Selection and positioning of antennas

SAFEMASTER W

Mounting and positioning of antennas

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Selection of antennas

Antenna selection / gain

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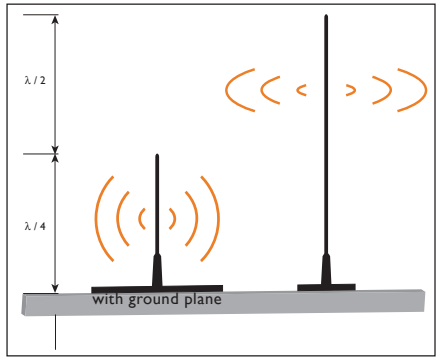
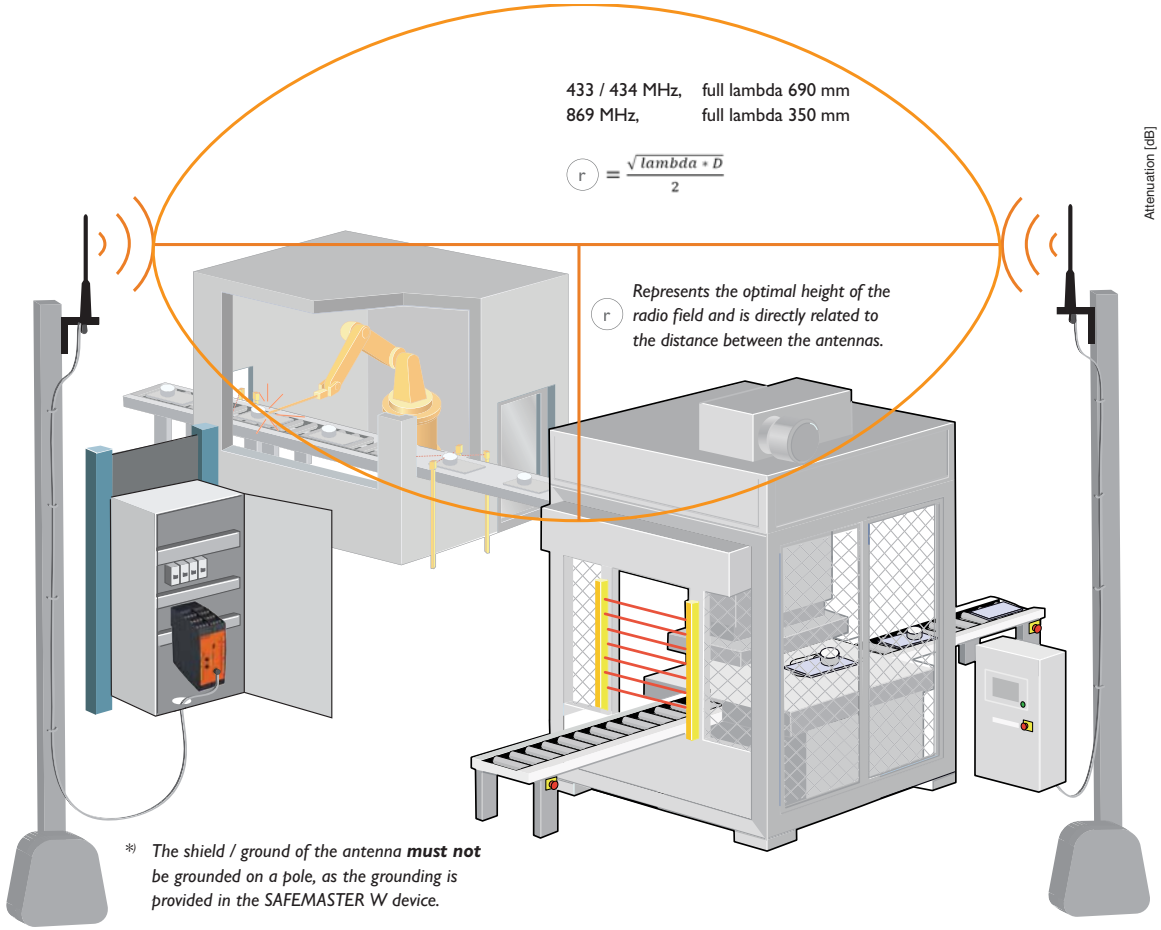
When choosing an antenna the characteristic and polarisation of antenna and receiver should be similar. It is also important to direct a high gain antenna very precisely to achieve the best transmission characteristic. Line of sight view between the antennas is recommended but not essential.

Application areas
Depending on the area, distance and possible reflections, the antenna size of 1/4 lambda or 1/2 lambda (higher gain) should be selected.

- 1/4 lambda antennas give a broader spread of signal and work more efficiently with a ground plane.
- The ground plane is a conductive metal plate or rod
- The shield of the coax cable or the male/female connector of the antenna must have a conductive connection with the ground plane of the antenna *)
- The ground plane should not be connected to earth. **Note:** A metal antenna mounting bracket should be isolated from a conductive surface!
- 1/2 lambda antennas do not need a ground plane!

NB: A ground plane for a 1/4 Lambda antenna is not essential but it does improve the transmission efficiency of the antenna.



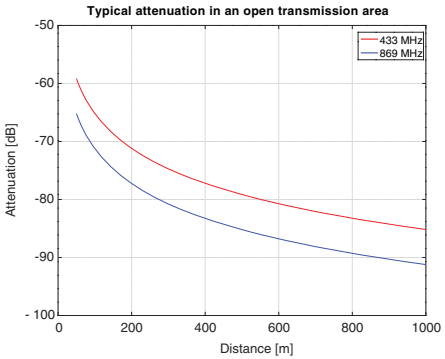


*) *The shield / ground of the antenna **must not** be grounded on a pole, as the grounding is provided in the SAFEMASTER W device.*

r *Is the optimal height differential of the antennas, two antennas should be installed within this height deferential if possible. This is only advisory and may have to be altered with regards to ground clutter noise and reflections.*

D *Is the distance between the antennas.*

Comparison of frequencies
433 / 434 and 869 MHz?



- Lower frequencies (433 / 434 MHz) cover a larger distance and tend to be less influenced by obstacles.
- Higher frequencies create more attenuation and more absorption (i.e. objects can disturb the radio connection). The higher the frequency the shorter the operational distance.
- The frequency 433 / 434 MHz may already be used in existing applications such as rolling gates or cranes.
  Therefore, the frequency range 869 MHz can allow for higher availability as it is not used as often as 433/4 Mhz.

Tip **Creating a frequency plan for the radio operation area is strongly recommended, to avoid operating at frequencies that are already being used.**

Distance [m]	Antenna height [m]	
	433 / 434 MHz	869 MHz
100	4.2	3.0
200	5.9	4.2
300	7.2	5.1
400	8.4	5.9

This table represents the optimal heights compared to distance D, they may seem high but for longer distances they represent the optimal height for reflection free transmission i.e. free from ground clutter.

Mounting and positioning

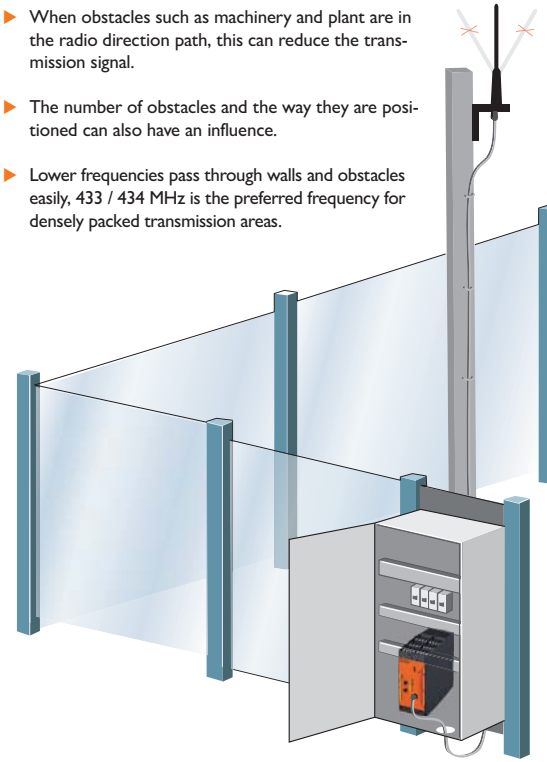
Mounting height

The length of the cable between radio module and antenna should be as short as possible to keep the losses as low as possible on the transmission signal.
For outside applications the antenna cable should always approach and be connected from the bottom to the antenna. If this is not possible a drip loop could be implemented.
For protection against weather influences at the cable antenna junction, weather tape is recommended for protection against ice and snow.
For longer distances the antenna should be installed in the operation area as high as practical, up to the recommended optimum height.

Tip **Only as much transmission power as is required!**

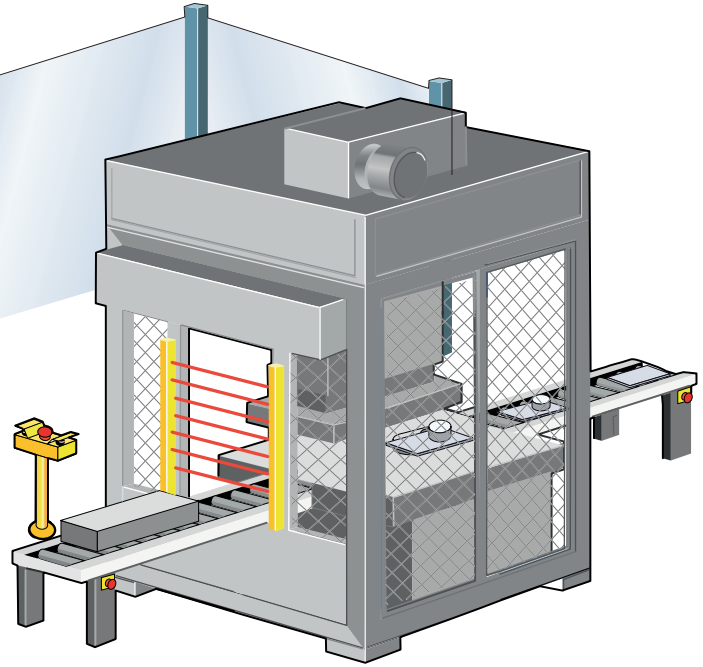
- If the power is too high, receivers could be saturated and the data not decoded.
- Also ground generated radio noise can rise.
- The spacing between used frequency channels should be as big as possible, two channels minimum is recommended.
- The distance to other radio systems e.g. 2.4 GHz or WLAN, should be a minimum of 500 mm.

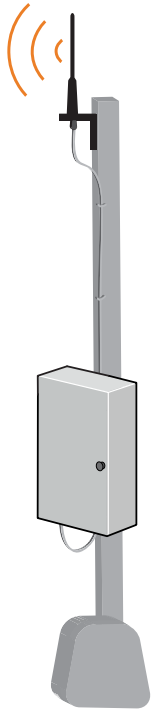
- When obstacles such as machinery and plant are in the radio direction path, this can reduce the transmission signal.
- The number of obstacles and the way they are positioned can also have an influence.
- Lower frequencies pass through walls and obstacles easily, 433 / 434 MHz is the preferred frequency for densely packed transmission areas.



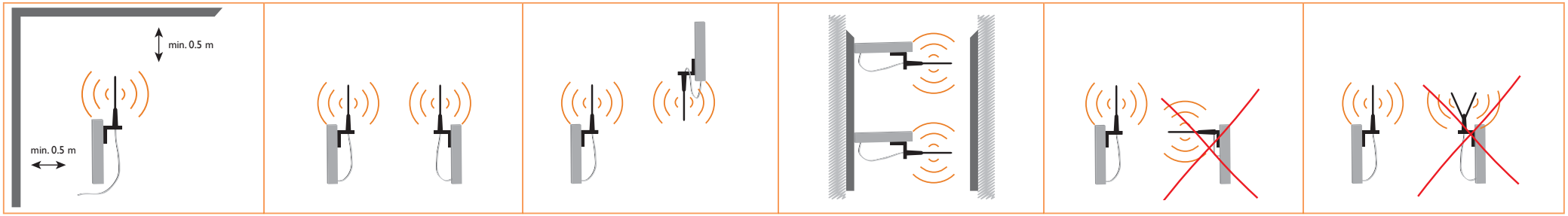
Remark

If the Antenna is not mounted parallel to the receiver antenna and is only shifted by a few degrees, this could lead to partial loss of the radio signal, particularly at longer distances.





Antenna positions



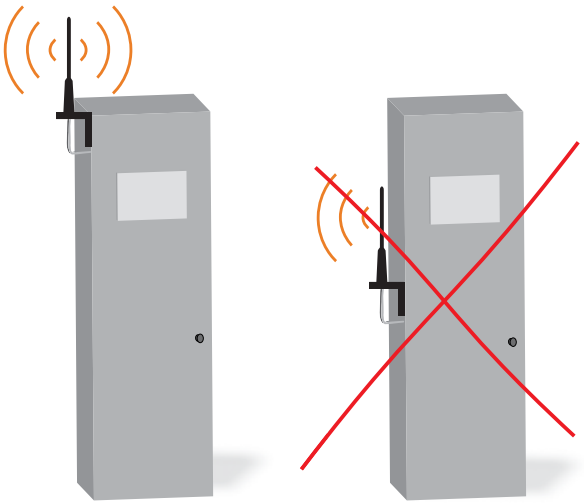
Distances

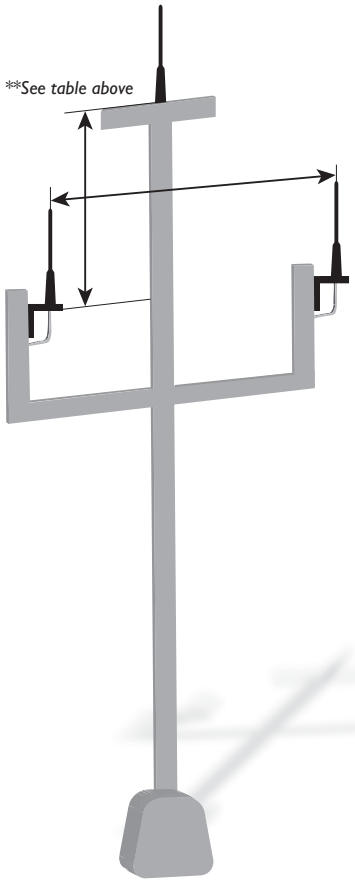
For a reliable reception the correct distance and stable mounting and adjustment is important.
It is best is to install the antenna as far as practical from obstacles (buildings, trees, poles, metal objects and other antennas).

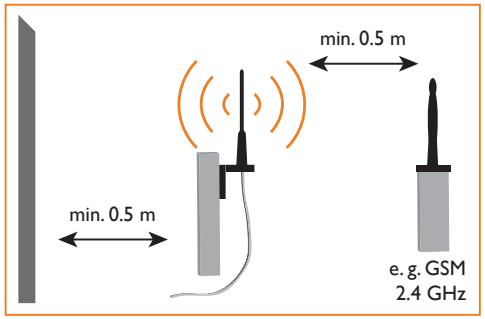
To avoid lightning strikes on outdoor applications, the antenna should not be mounted close to a lightning rod, and should have an over voltage transient protection device fitted.

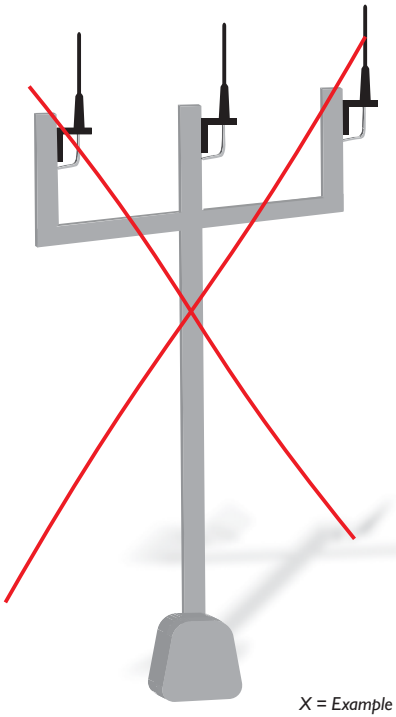
For protection against weather influences at the cable antenna junction, weather tape is recommended for protection against ice and snow.

Frequency [MHz]	Minimum distance [m] vertical	horizontal
869	1	2
433 / 434	2	4









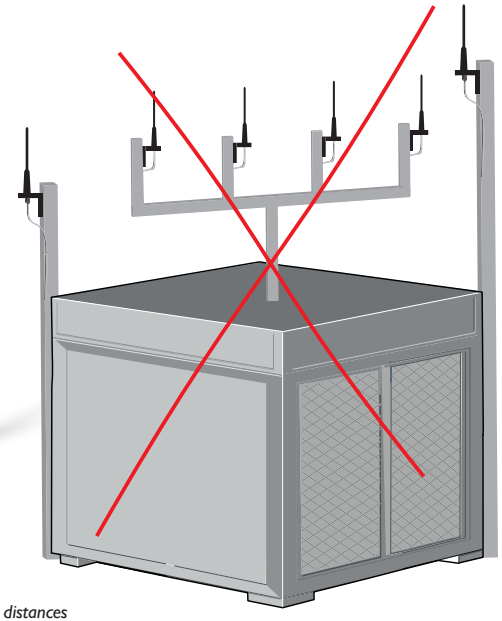
X = *Example with incorrect distances*

Distances

When using several fixed radio modules transmitting in the same area the mounting distance between the different antennas must be observed.

In the the area of 2 ... 5 m the distance between different antennas should not be a multiple of the radio wave length (e.g. 3 x 690 mm or 4 x 690 mm). An uneven quotient of the wave length (e.g. 3.5 x 690 mm or 4.5 x 690 mm) should be used.

***moving systems like AGV's could use a twin antenna system*



Our experience. Your safety.

SAFEMASTER - Multifunctional safety solutions

Innovative safety concepts

As a solution provider for safe automation and electrical safety, DOLD offers a comprehensive product portfolio from a single source. Our SAFEMASTER solutions have been successfully used for many decades around the world.

From single function safety switching devices for simple safety applications through to multifunction, modular safety systems, DOLD develops tailor-made solutions for your industry and applications.

We would be happy to provide you with information about further safety solutions.

SAFEMASTER STS

The SAFEMASTER STS modular safety switch and key transfer system serves to monitor the moveable safety guards. It combines the advantages of safety switches, guard locks, key transfer and command functions in a single system. The new FRP variation stands out for its attractive design, and can be combined with our trusted stainless steel version.

SAFEMASTER S

Our solutions for secure drive monitoring utilise a combination of safe speed, standstill, or frequency monitoring, with or without external sensors, to increase productivity and safety.

SAFEMASTER PRO

The modular and configurable SAFEMASTER PRO safety system monitors all safety circuits of your machinery and installations – in a simple, flexible and safe manner. The number of inputs and outputs of the central control unit can be upgraded via extension modules at any time. Now also featuring safe speed monitoring and dynamic program realization.

SAFEMASTER W

The emergency stop system and radio-controlled enabling switch in the SAFEMASTER W series can be used to wirelessly shut down hazardous movements in a fraction of a second. The Wireless Safety System thus ensures maximum freedom of movement for the operating and maintenance personnel.

More

Info

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