

Installation instruction for train and bus antennas (outdoor)



OmPlecs®-
TOP 200 AMR

OmPlecs®-
TOP 200 RA

X-Plecs®-
120 AMR

X-Plecs®-
200 AMR

1. Place for installation

Choose the place for installation that

- is stable enough for the mechanical installation of the antenna,
- is horizontally aligned
- is flat, i.e. includes neither dents, bulges nor unevennesses in an area corresponding to the minimum size of the RF counterweight
- has big enough plane RF-metal space (ground plane) under the antenna,
- permit to connect the high frequency cable to the antenna without any problems,
- is free from reflective parts/modules around the antenna.

If the antenna is placed in a sink or at an angle (not horizontal), this should be done only under consultation with us. Furthermore, a roof drainage at such locations is indispensable.

The following illustrations show OmPlecs-TOP 200 antennas in different designs; They also apply analogously to all other designs (if feasible) as well as for X-Plecs-120 single antennas.

Notes:

Metal foil (e.g. cooper foil) isn't an adequate ground plane (counterweight), because it could tear when tightened and thus can't offer a defined ground closure.

Nevertheless, the counterweight should not be thicker than 5mm. Also the distance of the counterweight for plastic roofs to the antenna base should not exceed 10mm (Fig.1).

Please contact us when you have a light construction without metal ground (GRP/GFK) – we can design the antenna for this use or offer you a special ground plane for your chosen antenna.

In the case of thicker roofs (for example, GRP sandwich construction), we recommend to install the counterweight from above (in case of customized Antonics antennas, see Fig.2), because the adjustment between the nut (metallic contact to the counterweight) and antenna can be adversely affected.

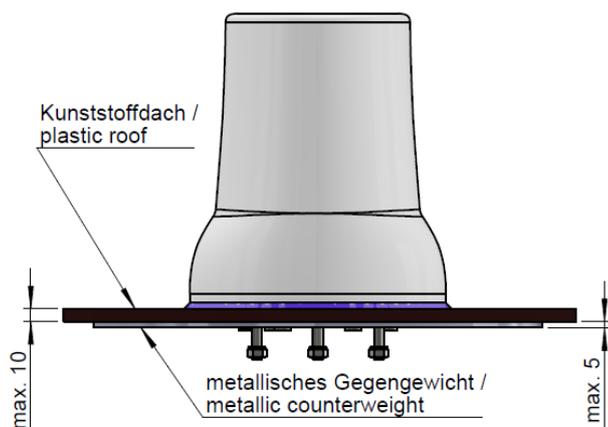


Fig. 1

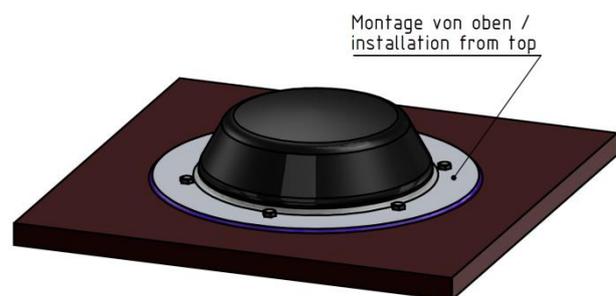


Fig. 2

The design of the counterweight as a dome is not permissible as the RF counterweight must represent a flat surface below the antenna. If this is unavoidable, a minimum diameter of 300mm and a maximum height of 150mm must be observed (Fig.3). For applications with a frequency range of 700 MHz (LTE 700) and below, the dome must necessarily be welded to the metallic roof skin or be designed with a larger surface. If the counterweight is to be designed as an angled holding structure (antenna table) on the roof, then it must be installed completely or at least partially closed in the travel direction (Fig.4). This avoids contact with exposed cables, connectors and amplifiers with running water. We would like to point out that such constructions are only conditionally suitable for use in washing systems.

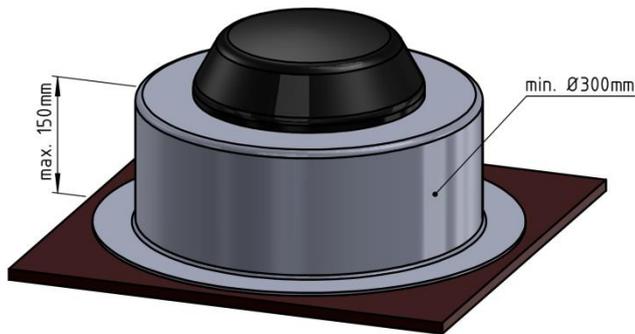


Fig. 3

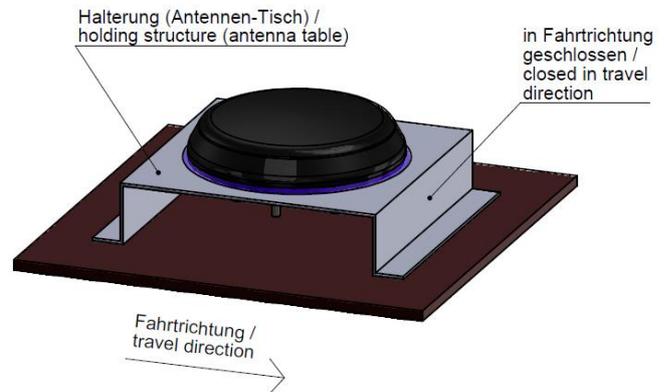


Fig. 4

For frequency bands above GSM-R (ca. 873 MHz) an additional ground plane is not necessarily required, because it is already provided by the ground plate of the antenna with a diameter about 200 mm. However, if the antenna supports also lower frequency bands than GSM you have to install a suitable ground plane (see also "Further information according to the size of antenna ground plane").

If the antenna is to be installed below an additional cover (for example, trim / hood), it must not consist of carbon / carbon fiber material. Plastics and glass fiber materials are permitted. No metal may be incorporated in the materials, for example as a mesh braid.

To avoid frequency shifts, we recommend a minimum distance of 200mm from the antenna outer edge to the material of the cover (Fig.5).

Metallic support structures below the cover should also be observed with regard to the radiation behavior (Fig.6).

Important:

For this indoor installation, a separate variant (suffix "-BA") with special fire protection housing (colour similar to RAL 7035 light grey) must be requested.

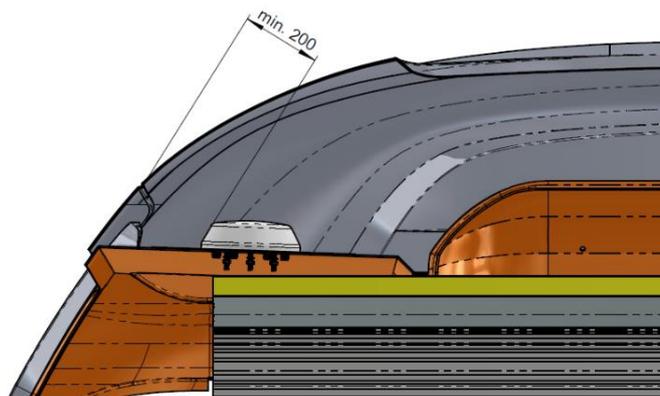


Fig.5

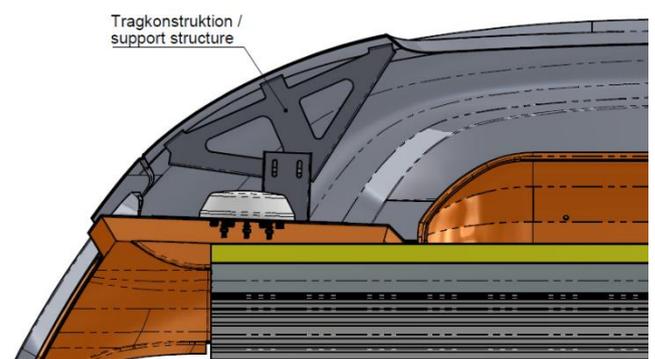


Fig.6

Further information according the size of antenna ground plane:

The dimension of the ground plane (counterweight) for the antenna depends on the wavelength the antenna was developed for. The counterweight should spread for at least a quarter of the wavelength ($\lambda/4$) from the antenna in every direction, so the inversely phased current can propagate adequately. The optimum counterweight therefore is round. Examples for suitable dimensions of a counterweight:

Band	Frequency	Standard	Ø / □ (theoretic)	Ø / □ (Minimum)	Ø / □ (recommended)
2 m	≈ 150 MHz	2 m / LSA	100 cm	100 cm	150 cm
70 cm	≈ 400 MHz	TETRA / BOS	35 cm	50 cm	70 cm
40 cm	≈ 700 MHz	LTE 700	20 cm	30 cm	50 cm
30 cm	≈ 900 MHz	GSM-R / GSM 900	15 cm	20 cm	50 cm

Ø = Diameter; □ = Edge length of a square

In general:

An existing and sufficiently large ground plane always leads to better adjustment and flatter radiation. Gain and antenna efficiency can benefit from an adequate ground plane.

Attention!

To avoid deterioration of the signal due to reflections from an open connection, we strongly recommend to lock the unused connections with a 50 Ω terminator.

The cables to be connected from the antenna to the router should be as short as possible (max. 8m each).

You can also purchase terminating resistors and cables from us. It is best to give us as much information as possible right at the start of the project so that we can give you the best possible advice.

2. Antenna installation

By mounting the antenna make sure, that a proper electrical ground contact between all the antenna mounting bolts (or detent-edged washer) and the metal roof of the vehicle is made.

Use our drill template to mark the drill holes or order an optional mounting support at our service (drilling template with hardened drilling sleeves). It is recommended to pre-drill all holes using a small drill with the help of the drilling template and then expand with a step drill or similar tool in the second step. The size of the drill holes is included in the particular drill pattern. The specified size of the holes ($\text{Ø}30$ for connectors, $\text{Ø}9$ for screw) should necessarily be neither undershot nor exceeded, otherwise there is a danger, that necessary vent holes are hidden, and bolts cannot be carried out without damage or the antenna by tightening the nuts does not lie evenly (in case of bus antennas the EPDM sealing foam is too much compressed). The antenna must be installed into the roof without mechanical damage of the bolts. By a mechanical damage to the thread, the nut may seize on bolts and while trying to resolve the nut or continue to lathe, tear them.



Incorrect: Vent holes covered

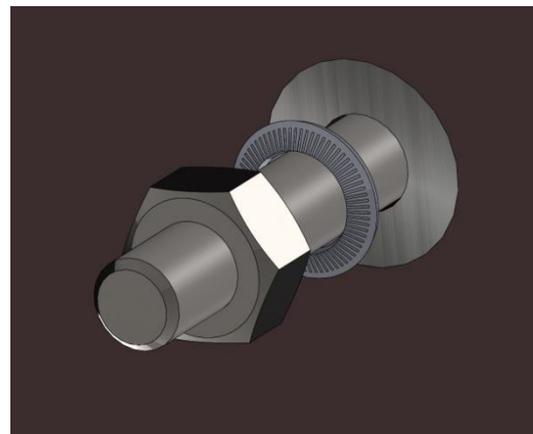


Correct: Vent holes free

The area around the drill holes has to be made “contact blank” on both sides according to the specified dimensions in the drill-template and by means of a cup brush ($\text{Ø}18$, stainless steel). Contact blank means, that the areas around the drilling holes mustn't polluted by any residues of dust, oil, varnish or coating. Existing coatings must be removed. (Please note the particular manufacturer's notification for the proper handling with cleaning supplies and tools!)



Incorrect: painted / coated

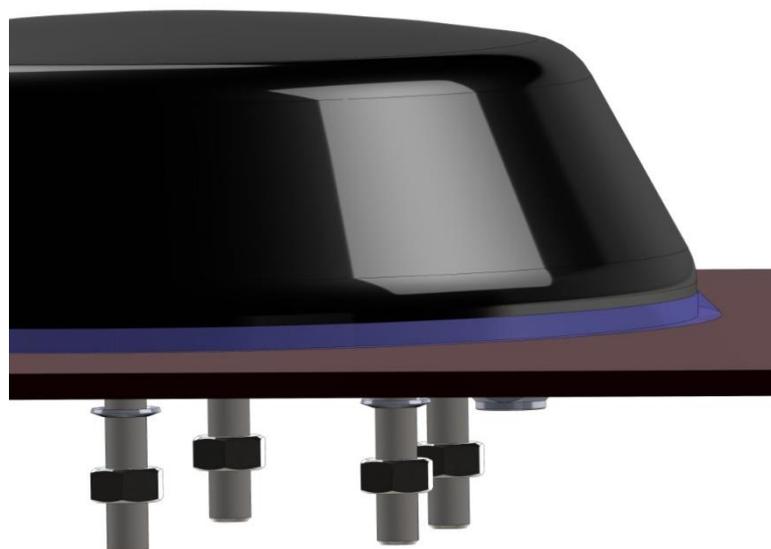


**Correct: both sides contact blank
(shown: underside)**

The antenna has to be mounted to the mounting bolts with detent-edged washer (SK-washer) and M8 nut. After tightening the screw connection, the detent-edged washer, M8 nut and the contact blank parts must be sealed (antirust) with a zinc spray (e.g. TYPE Henkel Teroson®, electrically conductive); it is considered as rust protection and prevents reducing the electrical conductivity, which would degrade the VSWR of the antenna. The tightening torque for this screw connection is **12Nm** and is exclusively for assembly tools without impact. Only use the supplied fasteners. They are included in the scope of delivery and must not be changed. The detent-edged washers must not be reused. If the screw connection is loosened, new detent-edged washers must be used when re-assembling. Furthermore, no separating agent or lubricant or similar must be used, as our nuts are already provided with a coating against cold welding (antiseize). **Before you tighten up screws** you have to fill the gap between the vehicle roof and the outside edge of the antenna with a UV-resistant sealant (Sikaflex® 268 with Sika®-Primer 207). This additional protective measure is mandatory to the sealing and prevents humid air penetrating into the antenna due to low pressure (due to different temperatures) and then precipitates as a condensate. Make sure the housing of the antenna and the mounting surface is free from any dirt and oil (cleaning e.g. with acetone). By applying the sealing be aware of pimples, hollow spaces and slots. After application of the sealant with a spatula is preferably smooth to pull in a 45 ° angle to create a clean grouting between the antenna and ground (see picture). Sealing with Sikaflex® may be dispensed with as an exception if the antenna tables are open downwards and the vehicle or antenna table surface is 100% flat and deformation can be excluded. To prevent leaks due to surface corrosion on the vehicle or antenna table, the surface of the antenna table must be additionally painted or powder-coated from above or made of stainless steel. Even if this derogation is applied, the present installation instructions must be followed in full in all other respects.



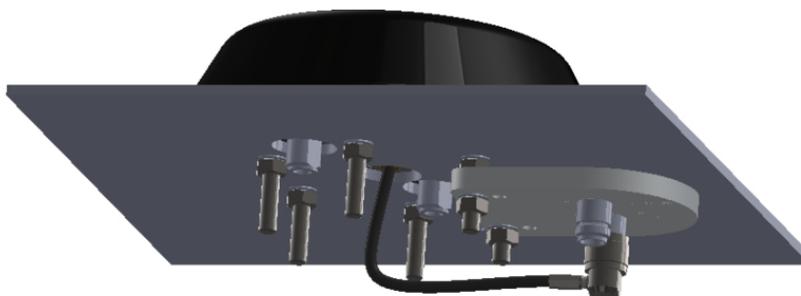
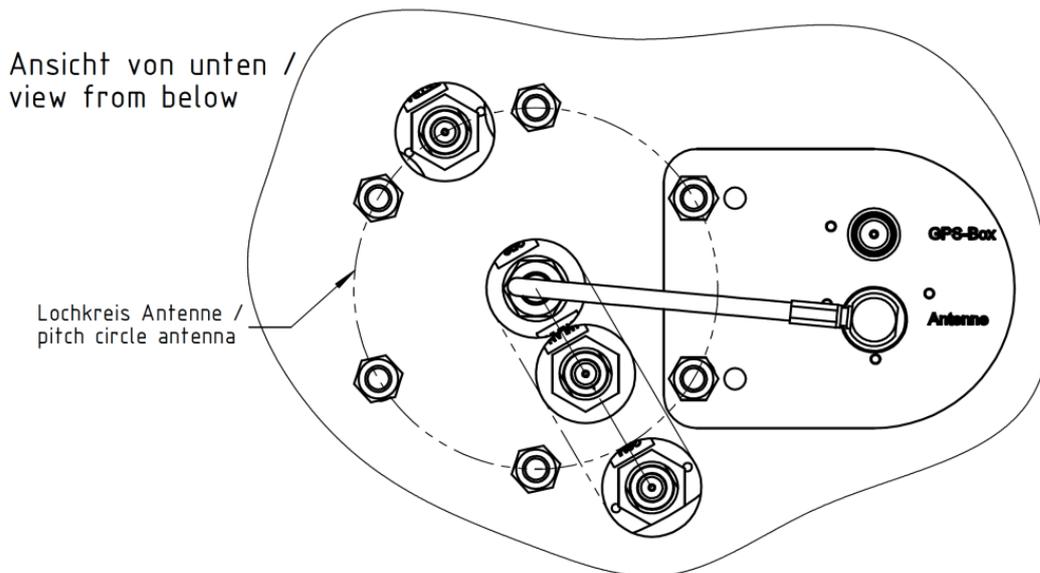
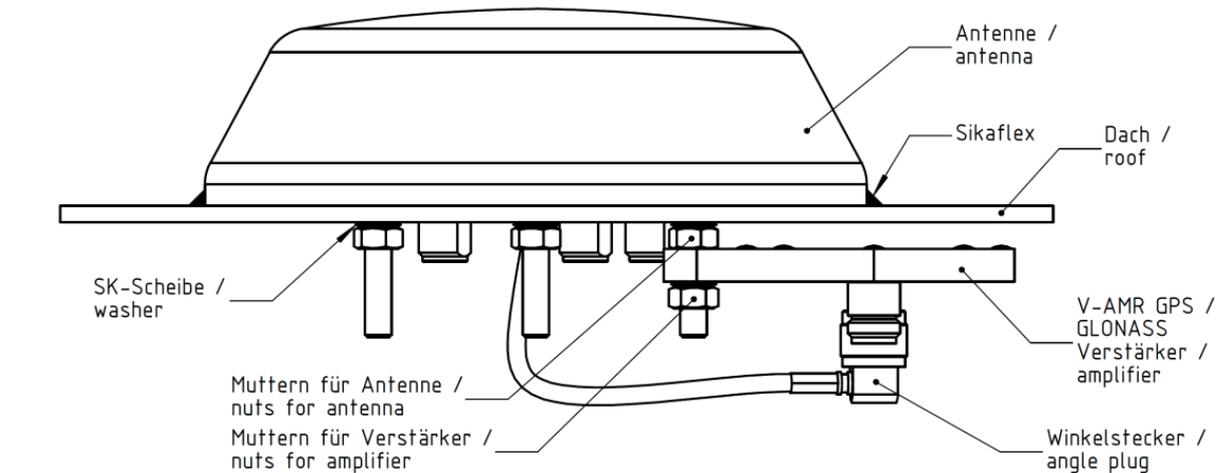
Clean sealing joint



Detail: Clean sealing joint

3. GPS-Amplifier Installation (usually only for train antennas)

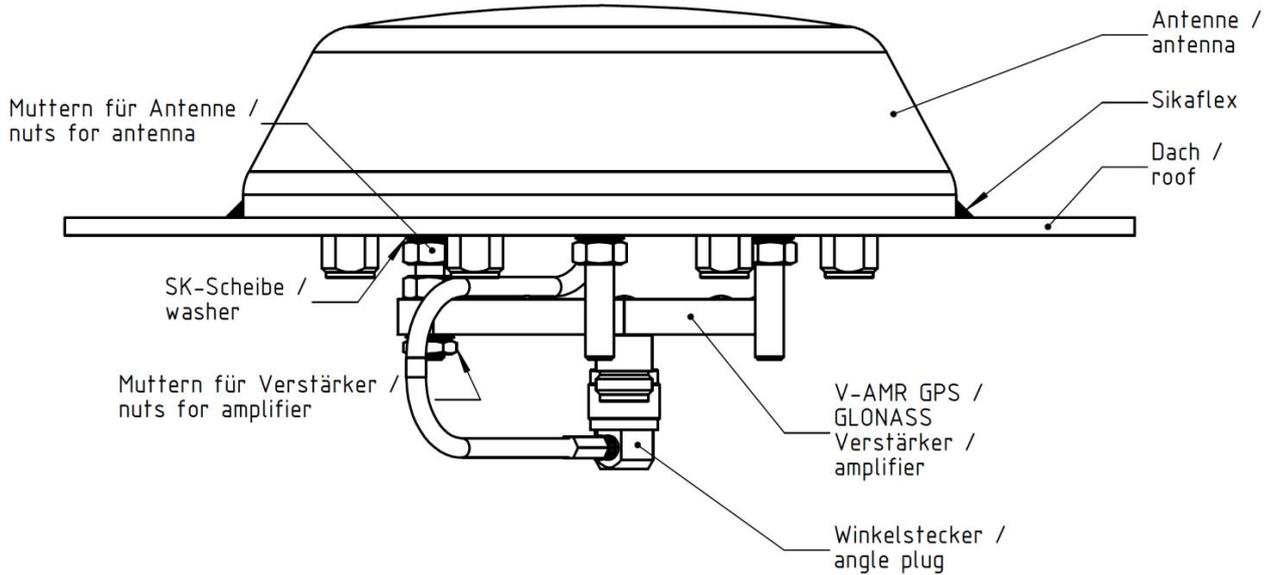
The GPS amplifier has to be mounted in the immediate proximity of the antenna, so that the antenna connecting cable can be connected easily to the amplifier. Antenna cable and GPS amplifier has to be connected to the correct sockets – engraved with “Antenne” and “GPS-Box”. The amplifier should be used in the radio system as it filters external signals in addition to the amplification of the GNSS signal and thus protects the GPS receiver. An extension of the antenna cable between the GPS amplifier and the antenna is not permitted, as this would increase the noise level in front of the amplifier.



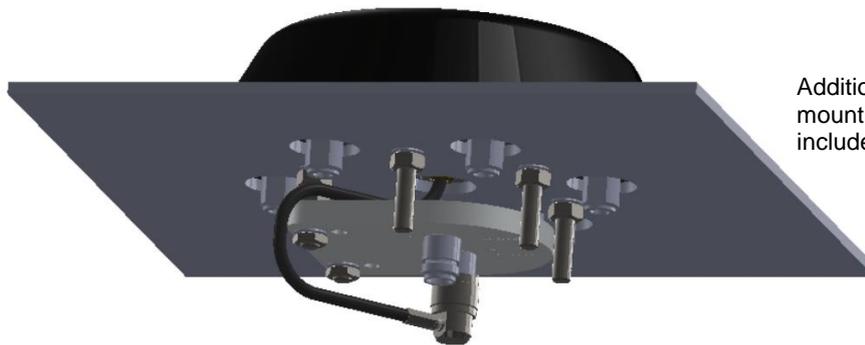
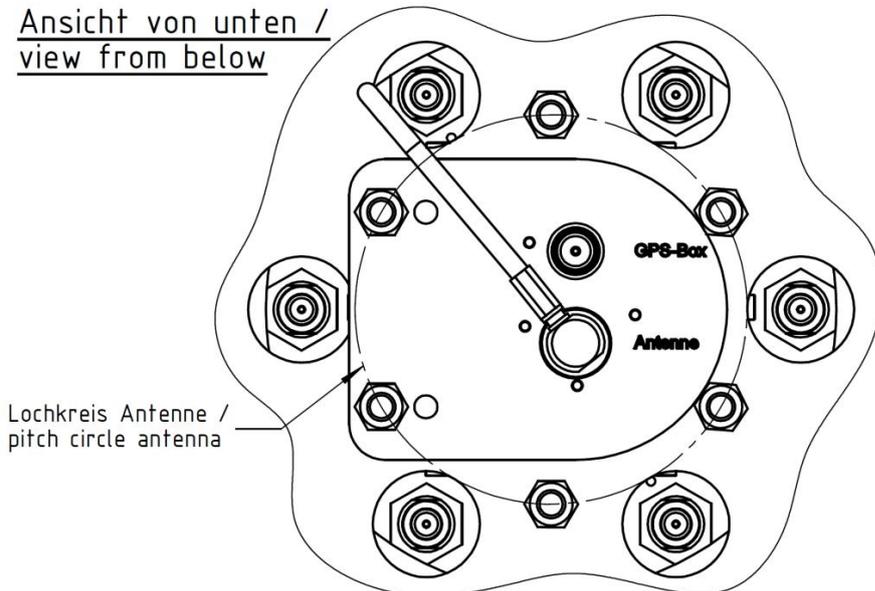
Additional nuts and washers for mounting of the amplifier not included.

The mounting of the amplifier on the screws of the antenna for all antenna series except of 4x4 MIMO. These are shown on the next site. Our antennas and amplifiers are maintenance-free units which can only be replaced completely as a whole. Therefore, no spare parts are needed.

For the mounting of the amplifier on the mounting bolts of a 4x4 MIMO antenna series, the following arrangement can be suggested:



Ansicht von unten / view from below



Additional nuts and washers for mounting of the amplifier not included.



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