

Specifications

and Operator Manual of antenna

RLA4G



Version: 1.3

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Specifications

Single loop dimensions:	About 500 mm x 500 mm
Amplifier dimensions (W x H x D):	140 mm x 60 mm x 120 mm (without connectors)
Frequency range:	50 kHz ... 30 MHz
Average noise level (without loops):	≤ -145 dBm/Hz (at 10 MHz)
IP3:	$\geq +32$ dBm (2x -6 dBm measuring tone at 10 MHz)
IP2:	$\geq +80$ dBm (10.0 MHz + 10.2 MHz -6 dBm measuring tone, 0.2 MHz measured difference tone)
Maximum output voltage:	≥ 1 V _{eff} , 1 dB compression
Supply via RF cable:	+6.0 V ... +13.8 V, maximum +14.4 V!
Power supply:	max. 100 mA
RF output:	TNC 50 ohm
Weight:	≤ 1.5 kg
Environmental conditions:	-20 ... +40 °C ambient temperature, ≤ 100 % rel. humidity IP65 (with connected loops and connection cable)
Compliance:	CE according to DIN EN 55013, EN 55020, EN 60065 RoHS / WEEE Directive, ear-Reg. 27676700

All specifications are subject to design changes!

Safety precautions

Please always keep the following safety precautions in mind!

Never connect the device to any other voltage than indicated in the specifications. Under no circumstances should the the device come into contact with the mains voltage of 230 V ~!

It is essential to observe the lightning protection regulations for the outdoor operation of electrotechnical systems! The antenna must be properly equipped with lightning protection when installed outside a protected area (e.g. house). The RF cable must be equipped with overvoltage protection. In case of lightning hazard, immediately take the antenna out of operation and disconnect it safely from other devices (remove RF connection)!

Observe the permitted temperature range for starting up the device! Do not switch the device on or off again if this range is exceeded or fallen below!

When disassembled, always provide a safe placement on a flat, straight and solid base of sufficient carrying capacity! The antenna is intended for outdoor installation on firmly anchored components (mast, beams, roof, wall, ...). Observe the permissible wind load! Always transport the device either in solid cardboard or wooden boxes (e.g. the delivery packaging), or transport it by firmly gripping the amplifier housing! The device may cause injury in the event of a fall due to its own weight!

Never expose the device to mechanical stress due to impact, pressure, vibration or shock which exceed a normal level. Never carry or attach the device to the antenna elements.

Never open housings and never move screw connections on housings, unless expressly requested in the operator manual. This can lead to damage to seals or components connected to the screw connections.

If you notice any damage to the device, immediately take it out of operation (remove power supply)! If necessary, send it to the supplier for repairs.

Would you like to dispose the device due to damage or no more usability, send it back to the supplier or return it to your local waste collection center. Never dispose of the appliance elsewhere, such as household waste. It pollutes our environment!

The nameplate of the RLA4G is located inside the amplifier housing. It is visible after removing the base plate.

Operator Manual

The RLA4G is a cross loop receiving antenna for fixed outdoor installation. It operates broadband as a non-tuned active antenna with an integrated amplifier. The power is supplied via the RF cable. The two loops consist of coaxial cables for symmetrical feed of two differential current amplifiers with a low-impedance input. The utilization of the latest components in the two amplifier branches guarantees very low intrinsic noise values and high intermodulation resistance. The two reception loops are arranged at an angle of 90° to one another. By adjusting the amplifiers, an electronic rotation of the receiving direction is possible. The outer jacket of the antenna elements is grounded on the amplifier housing and shields the actual loops (inner conductor) against interference radiation.

The amplifier is installed in a sealed aluminum housing. The RF currents of the antenna elements are lead waterproof into the housing via RP-TNC coaxial connectors. The RF derivation to the RX takes place via a sealed TNC housing bushing. The bottom of the housing has tabs with holes for screwing the antenna onto flat construction elements (beams, straight roof surface, mast head with flat sheet metal or similar).

In addition to the RF connections of the amplifier, the antenna elements are also attached to a connection housing (common ground point, RF voltage and current zero point). It is connected to the amplifier housing via a mounting rod. This means that all metal parts are at the same low-impedance potential and can be grounded via the amplifier housing (lightning protection).

If lightning protection is not necessary (observe the relevant regulations!), grounding is not necessary to operate the antenna. The connection to the receiver via the antenna cable is sufficient. However, grounding can be useful to suppress interference. On the other hand, it can also cause faults if the grounding point is chosen unfavorably (e.g. equipotential junction of the power supply, which often leads to high interference currents).

So-called ground loops can occur if the antenna is (supposed to be) grounded (multiple, spatially spaced ground connections, e.g. lightning rods and antenna cables), which can act as a reception loop. In this case, further measures are necessary, such as choking the antenna cable (e.g. winding it onto a ferrite toroid) or special grounding of the cable's receiver-end or the receiver. These measures are heavily dependent on the environment and the additional wiring of your electronics and their necessity / effectiveness must be determined empirically.

Power supply to the RLA4G is only possible via the RF cable ("remote power supply"). Any remote supply device that can be switched into the antenna cable and that can supply the required voltages and currents (see technical data) is suitable for this. The fed voltage's level can be modulated with a data signal in order to electronically control the direction of reception (for example using control units RSW2 or RSW3, see description of these devices).

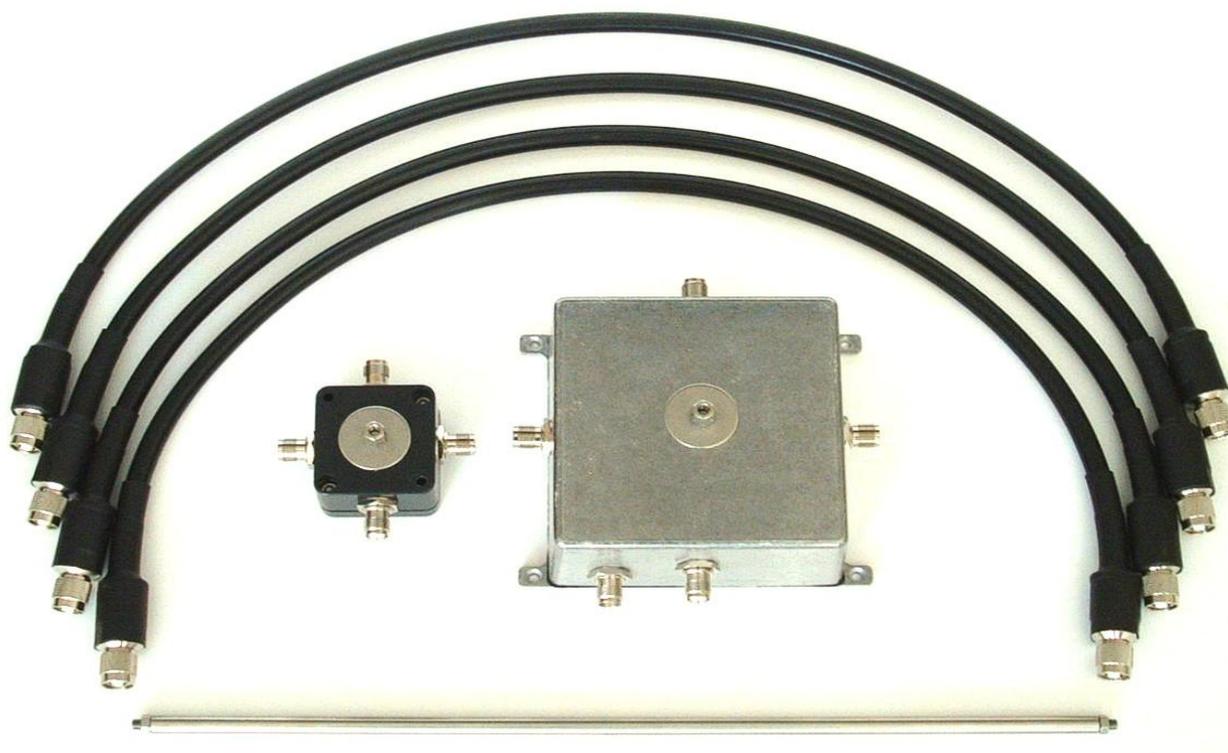
The RLA4G must be assembled vertically with the connection housing facing up. Slight deviations from the vertical are permitted. The reception diagram is then eight-shaped in the horizontal (bidirectional with 2 wide reception lobes and two sharp zeros). Without a control unit (remote supply with constant voltage), the main reception direction is approximately transverse to the direction of the connection socket for the antenna cable (the zeros are approximately in the axial direction of the socket).

This direction also corresponds to the 0° setting on the control unit. The RLA4G is not suitable for direction finding. The absolute deviation of the setting compared to the actual reception direction can be several 10°s. The purpose of the electronic rotatability is the orientation towards maximum suppression of interference signals, as well as the reception of useful signals, which are at the zero position for antennas with a fixed reception direction without the possibility of rotation.

If the degree display on the control unit should approximately correspond to the actual cardinal direction (max. reception or zero point), the antenna must be "northed" once during assembly.

Assembly of the antenna RLA4G

The RLA4G is supplied with disassembled antenna elements.



Component set for an antenna RLA4G

The component set consists of the following parts:

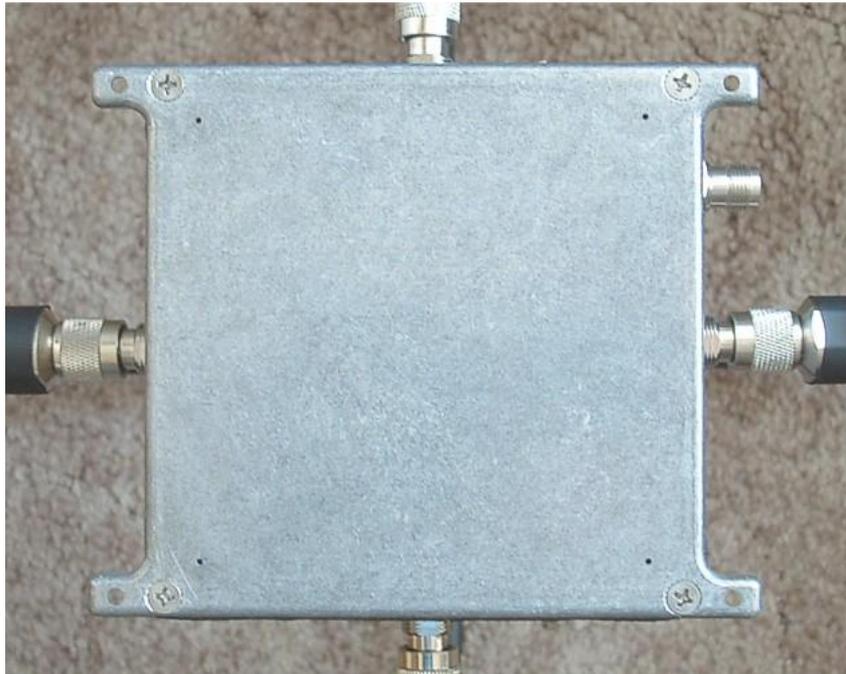
- 4 pieces of antenna elements (each half of a loop), coaxial cable LMR-400 with TNC connectors of reversed polarity (RP-TNC).
- Node (connection) housing made of plastic with 4 RP-TNC sockets.
- Amplifier housing made of bright aluminum with 4 RP-TNC sockets and normal TNC socket for the antenna cable.
- Connecting rod made of stainless steel, with a screwed-on M5 nut at each end.

All parts are made of weatherproof material (resistant to UV radiation and moisture) and are IP65 dust and waterproof after proper assembly. The amplifier inside the aluminum housing is designed for a wide temperature range (no electrolytic capacitors, components with an extended temperature range). All components, with the exception of the coaxial connector for connecting the TNC socket for the antenna cable, are arranged in an SMD version on a circuit board and sealed with synthetic resin.

The amplifier housing is bare metal in order to achieve a high reflectivity against solar radiation. This keeps the amplifier from heating up as much as possible on hot summer days. The housing consists of a body in which all parts are mounted and a screwed-on base plate with an inserted gasket. There are tabs on the floor panel for attachment to any support elements (mast heads, beams, roof surfaces, ...). Fastening must be carried out using suitable countersunk screws (wood, self-tapping or threaded countersunk screws of 4 mm in diameter).

Caution! When screwing the housing on, no forces may act on the tabs or the base plate (no "warping"). The mounting surface must be absolutely flat and level! If necessary, suitable supplements must be placed to compensate.

There are 4 small holes in the base plate near the corners. They serve to equalize the pressure in the housing when there are major changes in temperature, and to drain any condensed water that may have formed. At least one of the holes must be kept clear when mounting the antenna on a bracket. If the antenna is not absolutely horizontal, this must be the bottom hole (condensation water collects there).



Drilled holes in the base plate ensure ventilation and drainage

The assembly of the dismantled antenna is quite simple and should be carried out in the following order (disassembly in reverse):

- Screw the connecting rod into the amplifier housing. There is an M5 spacer bolt on the top of the housing, into which the threaded pin at the end of the rod fits. An M5 nut should already be screwed onto the threaded pin, which must be screwed onto the rod as far as it will go (otherwise screw on the nut so far). Screw the rod into the spacer of the amplifier housing until it stops against the nut. **Caution!** Tighten only slightly loosely to a maximum hand-tight and hold it straight, do not exert any torque or shear force on the spacer bolts!
- Similarly, screw the node housing onto the other end of the rod. Again, pay attention to the presence and full screwing of the nut and the maximum light tightening.
- Align both housings (turn them against each other) so that they are parallel to each other. The connectors on each side of both housings must point in the same direction (slight twisting by 1 - 2 degrees does no harm). **Caution!** The connecting rod must not be screwed firmly into the spacer bolts on either side! Only turn to the right (clockwise when viewed from above) until the screw connections are at most hand-tight. Then turn to the left (loose) to align the housings correctly.
- Counter the nuts on the threaded rod against the spacer bolts on both housings. To do this, hold the spacer bolts with a size 8 open-end wrench and use another wrench to turn the nut firmly against the bolt. Never grip the housing during assembly! The spacer bolts are sealed on the housing. If they are turned against the housing, the seal will be destroyed and moisture could penetrate! Make sure that the housings remain parallel to each other.
- Screw on the antenna elements. The cables are already approximately semicircular, so that they fit onto the sockets on either side of both housings without tilting. Bend a little if necessary. Despite their relatively large diameter, the cables are easily bendable.
- **Caution!** Never bend them sharply, especially not at the connectors! It is best to screw one side firmly onto a housing and then shape the cable so that the plug on the other side can be screwed straight and easily onto the socket on the housing.

- Screw on the antenna cable. The cable to the receiver must have a standard TNC connector (not reversed as with the antenna elements) at the antenna end. At the other end, a connector corresponding to the RX input is required (if an RSW control unit is used, a BNC connector).

Important Note: The TNC fittings should be tightened securely to ensure watertightness. Normally, manual force should be sufficient (always ensure axial alignment / easy screwability without tilting the connector!). If the force is too low (children, dainty adults, incomplete usability of the hands, ...), pliers can be carefully used for help. However, excessive force must never be exerted, as this could damage the seals or even the thread of the connector! Also, the sockets in the housing must not be twisted, otherwise their seals and inner connections can be destroyed!

Never turn TNC connectors against each other! Only the cap nut may be turned, never the plug against the socket!

Background: In the plug (the connector on the cable, with RP-TNC this is actually a socket) has spring elements slotted in the axial direction. When the plug is inserted, these press firmly against the corresponding contact surface of the socket. If the plug is turned, the sharp-edged slots literally mill off the contact surface of the socket.

So **never** e.g. only slightly insert the plug so that the cap nut grips, and then turn the entire cable together with the connector and nut onto the socket. This is relatively easy because you can use the cable as a lever. But it damages the spring elements and the socket!

Correct: Press the plug firmly onto the socket (only push axially, i.e. lengthways!) until the threads of the cap nut and socket are against each other. Now screw on the nut as much as easy possible. Then push on the plug again, turn the nut a little further and alternately continue until no further sliding / turning of the nut is possible.

The most sensible approach with the RLA4G is to first slightly screw on the cables to the upper connection housing and let them hang straight down near the sockets on the amplifier housing. Then plug them in as described and screw them on completely. Finally tighten the upper connections. In this way, a rotational movement of the plugs in the sockets can be largely avoided.

After assembly, the shape of the coaxial cable can be straightened out a bit. Usually, the loops automatically have a slightly "wobbly" shape because the upper housing is smaller than the amplifier housing. Also, the cables are rarely exactly straight. This can be easily recognized by looking at the connecting rod and, if necessary, straightening the cable accordingly. However, all these are purely aesthetic flaws, the function of the antenna is not affected.

With frequent dismantling and assembly, the TNC connectors should only be screwed on so far that there is stable contact (protection of the threads). The connectors are made of brass, which tends to get jammed when worn. It is then helpful to use a small amount of acid-free grease (e.g. silicone grease).

If the antenna is likely to never be dismantled again, sealing the connectors by wrapping them with self-vulcanizing sealing tape is highly recommended. Caution, pay attention to UV-stable material!