Cellular Antennas

Installation note for industrial routers

Correct positioning of antennas for an optimum signal

Content

Considerations for the installation location 2
Indication using a mobile phone 2
Difficult installation situations 2
Installation of the antenna 3
Orientation 3
Conductive surfaces near the antenna 3
Using/placing several antennas 4
Positioning the antenna cable 4
Bypassing obstacles by using an antenna extension cable 4

Note

This document serves as a detailed description for the proper positioning of cellular antennas for INSYS routers and is a supplementary information to the installation and user manual of the respective router. Safety instructions, technical data, and functional descriptions must be taken from the installation and user manual.

Considerations for the installation location

Indication using a mobile phone

A mobile phone is useful as a first indicator for choosing a favourable installation location. The antennas are integrated in mobile phones without cables and are optimally adapted to the hand. Thus, the signal strength indicator of a mobile phone is well suited to find the position with the best transmission and reception conditions for the planned antenna in the installation environment of the router.

However, it is prerequisite that a SIM card from the same provider is used, which will later be used in the router.

Difficult installation situations

If the router is installed in a metal switch cabinet, the attenuation of the cellular signal strength is too high. Therefore, the antenna must be positioned outside the switch cabinet.

Windows with thin metal plating are often installed for energy efficiency reasons in modern buildings. However, this metal plating leads to high radio signal attenuation and the signal strength available in the building may be too low.[1] In such cases, the use of an outside mounted antenna is very helpful.

In practice, metal plating of the windows at the installation site is usually not visible, but you can ascertain it with a simple test: If the cellular signal strength improves significantly when the windows are opened, the windows are metal plated.

If an outside mounted antenna is to be used, the following antenna properties are relevant:

- UV resistant antenna housing and cable material
- Water- and dust-proof (depending on location, optimally IP 67)
- Vandalism-proof (optional, depending on location)

[1] The cellular signal strength also depends on the orientation of the building and the distance to the nearest available cellular base station of the desired provider.

Installation of the antenna

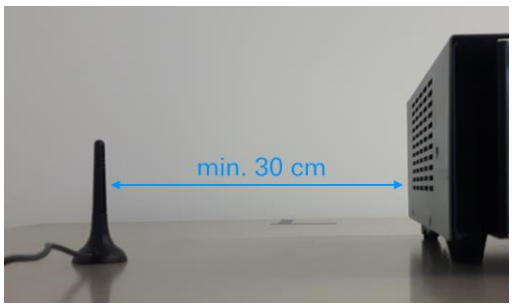
Orientation

The base station antennas of cellular network operators are vertically aligned. Therefore make sure that the antennas of the cellular router are also aligned vertically for optimal transmitting/receiving conditions.

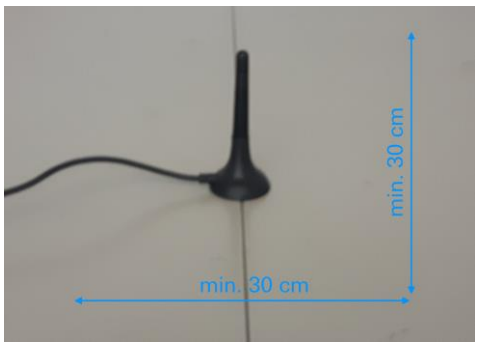
This note applies especially to long antenna designs, so-called rod antennas. For other designs, the usual orientation is shown in the product photo or stated in the item description.

Conductive surfaces near the antenna

For optimum radio performance, always keep a minimum distance of 30 cm from metal surfaces.



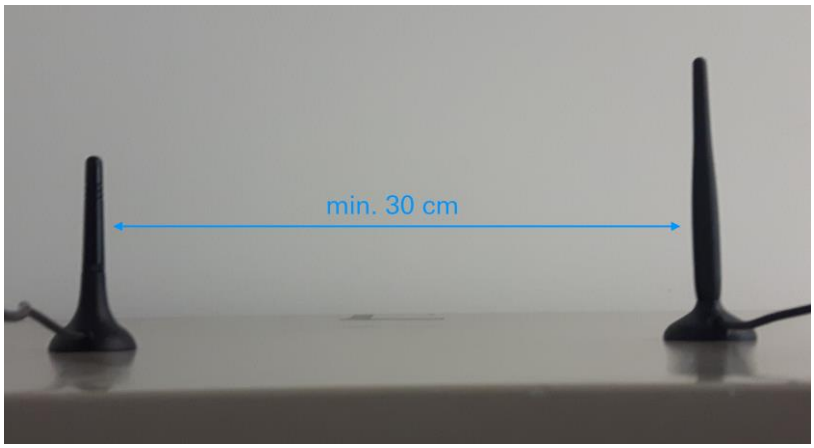
However, some antennas require a conductive (metallic) surface for optimal radio performance (specified for INSYS antennas). It should be noted here that the metallic surface is at least 30 x 30 cm.



However, the above mentioned minimum distance of 30 cm also applies to other conductive surfaces in the vicinity.

Using/placing several antennas

If several antennas are used (e.g. for different radio services such as cellular radio and Wi-Fi), a distance of at least 30 cm between the individual antennas must also be observed here.



Positioning the antenna cable

The antenna cable is a high-frequency cable with a sensitive structure and must therefore never be folded. A bending radius that is are too tight can also lead to high signal attenuation or permanent damage. A minimum bending radius of 10x the cable diameter applies as a rule of thumb.

Bypassing obstacles by using an antenna extension cable

The antenna cable should be as short as possible and connections in between should be avoided as far as possible to minimise the resulting signal attenuation.

However, there are often radio obstacles in the installation environment such as solid walls, large metal objects (e.g. machines) or metal plated windows. These obstacles attenuate the antenna signal significantly more than a “bypass” by an additional high-quality antenna cable.

Thus, it is often helpful to use an antenna extension cable to install the antenna in a place with a good cellular signal (e.g. as an outside mounted antenna). In such cases, however, the extension cable should be chosen as short as possible.