

Technical Description

General System Information
GPS



Safety information

The safety regulations and technical data are important for the smooth running of the devices and the protection of people and equipment. Strict compliance with these regulations is required. In case of non-compliance with these regulations the guarantee and warranty claims for the device expire. There is no liability for possible consequential damages.

Safety of the Devices

The production of this device follows the latest technological standards and safety regulations.

The device must not be assembled by anyone but trained personnel. Please make sure that all the connected cables are laid and fixed properly. The device is to be run with the supply voltage stated on the identification plate only.

Only trained personnel or specialists may operate the device.

Repair on opened devices must not be carried out by anyone but specially trained staff or by the *hopf* Elektronik GmbH company.

If the maintenance work requires the opening of a device or if a fuse needs changing the device must be separated from all voltage supplies.

If there are reasons to believe that the operational safety can no longer be guaranteed the device must be taken out of service and labelled accordingly. The safety may be impaired when the device does not operate properly or if it is obviously damaged.

***hopf* Elektronik GmbH**

Nottebohmstr. 41 58511 Lüdenscheid
Postfach 1847 58468 Lüdenscheid

Tel.: ++49 (0)2351 / 9386-86

Fax: ++49 (0)2351 / 9386-93

Internet: <http://www.hopf.com>

e-mail: info@hopf.com

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1 How GPS works

At a height of about 20,000km satellites circle around the earth twice a day on 6 different orbits and angles (see picture below).

The GPS system¹ was developed on the basis of 18 satellites with 3 in reserve. In the course of time this number was increased to 21 plus 3 in reserve to cover possible short-term breaks in coverage. Therefore 6 to 11 satellite are visible from any point on earth at all times. On board each satellite there is a highly accurate atomic clock (accuracy at least 1×10^{-12}).

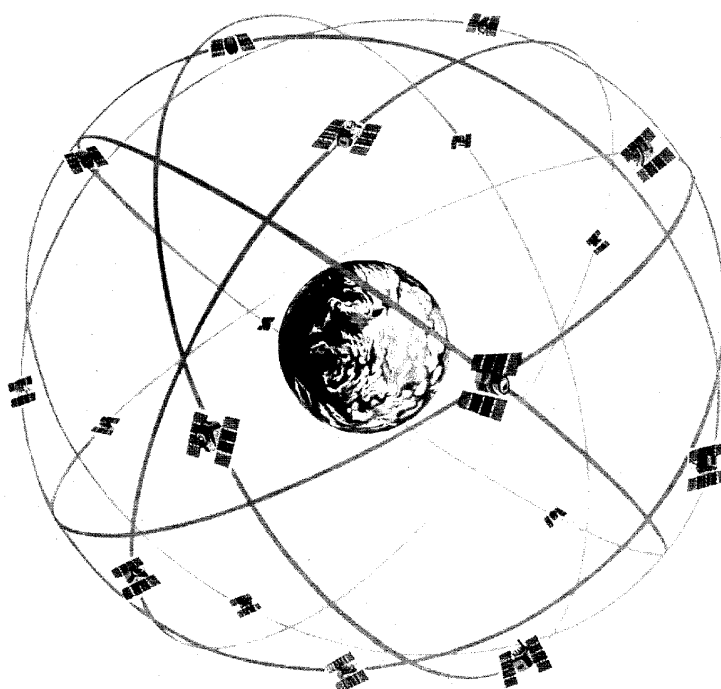
A basic frequency of 10.23 MHz is derived from the frequency of the atomic clocks. The two carrier frequencies L1 and L2 are produced from this basic frequency.

- transmission frequency L1 = $154 \times \text{basic frequency} = 1575.42 \text{ MHz}$
- transmission frequency L2 = $120 \times \text{basic frequency} = 1227.60 \text{ MHz}$

Every satellite broadcasts by modulation all the important navigation and system data on these two carrier frequencies. The data of the frequency L1 may be decoded for civil purposes. The exact time can be calculated from these data and the position defined via the antenna.

The GPS antenna receives signals from all the satellites visible above the horizon and passes them on to the GPS receiver through a coaxial cable. Four satellites are required for continuous time decoding.

The GPS world-time UTC² is calculated by subtracting the leap seconds from the GPS world-time (GPS-UTC). At present (JAN 1999) world-time lags 13 seconds behind GPS-UTC. The difference is not constant, but changes with every insertion of a leap second.



¹ GPS = global positioning system

² UTC = universal time coordinated

2 Accessories

2.1 GPS Antenna

Due to the high signal frequency of approx. 1.5 GHz an outdoor antenna is recommended for the reception of GPS satellite data.

2.1.1 Where to install the antenna

Since the antenna is designed to receive data from all directions it must be non-directional. Because of the high frequency there must be "visual contact" to the satellites.

Visual contact means that no solid or large objects (buildings) may block the view to the horizon (see drawing **A06** "GPS Reception in 3D and Position Fixed Mode"). Rain, fog and clouds as well as small objects, e.g. chimneys, at a certain distance may impair the view minimally.

Please Note: THE LARGER THE VISIBLE SECTION OF THE SKY, THE LONGER THE POST-CONNECTED ELECTRONICS REMAIN RADIO-SYNCHRONOUS.

In the standard reception mode (3D) of the GPS system reception from at least 4 satellites is necessary. In position fixed mode reception from only one satellite is necessary (see technical description of GPS system). It is also possible to install the antenna behind a non-coated window.

No additional voltage supply is required to operate the antenna. The 5V DC voltage is provided via the antenna cable and is supplied by the BNC connector of the *hopf* GPS system.

2.1.2 Mechanical Structure of the Antenna

The antenna is housed in a round weatherproof plastic casing. The casing cover is arched to prevent any rain water, snow or other impurities from settling on the antenna.

The mechanical construction (see drawing **A04** "Dimensions of Antenna 4490G10 / 4418A") consists of sturdy, anodized aluminium or aluminium die-casting and is designed to resist high winds.

The plastic housing can be installed horizontally as well as vertically to the mechanical parts (see drawing **A03** "Mounting of Antenna 4490G10 / 4418A"), allowing both wall and flat-roof installation of the antenna. The antenna cable can be fed either through the base or through a slot on the side of the mounting flange.

2.1.3 Electrical Structure of the Antenna

As the antenna is non-directional, reception cannot be improved by mechanical shaping as, for example, with parabolic antennas. Therefore the signal strength at the antenna input is about 1×10^{-16} Watts and already below the generally permitted noise level.

An extremely low-noise pre-amplifier is placed behind the antenna in order to feed the signals to the electronics via an antenna cable. The antenna cable also supplies the voltage to the pre-amplifier.

2.2 Antenna Cable

2.2.1 Cable length

The cable length is restricted because of the high frequency and the low signal strength. It can be lengthened by using a repeater. At present two different types of cables are available allowing the following distances between antenna and electronics to be bridged:

hopf low loss LSZH¹ cable KA110109 replaces *hopf* GPS special cable KA110107. The BNC connectors ST001106 used for *hopf* GPS special cable KA110107 are also suitable for the new *hopf* low loss LSZH cable KA110109.

Please Note: THE COMBINATION OF DIFFERENT CABLE TYPES WITHIN ONE ANTENNA CONFIGURATION IS **NOT** POSSIBLE.

| Antenna cable | length | see |
|--|--------------------------------|-------|
| Standard cable RG59, supplied on a coil: | max. 25m (82.0 ft) | (A07) |
| <i>hopf</i> low loss LSZH cable <u>without</u> line-amplifier 6849: | max. 100m (328.0 ft) | (A08) |
| <i>hopf</i> low loss LSZH cable with <u>one</u> line-amplifier 6849: | max. 200 m (656.0 ft) | (A09) |
| <i>hopf</i> low loss LSZH cable with <u>two</u> line-amplifiers 6849: | max. 325 m (1,066.0 ft) | (A10) |
| <i>hopf</i> low loss LSZH Kabel <u>without</u> line-amplifier 6849 <u>with</u> power splitter 4443 (Configuration 1): | max. 75 m | (A11) |
| <i>hopf</i> low loss LSZH Kabel <u>without</u> line-amplifier 6849 <u>with</u> power splitter 4443 (Configuration 2): | max. 75 m | (A12) |

A maximum of two line amplifiers can be used.

- Cable length up to max. 25 m (82.0 ft): Using standard cable ring KA4017
- Cable length over 25 m (82.0 ft): Using *hopf* LSZH cable KA110109

For antenna systems deviating from the above-listed configurations (e.g. modules and cable lengths) clarification based on the required cable length is necessary.

2.2.2 Preparation of the cable

Because of the high frequency and the signals below the permitted noise level, special attention must be paid to preparation of the cable. If the cables are not prepared correctly this could impair reception.

When antenna systems are ordered with cables prepared by *hopf* the whole system is factory-tested for reception.

For preparation of the antenna cable by the customer refer to: **A13-A14.**

¹ LSZH: **L**ow **S**moke **Z**ero **H**alogen

2.2.3 Cable Installation

When laying the cable special attention must be paid to the following points:

- The coaxial connectors should not be damaged or soiled. The connections should be protected with plastic foil.
- The bending radius of the cable must not be less than 10 cm.
- No section of the cable should be crimped nor should the insulation coating be damaged

The cable is fed through the antenna base and connected to the antenna via a coaxial connector. To lay the cables this can be disconnected. To do this the Allan screws on the antenna base are removed and the dish is lifted off.

Please Note: THE CABLE MUST NOT BE INSTALLED IN THE VICINITY OF OTHER HF-, CONTROL OR POWER CABLES.

The emitted radio interference from these cables may interfere with GPS reception because of the extremely low reception power.

2.3 Lightning Protection

2.3.1 General Information about Lightning Protection

When outdoor antennas are used high interference voltage or current pulses may occur in the antenna cable during thunderstorms. This may result in damaging or destroying not only the directly connected radio-controlled clock system but also any other devices connected.

To avoid severe damage and damage-related costs an indirect lightning protection should be installed between the outdoor antenna and the circuit board of the radio-controlled clock (see drawing **A15** "Dimensions of Lightning Protector").

2.3.1.1 Causes of Overloading

Buildings can be protected with the aid of the lightning conductor developed by Benjamin Franklin. This though does not, however, protect the electronic devices inside from indirect consequences of lightning.

A flash of lightning is simply an excessive short circuit of two lines with different potentials. When lightning occurs these two lines are usually two layers of cloud or one layer of cloud and the earth. Then a current of 1000 to 100000 ampere circulates between the two layers of cloud or between the earth and the clouds. On unprotected devices connected to open lines (antenna, antenna cable) this results in the following forms of indirect interference or destructive influence.

2.3.1.2 Electrostatic Field

The increase of the electrostatic field up to 50 kV/m can be caused by the vicinity of potential-loaded thunder clouds or by the static charging of the air. Field changes take place suddenly creating high-frequency, electromagnetic micro-pulses.

2.3.1.3 Increase in the Earth Potential

When lightning strikes into the ground this causes a sudden increase in the earth potential which depends on the power of the current and on the local specific resistance of the earth. This overloading is reduced undulatorily through the ground and this causes high voltage-potential differences in unprotected devices.

2.3.1.4 Electromagnetic Radiation

The flash of lightning may be compared to an antenna of several kilometres length. The pulse current of several kiloamperes radiates a strong electromagnetic field. This radiation induces high voltages and currents in "neighbouring" lines (1 to 2 km) which can also cause overloading in connected devices.

2.3.2 Lightning Protection Concept

Overloading caused by the indirect effects of lightning cannot be avoided, but devices can be protected against its destructive consequences.

To reduce overloading as quickly as possible it is necessary to short-circuit the lines. When the problem is solved the device should return to its original specifications.

This is why the *hopf* lightning strategy is made up of a combination of rough and fine protection.

2.3.2.1 Rough Lightning Protection

The double-chamber gas arrester, located in the lightning protection, has a dynamic operating voltage of < 700 V and conducts voltage, when ignited, out of the cable to the earth potential.

2.3.2.2 Fine Protection (in the hopf electronic)

Fast absorber diodes with a response time of < 1 nsec. and an absorber power of 600W at the input of the GPS receiver board keep the potential differences between antenna core and zero at a constant approximate $\pm 6V$ until ignition of the double-chamber gas arrester.

Because of the high frequency and the signals below the permitted noise level, the elements must be set up in strip-line sequence.

This combination also guarantees the potential separation of the antenna circuit to other electronics in conditions without interference.

If no further devices (eg. power splitter) are installed between lightning protection and electronic with fine protection, for safety reasons the cable length must be min. 2 m (RG59) resp. 5 m (*hopf* low loss cable).

2.3.3 Installation

When *hopf* lightning protection is used it is assumed that at the location there is a comprehensive lightning protection concept, including direct lightning protection of the building according to VDE and a lightning-protected voltage supply to the devices.

The antenna is connected to the "**Antenna Input**" BNC connector, and the extended cable to the electronics on the connector marked "**Output**".

It is important that the earth line of the connected device has the same earth connection point as the lightning protection, so that no destructive potential differences can arise.

A stranded wire of at least 4 mm² is laid from the earthing screw to the next earth connection point with a maximum length of 2.5 m. With a maximum length of 10 m the stranded wire must be at least 10 mm² thick.

The earth wire may not exceed 10 m.

See drawing **A02** "Mounting of Outdoor Antennas GPS/DCF77".

Please Note: ONLY TRAINED PERSONNEL MAY INSTALL THE LIGHTNING PROTECTION.

2.4 Line Amplifier

For positioning and required quantity of line amplifiers see Appendix **A09-A10**.

2.4.1 Installation

The line amplifier (see drawing **A16** "Dimensions of Line Amplifier") is integrated into an HF-proof housing with a base plate. It is therefore easy to fix the device to the wall.

Refer to section 2.2.1 to find out for which lengths of cable it is necessary to use the 6849 line amplifier.

The 6849 line amplifier is looped into the antenna cable. The 5V DC voltage supply of the 6849 is provided via the antenna cable by the BNC connector of the *hopf* GPS system.

The GPS antenna cable from the antenna is connected to the BNC connector "ANTENNA". The signal is supplied to the connected *hopf* GPS system by the BNC connector "RECEIVER".

To avoid destruction caused by overloading ensure that the line amplifier is not earthed.

The integrated fine protection of the line amplifier enables installation before the lightning protection without any risk of destroying the line amplifier through overloading.

2.5 Dual Power Splitter (operation of two appliances on one antenna)

The passive Power Splitter 4443 is used to separate the antenna signal into two equally strong signals to minimize the loss while operating two *hopf* GPS systems on one antenna. The power splitter also serves to decouple the external voltage supply on the internal conductor of the antenna.

2.5.1 Installation

The Power Splitter (see drawing **A17** "Dimensions of GPS Power Splitter") is mounted in a HF-proof housing with an insulated base plate. The unit can therefore be easily screwed to the wall near the GPS systems. The antenna is connected to the single BNC-connector called "**Antenna in**". On the opposite side of the housing there are the two antenna outputs to the GPS systems.

The 5V DC voltage supply of the 4443 is provided via the antenna cable and is supplied by the BNC connector of the *hopf* GPS system.

The power splitter may not be connected to earth to avoid damage by overvoltage.

The integrated fine protection of the power splitter enables installation before the lightning protection without any risk of destroying the power splitter through overloading.

Please Note: A FREE OUTPUT PORT SHOULD BE CLOSED WITH A HF RESISTOR OF 50 Ω .

2.5.2 Outside Connection

It is also possible to connect a further GPS-system to a free splitter output. Care must be taken that the external power supply of the alien device for the antenna lies within the permitted voltage range (refer to technical data). The outside device must also be able to evaluate the original GPS signal in the L1 band.

3 Technical Data

Antenna

| | |
|---------------------------------------|-------------------------------------|
| Type of antenna: | micro-strip-line with pre-amplifier |
| Mean frequency: | 1575.42 MHz |
| Band width: | 10 MHz |
| Angle of view: | + 10° above the horizon |
| Impedance: | 50 Ohm |
| Power amplification: | 20 dB |
| Voltage supply via the antenna cable: | 4.5 - 7 V DC |
| Temperature range: | -30 to + 85° C |
| Category of application | outdoors (IP65) |

Lightning Protection

| | |
|--|----------------------------|
| Housing: | aluminium die-cast housing |
| Dimensions of housing: | 250 x 105 x 95 mm |
| Input / output: | BNC-connector |
| Earth connection point: | screw connection M6 |
| Weight: | approx. 1.8 kg |
| Operating speed: | < 1ns |
| Current surge pulse 8/20 µs wave form: | 10 kA |
| Protection level at 6 kV 1,5/50 µsec. wave at input: | < 12 V |
| Input impedance: | 50 Ω |
| Insertion loss: | max. 3 dB |
| Temperature range: | -20°C to +70°C |
| Category of Application | indoors, protected |

Please Note: OUTDOOR ANTENNAE AND LIGHTNING PROTECTION CAN BE DESTROYED BY LIGHTNING. WE CAN THEREFORE PROVIDE ONLY A LIMITED GUARANTEE FOR THESE PARTS.

Line Amplifier

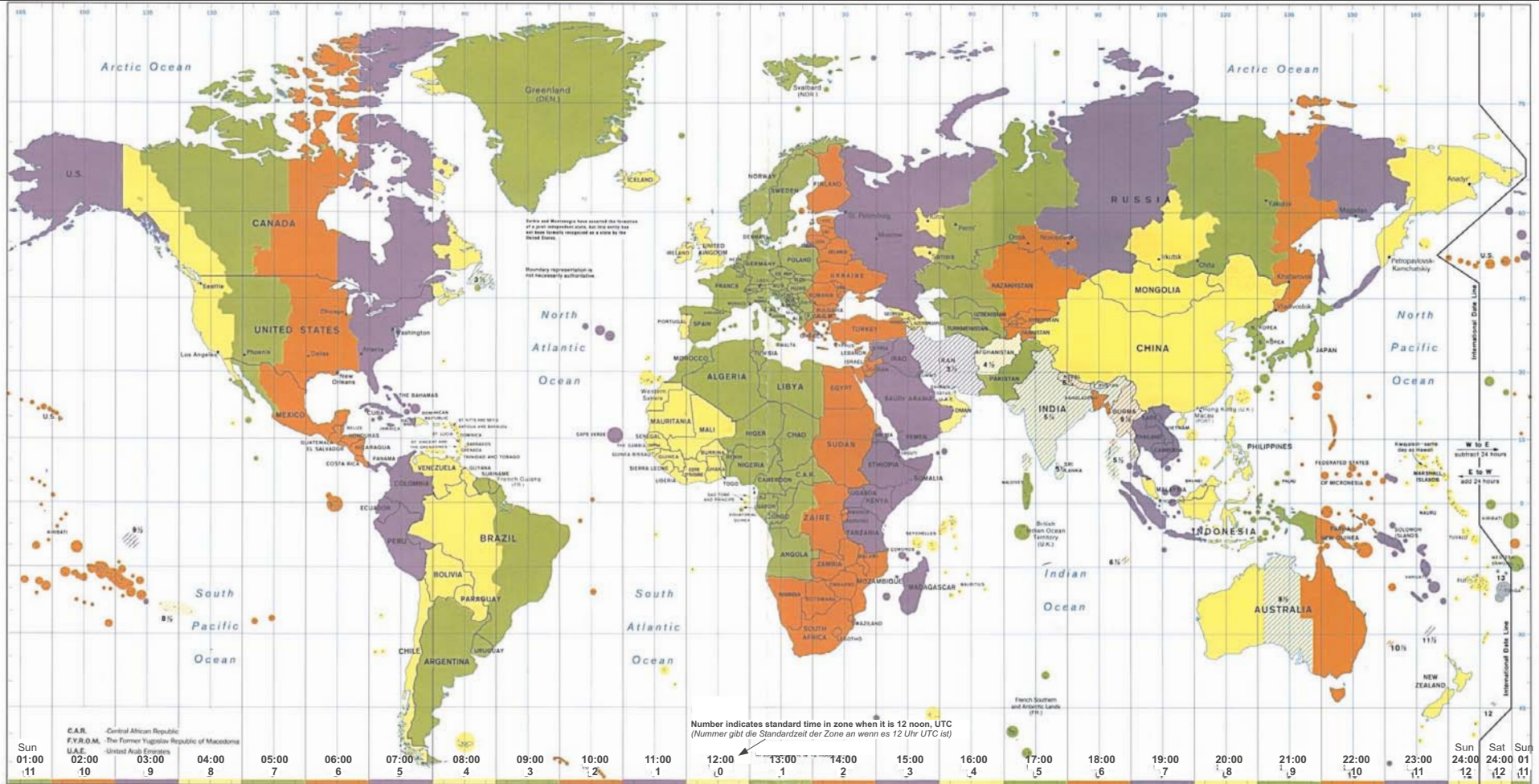
| | |
|---------------------------------------|--|
| Impedance: | input / output 50 Ω |
| Frequency range: | 1575 MHz |
| Band width: | ± 5 MHz |
| Power amplification: | min. 20 dB |
| Voltage supply via the antenna cable: | 4.5 - 7 V DC |
| Weight: | approx. 0.13 kg (1.8 kg with protection housing) |
| Temperature range: | -10 to + 70° C |
| Category of application | indoors, protected |

Power Splitter

| | |
|--|--------------------|
| Operating frequency: | 1575 MHz |
| Insertion loss (S21, S31): | max. 1 dB |
| Input reflection damping (S11): | 22 - 26 dB |
| Output reflection attenuation (S22,S33): | 20 - 26 dB |
| Output insulation (S23): | 23 - 27 dB |
| Amplitude stability (output): | 0.05 - 0.15 dB |
| VSWR (input): | min. 1 : 1.17 dB |
| External current: | max. 50 mA |
| Category of application: | indoors, protected |

World Time Zone Map (Difference Time to UTC)

Unterteilung der Zeitzonen (Differenzzeit zu UTC)



WEST
 Add time zone number to local time to obtain UTC. Subtract time zone number from UTC to obtain local time.
 (Addiere Zeitzone-nr. zu lokaler Zeit um UTC zu erhalten. Subtrahiere Zeitzone-nr. von UTC um lokale Zeit zu erhalten.)

EAST
 Subtract time zone number from local time to obtain UTC. Add time zone number to UTC to obtain local time.
 (Subtrahiere Zeitzone-nr. von lokaler Zeit um UTC zu erhalten. Addiere Zeitzone-nr. zu UTC um lokale Zeit zu erhalten.)

Universal Time Coordinated (UTC)
 formerly (vormals)
 Greenwich Mean Time (GMT)

| | | | |
|---------|---|------------|--------|
| changes | drawing number | ZC01091101 | page |
| | World Time Zone Map (Difference Time to UTC) | | |
| | date | 11.09.01 | System |
| | name | Vollmer | |
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| | | | A4 |

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Method of Mounting for Outdoor Antennas GPS / DCF77

Montagearten Außenantennen GPS / DCF77

4490G12 / 4420

4490G10 / 4418A

pole mounting not included

Mastbefestigung nicht im
Lieferumfang enthalten

4490G11 / 4417A

4490G10 / 4418A

cable entry
Hauseinführung

antenna cable


4490G10 / 4418A

EARTH STRAP (braided):
Erdleitung

10 mm² (0.0155 inch²)
for max. d=10m (32.8 ft)

4 mm² (0.0062 inch²)
for max. d=2.5m (8.2 ft)

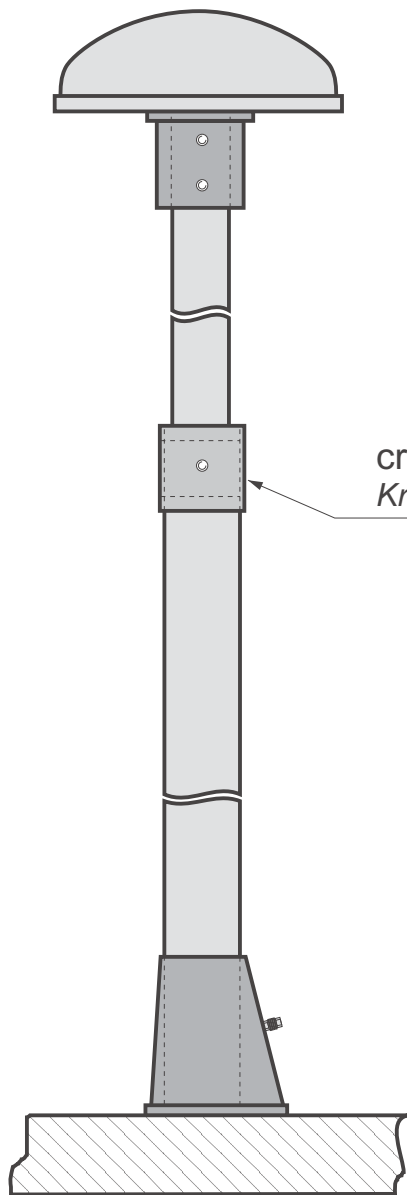
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| | | | name | Vollmer | |
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| date | changes | name | size | A4 | |



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Mounting of Antenna 4490G10 / 4418A

Montage Antennen 4490G10 / 4418A

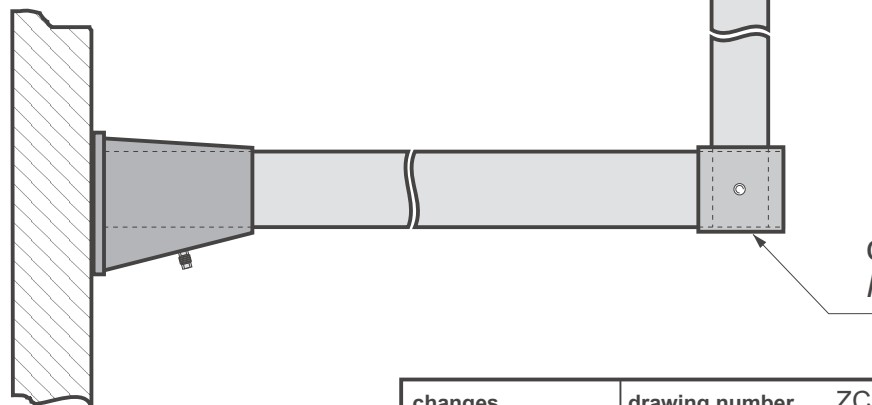


flat roof
Flachdach

cross-head
Kreuzkopf

The tube with the antenna will be supplied unmounted. The cross-head will be plugged according to mounting for wall or flat roof.


Das Rohr mit dem Antennenteller wird unmontiert geliefert. Der Kreuzkopf wird je nach Montagebedarf für Hauswand oder Flachdach gesteckt.



verticle wall
Senkrechte Hauswand

cross-head
Kreuzkopf

| changes | | drawing number | ZC01083001 | page |
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| | | Mounting of Antenna 4490G10 / 4418A | | |
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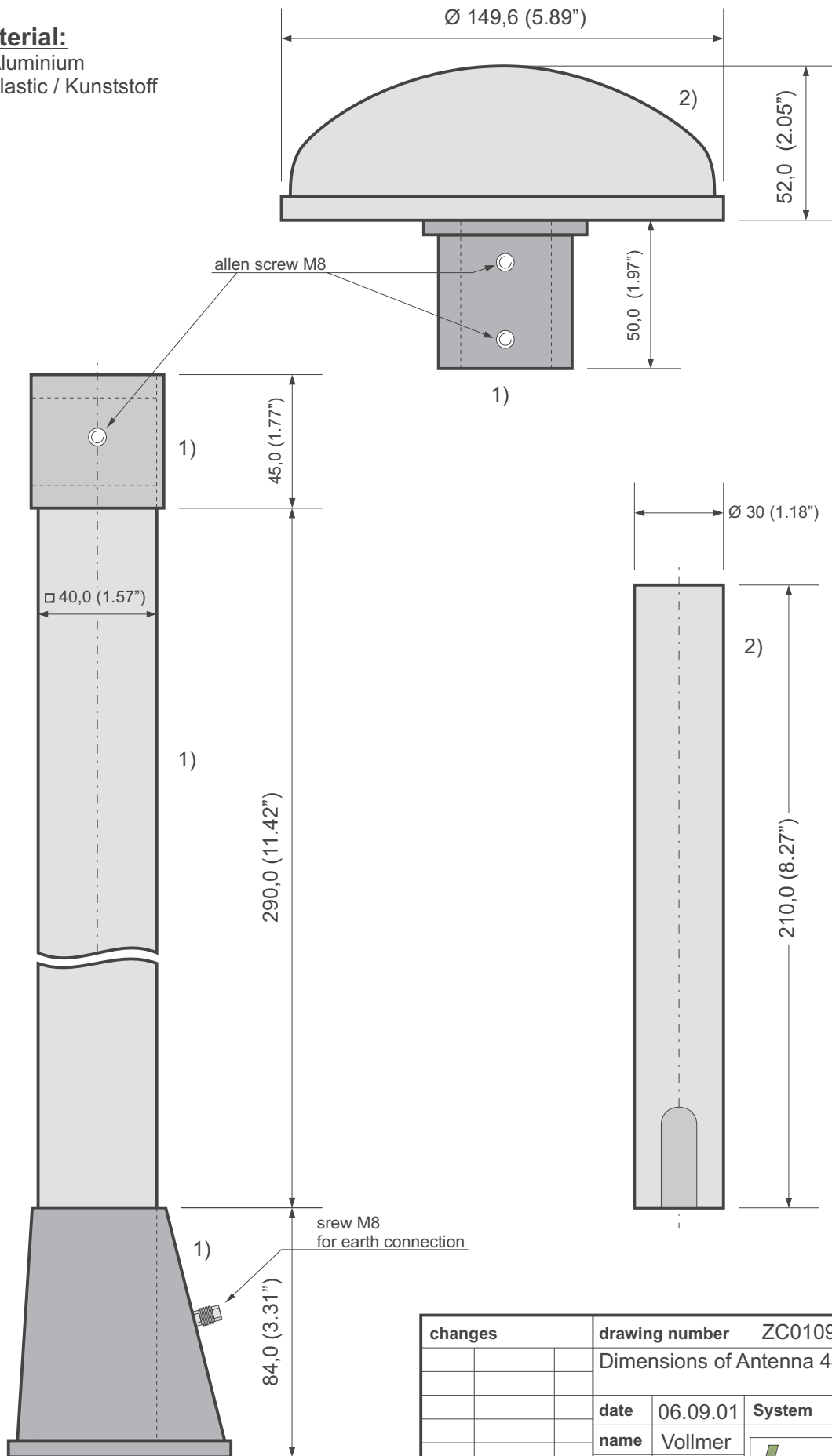
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Dimensions of Antenna 4490G10 / 4418A

Abmessungen Antennen 4490G10 / 4418A


Material:

- 1) Aluminium
- 2) plastic / Kunststoff



All dimensions in mm (inch)

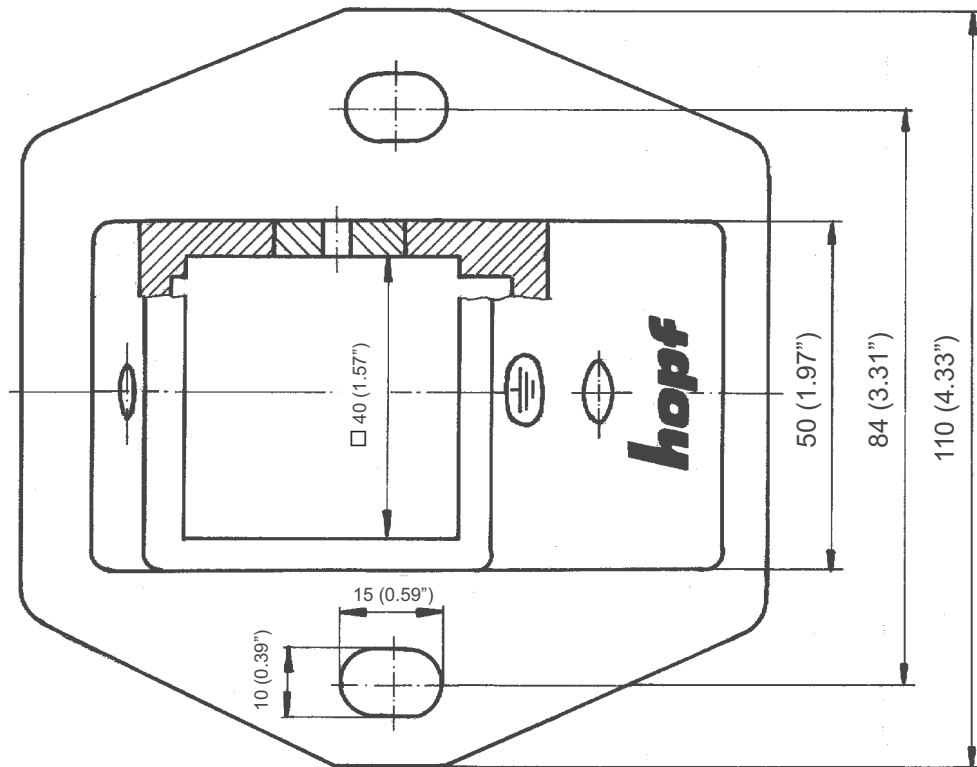
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| Dimensions of Antenna 4490G10 / 4418A | | | | |
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| | | check | | |
| | | size | A4 | |
| date | changes | name | | |



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Mounting Bracket for Antenna 4490G10 / 4418A

Montage des Antennensockels für Antennen 4490G10 / 4418A



All dimensions in mm (inch)

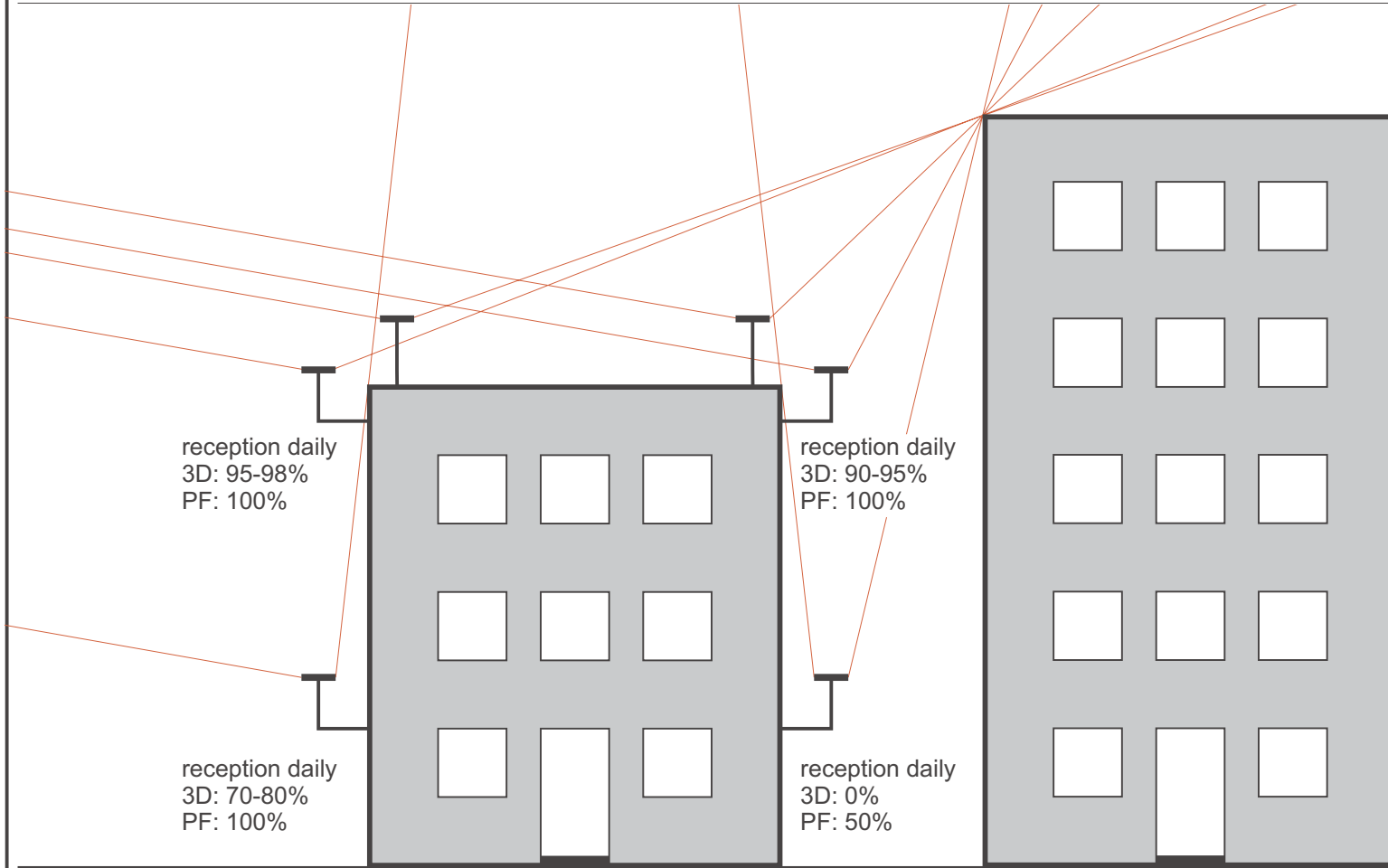
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| | | Mounting Bracket for Antenna 4490G10 / 4418A | | |
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| | | name | Vollmer | |
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| date | changes | name | size | A4 |



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GPS Reception in 3D and Position Fixed Mode

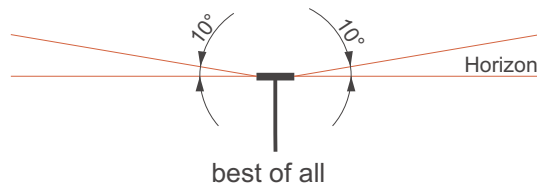
GPS Empfang im 3D und im "Position Fixed" Modus




3D: 3D-Reception Mode (Standard)
 Reception of 4 satellites is required
 (position will be calculated)
*Empfang von mindestens 4 Satelliten notwendig
 (Position wird ermittelt)*

PF: Position Fixed Mode
 Reception of only 1 satellite is required
 (position won't be calculated)
*Empfang von nur 1 Satelliten notwendig
 (Position wird nicht ermittelt)*

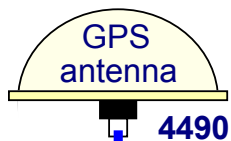
Detailed Information can be seen in technical description.
Genauere Informationen können der Technischen Beschreibung entnommen werden.



| | | | | |
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| changes | | drawing number | ZC01091301 | page |
| | | GPS Reception in 3D and Position Fixed Mode | | |
| | | date | 13.09.01 | System |
| | | name | Vollmer | |
| | | check | | |
| | | size | A4 | |
| date | changes | name | | |



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 D-58468 Lüdenscheid
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GPS antenna cabling for max. 25m (82 ft) cable

with RG59 cable (KA110106)

Cable lengths are also applicable for aerial systems without lightning protection.

ATTENTION!

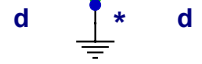
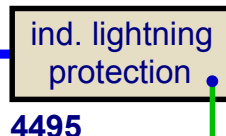
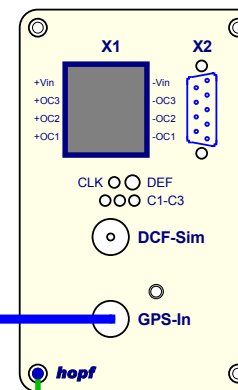
Danger of destruction of electronics by overvoltage while operation without lightning protection.

Kabellängen auch für Antennenanlagen ohne Blitzschutz gültig

ACHTUNG!

Bei Betrieb ohne Blitzschutz Gefahr der Zerstörung der Elektronik durch Überspannung

GPS clock system



A

B

A+B = max. 25m (82.0 ft)
 A,B = min. 2m (6.6 ft)

EARTH STRAP (braided):
 10 mm² (0.0155 inch²) for max. d=10m (32.8 ft)
 4 mm² (0.0062 inch²) for max. d=2.5m (8.2 ft)
 * equipotential bonding bar (e.q.b.b.)

| | | | | |
|---------|----------|------------------------------|------|-------|
| changes | | drawing number ZA01091701 | | sheet |
| | | cable configuration max. 25m | | |
| date | 17.09.01 | system | | |
| name | Vollmer | | | |
| check | | | | |
| date | changes | name | size | A4 |

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 58468 Lüdenscheid
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 Fax: 02351 / 459590

GPS antenna cabling for max. 100m (328 ft) cable

with **hopf** low loss LSZH* cable (KA110109)

* low smoke zero halogen

Cable lengths are also applicable for aerial systems without lightning protection.

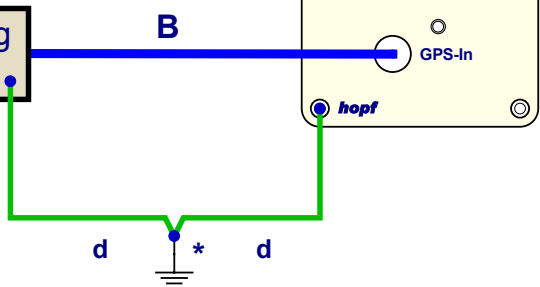
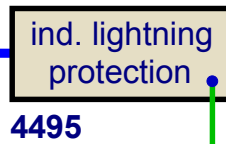
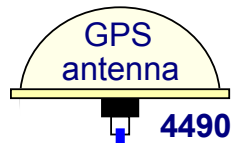
ATTENTION!

Danger of destruction of electronics by overvoltage while operation without lightning protection.

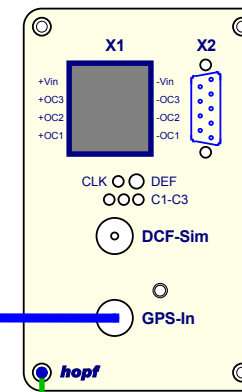
Kabellängen auch für Antennenanlagen ohne Blitzschutz gültig

ACHTUNG!

Bei Betrieb ohne Blitzschutz Gefahr der Zerstörung der Elektronik durch Überspannung



GPS clock system




A+B = max. 100m (328.0 ft)
 A,B = min. 5m (16.4 ft)

EARTH STRAP (braided):

10 mm² (0.0155 inch²) for max. d=10m (32.8 ft)
 4 mm² (0.0062 inch²) for max. d=2.5m (8.2 ft)

* equipotential bonding bar (e.q.b.b.)

| | | | | | | |
|----------|-------------|------|-------------------------------|----------|--|--|
| changes | | | drawing number ZA01052831 | | sheet | |
| | | | cable configuration max. 100m | | | |
| | | | date | 28.05.01 | system | |
| 15.10.01 | text | Vo | name | Grauer | check | |
| 15.08.01 | earth strap | Gr | | | | |
| 06.07.01 | A, B min. | Mai | | | | |
| date | changes | name | size | A4 |  fon: +49 2351 938686 fax: +49 2351 938693 http://www.hopf.com mail: info@hopf.com | |

GPS antenna cabling for max. 200m (656 ft) cable

with **hopf** low loss LSZH* cable (KA110109)

* low smoke zero halogen

Cable lengths are also applicable for aerial systems without lightning protection.

ATTENTION!

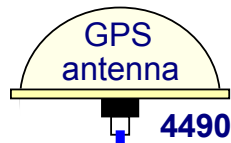
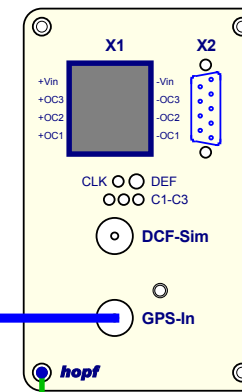
Danger of destruction of electronics by overvoltage while operation without lightning protection.

Kabellängen auch für Antennenanlagen ohne Blitzschutz gültig

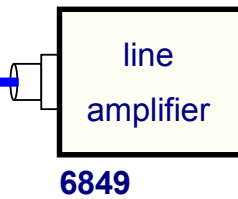
ACHTUNG!

Bei Betrieb ohne Blitzschutz Gefahr der Zerstörung der Elektronik durch Überspannung

GPS clock system



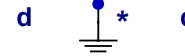
A



B



C




- A = max. 100m (328.0 ft)
- A = min. 50m (164.0 ft)
- B+C = max. 100m (328.0 ft)
- B,C = min. 5m (16.4 ft)

EARTH STRAP (braided):

- 10 mm² (0.0155 inch²) for max. d=10m (32.8 ft)
- 4 mm² (0.0062 inch²) for max. d=2.5m (8.2 ft)

* equipotential bonding bar (e.q.b.b.)

| | | | | | |
|----------|-------------|------|-------------------------------|----------|--|
| changes | | | drawing number ZA01052832 | | sheet |
| | | | cable configuration max. 200m | | |
| | | | date | 28.05.01 | system |
| 15.10.01 | text | Vo | name | Grauer |  fon: +49 2351 938686 fax: +49 2351 938693 http://www.hopf.com mail: info@hopf.com |
| 15.08.01 | earth strap | Gr | check | | |
| 06.07.01 | B, C min. | Mai | size | A4 | |
| date | changes | name | | | |

GPS antenna cabling for max. 325m (1066 ft) cable

with **hopf** low loss LSZH* cable (KA110109)

* low smoke zero halogen

Cable lengths are also applicable for aerial systems without lightning protection.

ATTENTION!

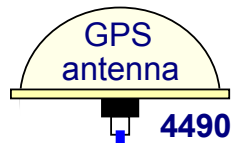
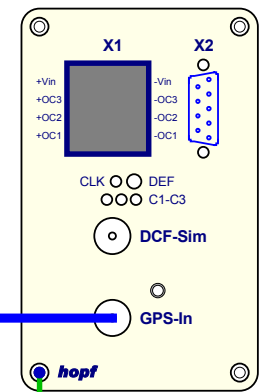
Danger of destruction of electronics by overvoltage while operation without lightning protection.

Kabellängen auch für Antennenanlagen ohne Blitzschutz gültig

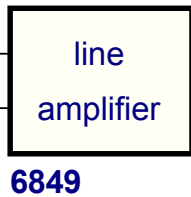
ACHTUNG!

Bei Betrieb ohne Blitzschutz Gefahr der Zerstörung der Elektronik durch Überspannung

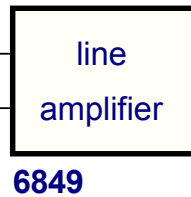
GPS clock system



A



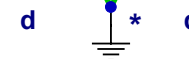
B



C



D




- A = max. 100m (328.0 ft)
- B = max. 125m (410.0 ft)
- A,B = min. 50m (164.0 ft)
- C+D = max. 100m (328.0 ft)
- C,D = min. 5m (16.4 ft)

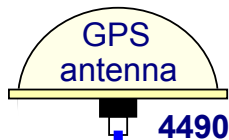
EARTH STRAP (braided):

10 mm² (0.0155 inch²) for max. d=10m (32.8 ft)
 4 mm² (0.0062 inch²) for max. d=2.5m (8.2 ft)

* equipotential bonding bar (e.q.b.b.)

| | | | | | |
|----------|-------------|------|-------------------------------|----------|--|
| changes | | | drawing number ZA01052833 | | sheet |
| | | | cable configuration max. 325m | | |
| | | | date | 28.05.01 | system |
| 15.10.01 | text | Vo | name | Grauer |  fon: +49 2351 938686 fax: +49 2351 938693 http://www.hopf.com mail: info@hopf.com |
| 15.08.01 | earth strap | Gr | | | |
| 06.07.01 | C, D min. | Mai | check | | |
| date | changes | name | size | A4 | |

GPS antenna cabling for Power Splitter 4443 (Configuration 1)



with **hopf** low loss LSZH* cable (KA110109)

* low smoke zero halogen

Cable lengths are also applicable for aerial systems without lightning protection.

ATTENTION!

Danger of destruction of electronics by overvoltage while operation without lightning protection.

Kabellängen auch für Antennenanlagen ohne Blitzschutz gültig

ACHTUNG!

Bei Betrieb ohne Blitzschutz Gefahr der Zerstörung der Elektronik durch Überspannung

A

d

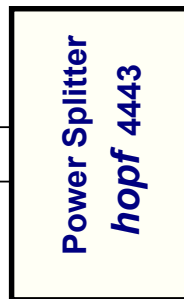
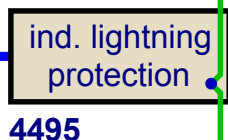
d

d

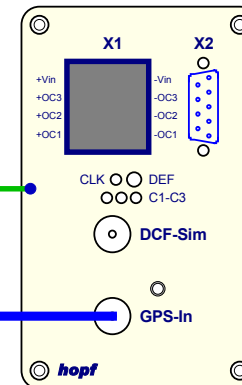
d

C

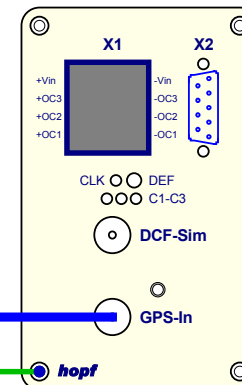
C



GPS clock system



GPS clock system



- A = max. 50m (164.0 ft)
- A+B+C = max. 75m (246.0 ft)
- A,B,C = min. 5m (16.4 ft)

EARTH STRAP (braided):

- 10 mm² (0.0155 inch²) for max. d=10m (32.8 ft)
- 4 mm² (0.0062 inch²) for max. d=2.5m (8.2 ft)

* equipotential bonding bar (e.q.b.b.)

| | | | | |
|----------|---------|---|----------|--------|
| changes | | drawing number ZA01062636 | | sheet |
| | | cable config. (1) for Power Splitter 4443 | | |
| | | date | 26.03.01 | system |
| | | name | Grauer | |
| | | check | | |
| | | size | A4 | |
| 30.01.02 | text | Vo | | |
| 14.08.01 | min. | Gr | | |
| date | changes | name | | |
| | | | | |
| | | Postfach 1847 58468 Lüdenscheid Tel.: 02351 / 938686 Fax: 02351 / 459590 | | |

GPS antenna cabling for Power Splitter 4443 (Configuration 2)

with **hopf** low loss LSZH* cable (KA110109)

* low smoke zero halogen

Cable lengths are also applicable for aerial systems without lightning protection.

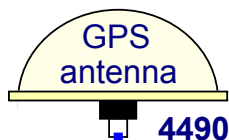
ATTENTION!

Danger of destruction of electronics by overvoltage while operation without lightning protection.

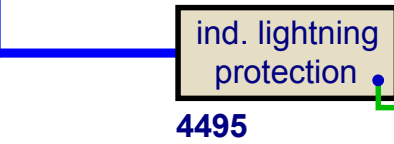
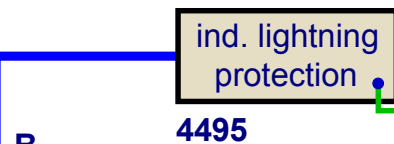
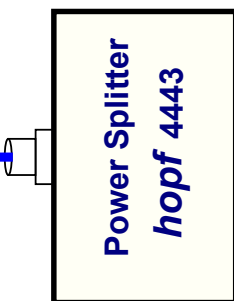
Kabellängen auch für Antennenanlagen ohne Blitzschutz gültig

ACHTUNG!

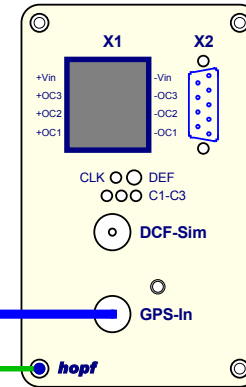
Bei Betrieb ohne Blitzschutz Gefahr der Zerstörung der Elektronik durch Überspannung



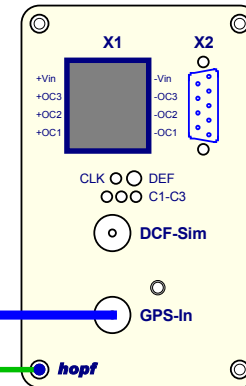
A



GPS clock system



GPS clock system



- A = max. 50m (164.0 ft)
- B+C = max. 25m (82.0 ft)
- A+B+C = max. 75m (246.0 ft)
- A,B,C = min. 5m (16.4 ft)

EARTH STRAP (braided):

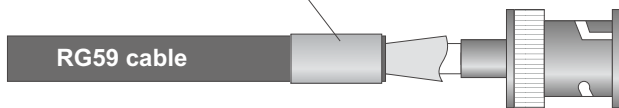
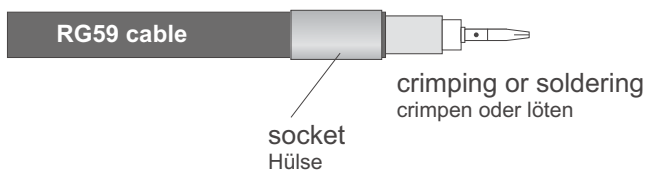
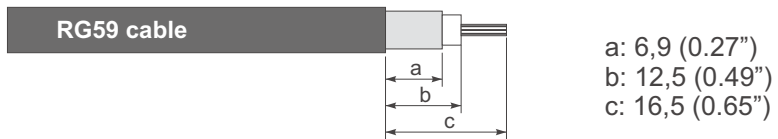
10 mm² (0.0155 inch²) for max. d=10m (32.8 ft)
 4 mm² (0.0062 inch²) for max. d=2.5m (8.2 ft)

* equipotential bonding bar (e.q.b.b.)

| | | | | |
|--|----------|---|------|-------|
| changes | | drawing number ZA02013001 | | sheet |
| cable config. (2) for Power Splitter 4443 | | | | |
| date | 30.01.02 | system | | |
| name | Vollmer | Postfach 1847 58468 Lüdenscheid Tel.: 02351 / 938686 Fax: 02351 / 459590 | | |
| check | | | | |
| date | changes | name | size | A4 |

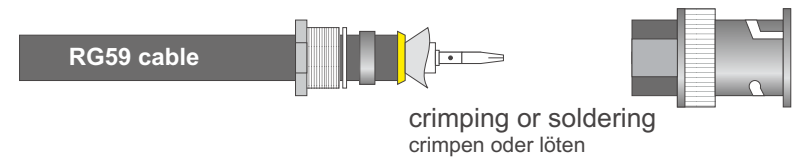
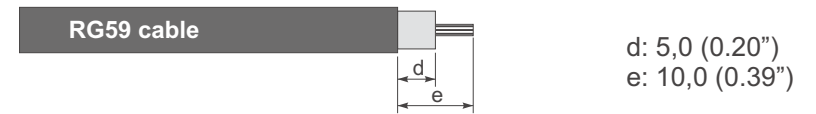
Assembly of RG59 cable (article no.: KA110106)

BNC-plug with **crimping technique** (article no.: ST001103)




Assembly of RG59 cable (article no.: KA110106)

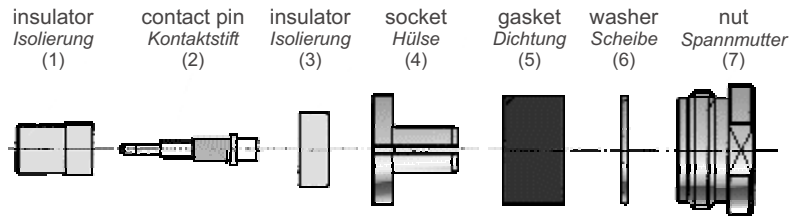
BNC-plug with **screw technique** (article no.: ST001115)



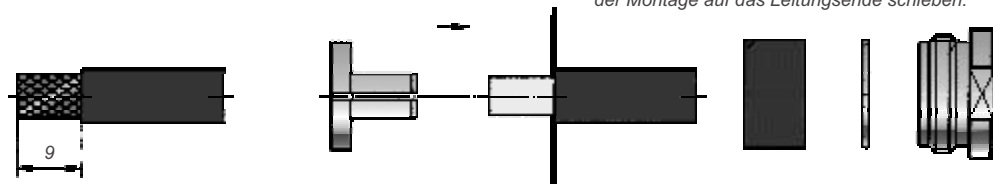
All dimensions in mm (inch)

| | | | | |
|---------|---------|---------------------------|----------|--|
| changes | | drawing number ZC01083105 | | page |
| | | Assembly of RG59 cable | | |
| | | date | 31.08.01 | System |
| | | name | Vollmer |  post box 1847 D-58468 Lüdenscheid fon: (02351) 938686 fax: (02351) 459590 |
| | | check | | |
| | | size | A4 | |
| date | changes | name | size | |

Assembly of **hopf** low loss LSZH* cable (article no.: KA110109) BNC-plug with **screw technique** (article no.: ST001106)

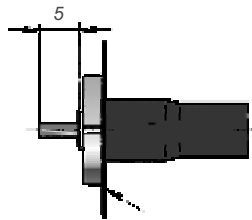


Before mounting, push gasket (5), washer (6) and nut (7) onto the end of the cable.
Dichtung (5), Scheibe (6) und Spannmutter (7) vor der Montage auf das Leitungsende schieben.

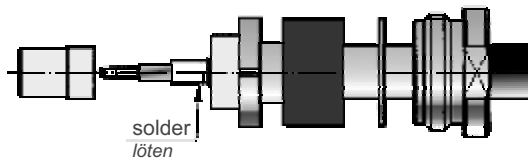
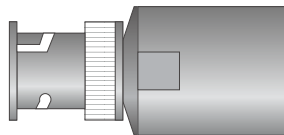


Insulation unit for BNC plug
Abisoliermaß für BNC-Stecker

Turn back netting 90°. Insert the socket between foil and netting up to the attempt. Use knife to carefully slit and remove excess foil.
Geflecht um 90° abwinkeln. Hülse zwischen Folie und Geflecht bis zum Anschlag einschieben. Überstehende Folie mit Messer anritzen und entfernen.




Cut of excess netting. Insulate the internal conductor. Mounting insulator (3) and solder on contact pin (2).
Überstehendes Geflecht abschneiden. Innenleiter abisolieren. Isolierung (3) aufstecken und Kontaktstift (2) anlöten.



Before mounting the housing, the gasket (5) must be pushed up to the socket (4).
Vor dem Aufstecken des Gehäuses, Dichtung (5) bis an die Hülse (4) schieben.

* low smoke zero halogen

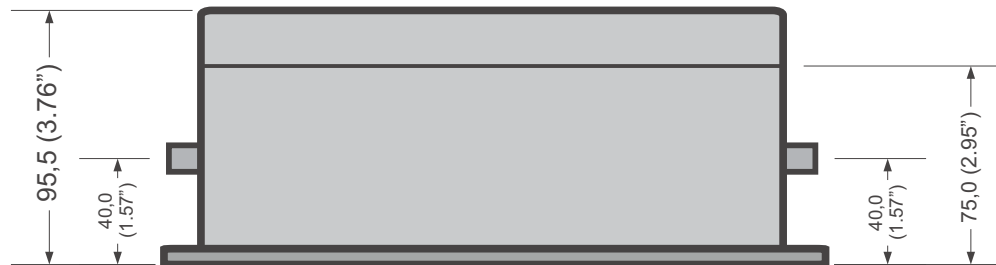
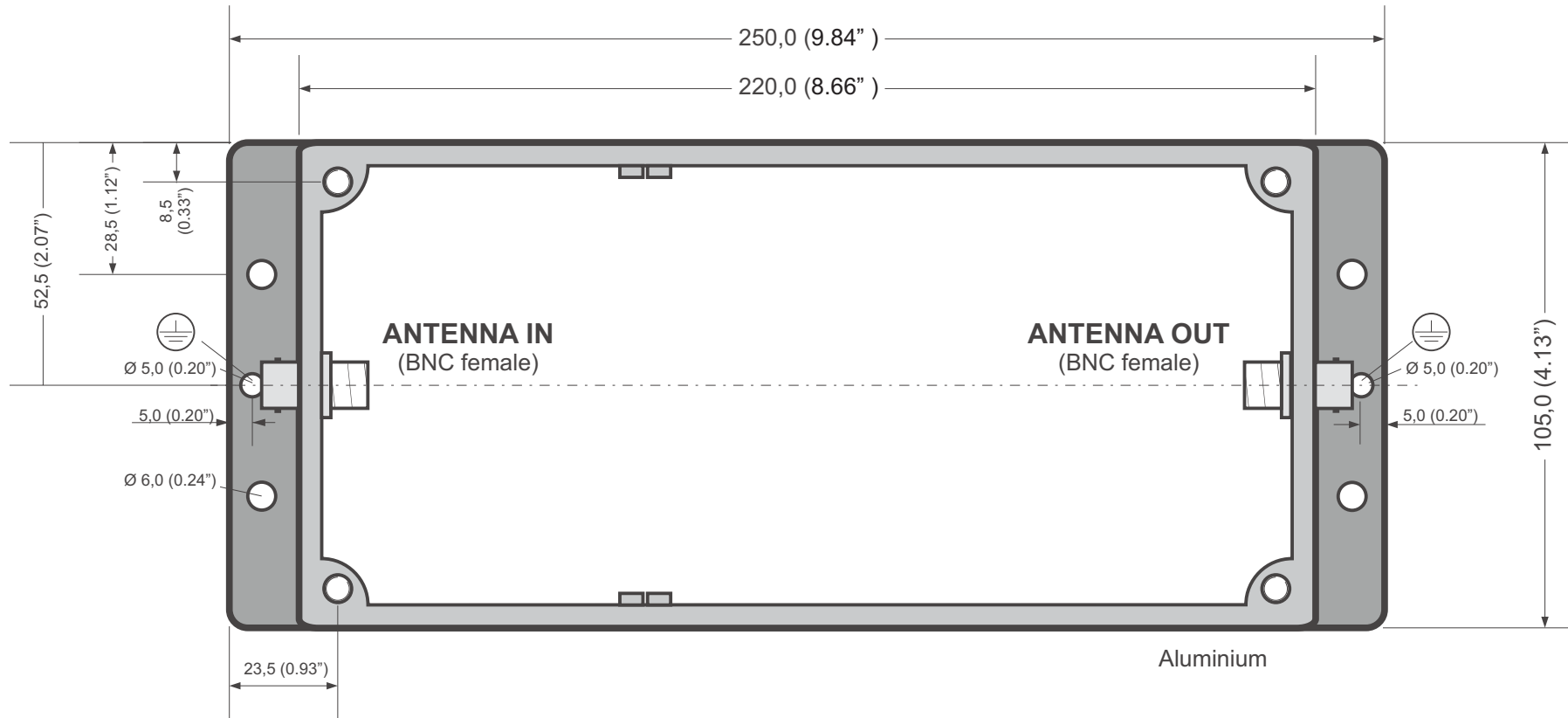
| | | | | | |
|---------|---------|---|----------|------------|------|
| changes | | drawing number | | ZC01090403 | page |
| | | Assembly of hopf low loss LSZH cable | | | |
| | | date | 04.09.01 | System | |
| | | name | Vollmer | | |
| | | check | | | |
| date | changes | name | size | A4 | |



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Dimensions of Lightning Protector (article no. for GPS: FG4495G0 / for DCF77: FG444100)

Abmessungen Blitzschutzgehäuse



All dimensions in mm (inch)

| | | | | |
|---------|---------|-----------------------------------|----------|--------|
| changes | | drawing number ZC01090701 | | page |
| | | Dimensions of Lightning Protector | | |
| | | date | 07.09.01 | System |
| | | name | Vollmer | |
| | | check | | |
| | | size | A4 | |
| date | changes | name | | |

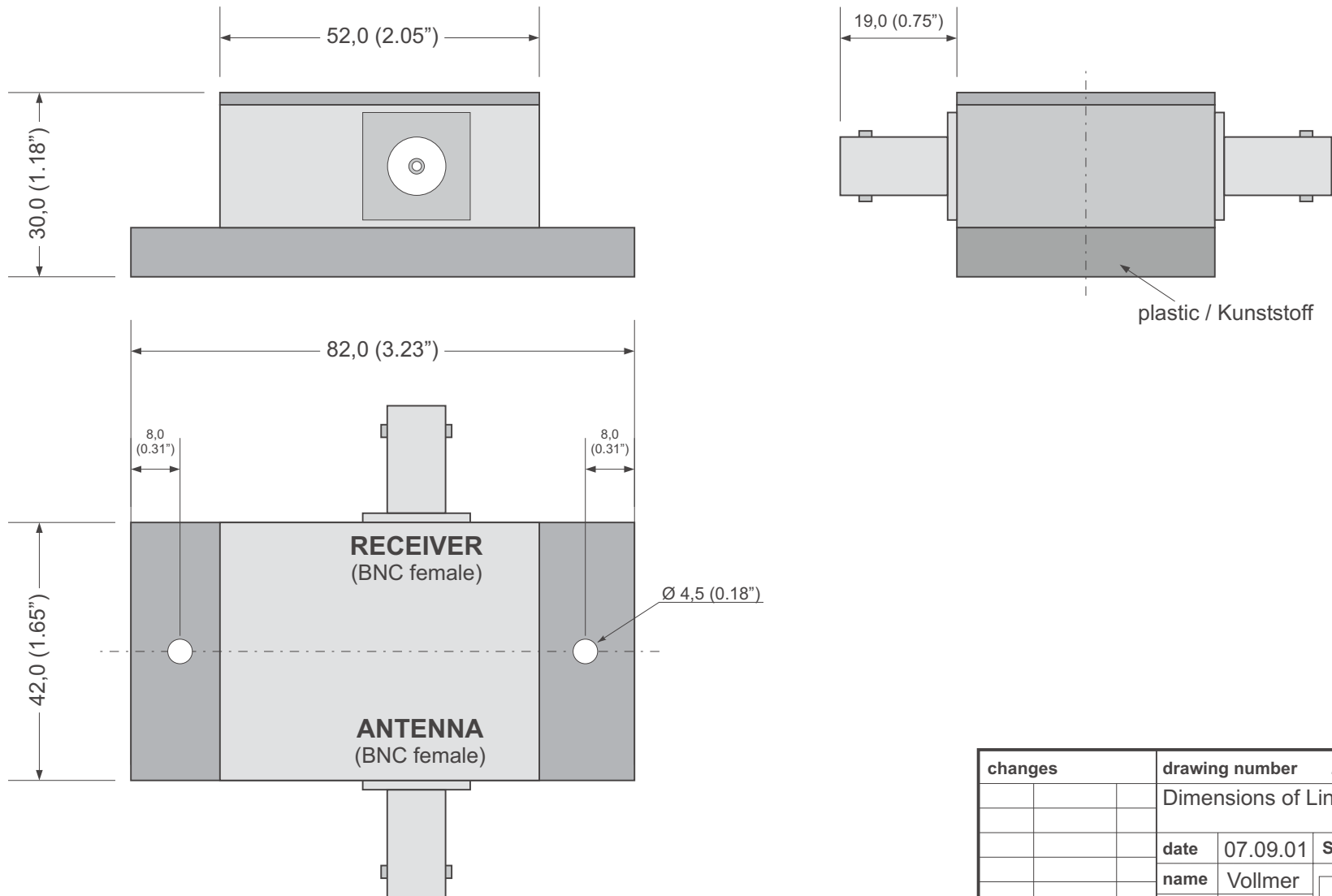


hopf
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fax: (02351) 459590

Dimensions of Line Amplifier (article no.: FG6849G0)

Abmessungen Leitungsverstärker

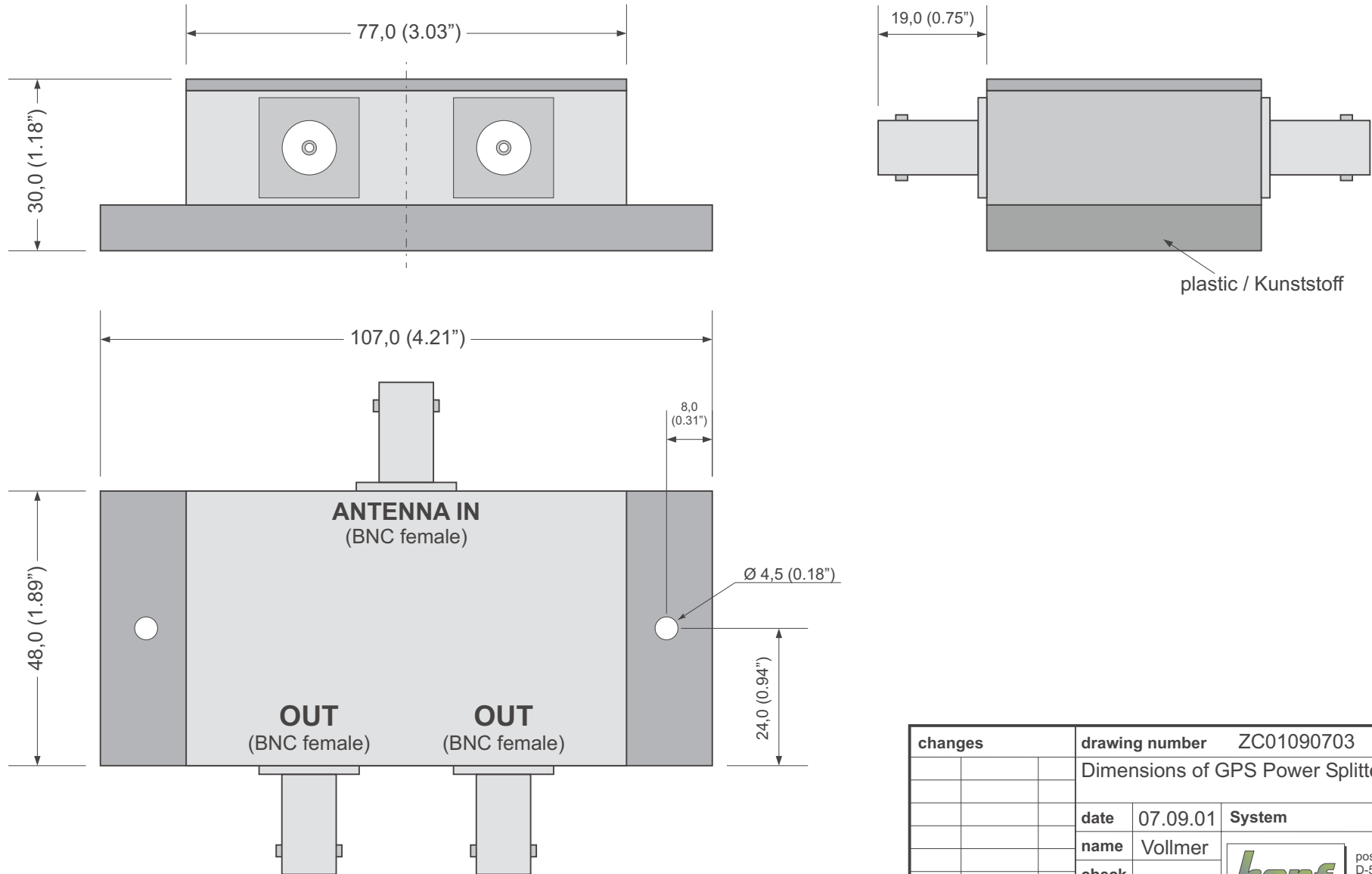


All dimensions in mm (inch)


| | | | | |
|---------|---------|--|---|--------|
| changes | | drawing number ZC01090702 | | page |
| | | Dimensions of Line Amplifier | | |
| | | date | 07.09.01 | System |
| | | name | Vollmer | |
| | | check | | |
| | | size | A4 | |
| date | changes | name |  | |
| | | post box 1847 D-58468 Lüdenscheid fon: (02351) 938686 fax: (02351) 459590 | | |

Dimensions of GPS Power Splitter (article no.: FG4443G00)

Abmessungen GPS Power Splitter



All dimensions in mm (inch)

| | | | | |
|---------|---------|----------------------------------|--|--------|
| changes | | drawing number ZC01090703 | | page |
| | | Dimensions of GPS Power Splitter | | |
| | | date | 07.09.01 | System |
| | | name | Vollmer | |
| | | check | | |
| | | size | A4 | |
| date | changes | name |  post box 1847 D-58468 Lüdenscheid fon: (02351) 938686 fax: (02351) 459590 | |