on the difference of frequency emitted and received back from the target. This difference is 0 if the target does not move.

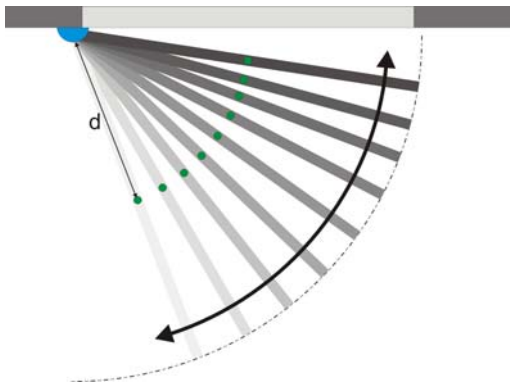


Let's consider a motion sensor based on this technology on a swing door (see figure).

The green point materializes one reference point of the door leave. As we can see, the distance between the sensor (in blue) and the green point (**d1**, **d2** and **d3**) changes in function of the opening angle of the door leave.

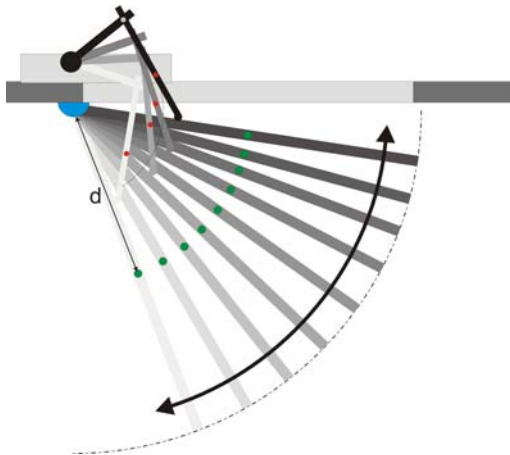
Conclusion: The signal (frequency) received from the sensor is different of the signal (frequency) emitted. When the door opens (or closes), the sensor 'sees' a movement.

Now, let's place the sensor somewhere else: aligned to the rotation axis of the door leave.



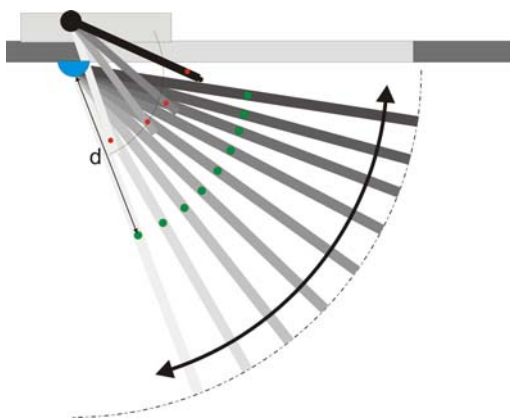
What does the sensor 'see' now? Well, nothing! And why? Because there is nothing that moves towards or away from the sensor. Every point (in green) always stays in the same distance d to the sensor (in blue) and therefore no motion can be detected (see figure above: the green point is always found in the same distance to the sensor, regardless of the opening angle of the door).

Up to this, everything looks fine! But: a swing door has most of the time a lever which pushes/pulls the leave to open/close the door. What happens now?



Although the green point still maintains the same distance d to the sensor, the red point is slightly shifting away from the circle around the sensor, which represents a constant distance. This means that the red point is moving away from or towards to the sensor, which could cause detection.

In such configurations, the adjustment of the sensor in order not to detect the movement of the door leave (or better: the movement of the lever of the door leave) becomes a bit trickier.

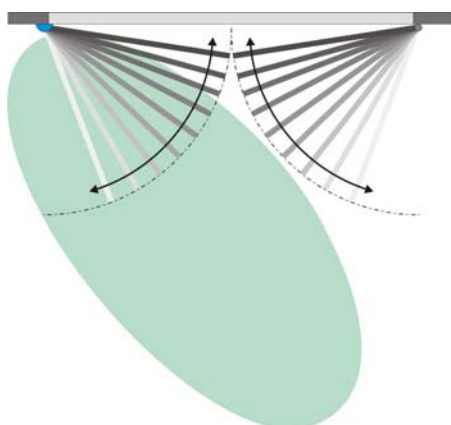


Here you can see another type of door, where the lever is sliding on the door leave. Here also the red point does not follow a circle around the sensor. So, the problem remains the same.

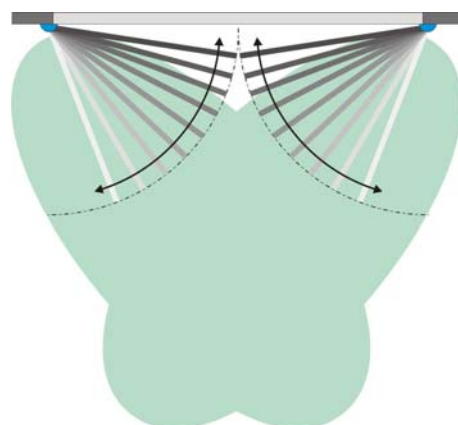
But: Tests have proven that it remains possible to adjust BEA's radar sensors in such situations.

2.2 DOUBLE SWING DOOR

All we have seen above applies to double swing doors also. With an additional difficulty: you can't mount one single sensor on the axis of rotation of both door leaves. You could mount the sensor on one rotation axis, or on the other, or even on both. The resulting detection field certainly depends on where you mount the sensor.





Single sensor (Eagle)





Double sensor (1 Microhead or 2 Eagle)

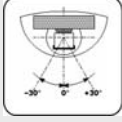
Again, this requires some small adjustments when installing the sensor.



- 1 UNIDIRECTIONAL** Select a **unidirectional sensor** : Eagle ONE or MicroHead ONE
The MTF function has to be deactivated.





- 2 NARROW FIELD** Select the **narrow field antenna**
It will be easier to adjust the sensor.


- 3 AXIS OF DOOR** **Mount the sensor on the rotation axis of the door leave!!!**


- 4 ANTENNA ANGLE** **Change the orientation of the detection field** by changing the angle of the antenna. Keep in mind that the sensor should see as few as possible of the lever.
The lateral angle should be maximum – or + 30°:
Max. - 30°: when the sensor is installed on the axis of the right wing.
Max. + 30°: when the sensor is installed on the axis of the left wing.


- 5 SENSITIVITY** **Change the sensitivity** of the sensor to increase/reduce the size of the detection field.



- 6 IMMUNITY** If necessary increase **the immunity** (rain, reflective environments etc.)



In case of a double swing door, make sure that the detection field is not crossed by the opposite door leave!