

SIEMENS

SICLOCK® GPS2000

2XV9450-1AR88-0AA0
2XV9450-1AR88-0AB0
2XV9450-1AR84-0AA0
2XV9450-1AR03
2XV9450-1AR82-0AA0
2XV9450-2AR10-0AA0
2XV9450-2AR50-0AA0
2XV9450-2AR82-0AB0

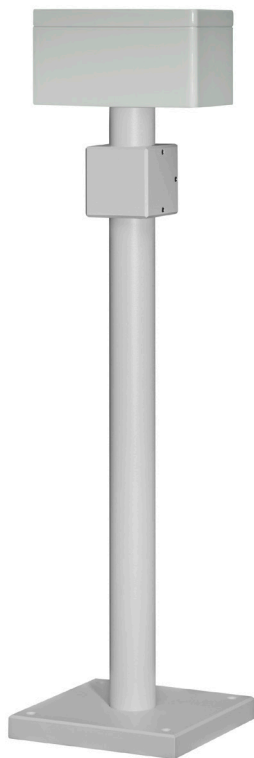
Operating Instructions

GB

English

Version 1.0

As at: February 2016



GPS2000 Wireless receiver and antenna frame



GS1000 PS (Power Supply)

Responsible distributor: **SIEMENS AG**, DF FA S

Manufacturer:

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Power supply 24-230 V AC/DC

WARNING

Danger from line voltage

This product can only function correctly and safely if it is transported, stored, set up, and installed correctly, and operated and maintained as recommended.

Connection and disconnection may only be performed by a qualified electrician! Connect or disconnect power supply cables only when the power is turned off!


Caution

Securing cables with dangerous voltage

Make sure that the connector cannot be released accidentally by pulling on the connecting cable. Lay the cables in cable ducts or cable channels and, if necessary, secure the cables with cable ties.

Caution

Supply of the device GPS1000 PS with dangerous voltage (higher than 60 V DC/42 V AC)

If the device is supplied with dangerous voltage, you must connect the PE of the supply voltage cable to the PE terminal .

Caution

Supply of the device GPS1000 PS with dangerous voltage (higher than 60 V DC/42 V AC)

If the device is supplied with dangerous voltage, you must connect a main power switch or a disconnect device in the unit being supplied or the house wiring to disconnect the devices from the power supply.

CE Conformity

SIEMENS AG, DA FA SE hereby declares that the GPS2000 Wireless Receiver is in conformity with the basic requirements and the other relevant provisions of Directive 1999/5/EC.

The Declaration of Conformity can be downloaded at: www.siemens.de/siclock

Preface

The GPS2000 Wireless Receiver can be directly connected to the current SICLOCK central clocks SICLOCK TC400 and SICLOCK TC100 without connecting the GPS1000 PS (Power Supply). This also applies to the connection to the older and discontinued model SICLOCK TS.

If connected to these central clocks, the power supply for the GPS2000 Wireless Receiver is provided by the SICLOCK TC400/TC100 or the SICLOCK TS.

If you connect the GPS2000 Wireless Receiver to the older and discontinued model SICLOCK TM, the GPS1000 PS is required for the power supply.

If you were to use the GPS2000 as a stand-alone solution that is directly connected to a PC or an S7, the GPS1000 PS is also required as the power source.

1. Quick-Start Guide

1.1. Function

The SICLOCK GPS2000 Wireless Receiver is a modern GPS radio-controlled clock which can be used worldwide for the reception of time signals from the 24 American GPS satellites. A DCF77 time message frame is available at the output of the wireless receiver. This is formed from UTC (Coordinated Universal Time).

The particular advantage of the GPS2000 Wireless Receiver is that the antenna, GPS receiver and GPS decoder are integrated in the device as one unit and there is therefore no need to lay coaxial cables, nor to separately install the decoder together with a power supply.

Both the power supply of the wireless receiver and also the transmission of the DCF77 time message frame is via line current by means of a shielded twin-core control cable with a maximum length of approx. 1000 meters. The power supply module (e.g. SICLOCK GPS1000 PS) is at the opposite end of the control cable. The receiver is thus supplied with power from this module. In the case of the SICLOCK GPS1000 PS, you have to supply the power supply module itself with 24 – 230 V AC/DC, with a SICLOCK TC400/TC100/TS with 24 V DC.

The SICLOCK GPS2000 Wireless Receiver does not require parameters to be assigned.

1.2. Scope of Delivery

The GPS2000 Wireless Receiver is supplied with lightning protection as operation is only permitted with lightning protection. The scope of delivery varies depending on the GPS2000 Wireless Receiver package. The following packages are available:

SICLOCK GPS2000 GPS Wireless Receiver package with lightning protection **2XV9450-1AR84-0AA0**

Comprising

- GPS2000 Wireless Receiver 2XV9450-1AR88-0AA0 with integrated electronics and 2.5m connecting cable with end splices
- Lightning protection module 2XV9450-1AR83

Antenna holding frame for universal mounting

2XV9450-1AR03

Comprising:

- antenna stand with base plate and holding arm,
- cube with 6 hexagonal socket set screws
- Sealing cap
- Allen key for installing the cube

SICLOCK GPS2000 GPS with GPS1000 PS package

2XV9450-1AR82-0AA0

Comprising

- SICLOCK GPS2000 GPS Wireless Receiver package with lightning protection
- SICLOCK GPS1000 PS (Power Supply) 2XV9450-1AR85-0AA2
- Antenna holding frame for universal mounting
- Conduit box for connecting the control cable
- Connecting cable to PC COM port (9-pin D-sub)
- Instruction Manual on CD (German/English)

SICLOCK GPS2000 GPS with TC400

2XV9450-2AR10-0AA0

Comprising

- SICLOCK GPS2000 GPS Wireless Receiver package with lightning protection
- SICLOCK TC400 2XV9450-2AR01
- Antenna holding frame for universal mounting
- Conduit box for connecting the control cable
- Instruction Manual on CD (German/English)

SICLOCK GPS2000 GPS with TC100**2XV9450-2AR50-0AA0**

Comprising

- SICLOCK GPS2000 GPS Wireless Receiver package with lightning protection
- SICLOCK TC100 2XV9450-2AR22
- Antenna holding frame for universal mounting
- Conduit box for connecting the control cable
- Instruction Manual on CD (German/English)

SICLOCK GPS2000 GPS with 20m connecting cable**2XV9450-2AR82-0AB0**

Comprising

- GPS2000 Wireless Receiver 2XV9450-1AR88-0AB0 with integrated electronics and 20m connecting cable with wire end ferrules
- Lightning protection
- Antenna holding frame for universal mounting
- Conduit box for connecting the control cable
- Connecting cable to PC COM port (9-pin D-sub)
- Instruction Manual on CD (German/English)

1.3. Installation Procedure

1. Look for a suitable location for the wireless receiver, taking the following into account:
Install the wireless receiver in such a way that it should be able to "see" as much sky as possible. It must be installed with the housing cover pointing upwards, parallel to the sky.
Do not install the wireless receiver in places where there is lightning hazard! (See Chapter3)
Make sure that there is easy access for service. (Electromagnetic interference fields from the plant do not need to be taken into account as the operating frequency of GPS2000 is above the industrial interference level.)
2. Mark the drill holes for installing the antenna stand in accordance with Figure 9 before drilling and inserting dowels.
3. Make the bore hole for the connecting cable, preferably in the middle underneath the base plate.
4. Assemble the wireless receiver on the antenna frame in accordance with Figure 7 or Figure 8.
5. Thread the cable into the bore hole and screw on the stand. For mounting on flat roofs, use an additional IP67 conduit box and an additional control cable to extend if necessary. Important: Total length max. 1000m
6. Inside the building, install the lightning protection module 2XV9450-1AR83 supplied near the cable entry, If required, install the surface-mounted conduit box supplied.
7. With a system to be synchronized (PC, SICLOCK TM, S7 or similar), mount the power supply module GPS1000 PS on a DIN rail, for example. If the system to be synchronized is a SICLOCK TC400/TC100 or SICLOCK TS, a GPS1000 PS power supply unit is not required.
8. Lay a shielded control cable from the GPS1000 PS power supply module (terminal strip X2/11,12) or the SICLOCK TC400/TC/TS to the lightning protection module (terminal strips 1' and 2', i.e. the output side). Now connect the input side (terminal strips 1 and 2) of the lightning protection module to the antenna connecting cable of the wireless receiver (polarity is not important in this case).
9. Attach the shielding of the control cable to the equipotential busbar in the control cabinet.
10. You have the following options for setting up synchronization to your plant:
Connection to a PC: via the cable supplied for X3 at SICLOCK GPS1000 PS to a free COM port. (Driver software required: 2XV9450-1AR28). In addition, supply the GPS1000 PS via the connections to the terminal strip X1/13, 14, 15.
Connection to SICLOCK TM: Using a shielded twin-core control cable (e.g. LiYCY 2x 1 mm²) from the terminal strip X2/1,2 at SICLOCK GPS1000 PS to the SICLOCK TM, terminal strip X2/5, 6. In addition, supply the GPS1000 PS via the connections to terminal strip X1/13, 14, 15.
Connection to SICLOCK TC400, TC100 and TS: Using a shielded twin-core control cable (e.g. LiYCY 2x 1 mm²) directly from the wireless receiver (the GPS1000 PS is not required) to the SICLOCK TC400/TC100 terminal strip X2/8, 9 OR X2/10/11 or to the SICLOCK TS terminal strip X2/9,10.
Connection to SIMATIC S7 digital input: Using a shielded twin-core control cable (e.g. LiYCY 2x 1 mm²) from the terminal strip X2/3, 4 of the SICLOCK GPS1000 PS to the corresponding SIMATIC S7 digital input. (The required function block for the Step7 software for the SIMATIC Manager and the TIA_Portal can be found on the Operating Instructions CD). In addition, supply the GPS1000 PS via the connections to the terminal strip X1/13, 14, 15.
11. Switch on the mains power of the SICLOCK GPS1000 PS or the SICLOCK TC400/TC/TS.
12. Setting the parameters for the PC driver software or the SICLOCK TC400/TC100/TM/TS or the S7 should be undertaken in accordance with operating specifications for the plant.

1.4. Operation and Maintenance

In the case of operation of a SICLOCK GPS1000 PS

After successful installation, the mains voltage can be directly switched on at the SICLOCK GPS1000 PS. The green "Pwr." LED lights up. Initialization of the wireless receiver starts (yellow LED "Sig." is constantly lit). After successful initialization processing of the time message frames begins. Depending on the reception quality and number of satellites received, this process is usually completed after 30 minutes (in as little as 15 minutes with good conditions). In this phase the wireless receiver sends a "heartbeat" in the form of 50ms pulses in 2-second intervals (indicated by the green LED).

The start of normal operation, with permanent radio reception is indicated by the transition of "heartbeat" pulses on DCF77 message frames (with UTC). If the yellow LEDs do not light up or flash at all, this indicates a device defect or a breakage of the antenna cable.

Normal operation then starts. The SICLOCK1000 PS now constantly makes DCF77 message frames with UTC available. The second pulses of these message frames are indicated by the brief non-appearance of the LED "Sig." at the GPS1000PS. The DCF77 message frames are constantly available in parallel at the outputs "TTY/20mA" and "TTY inv." at the terminal strip X2 as active TTY/20 mA signals and at the SUB-D jack X3 as an RS232 signal.

The SICLOCK GPS2000 wireless receiver operates maintenance-free.

If you have not installed alarm signaling for recognizing a malfunction of radio synchronization of the connected system in the plant, then checks should be made at regular intervals that the yellow LED "Sig." on the GPS1000 PS power supply module is still flashing (at one-second intervals).

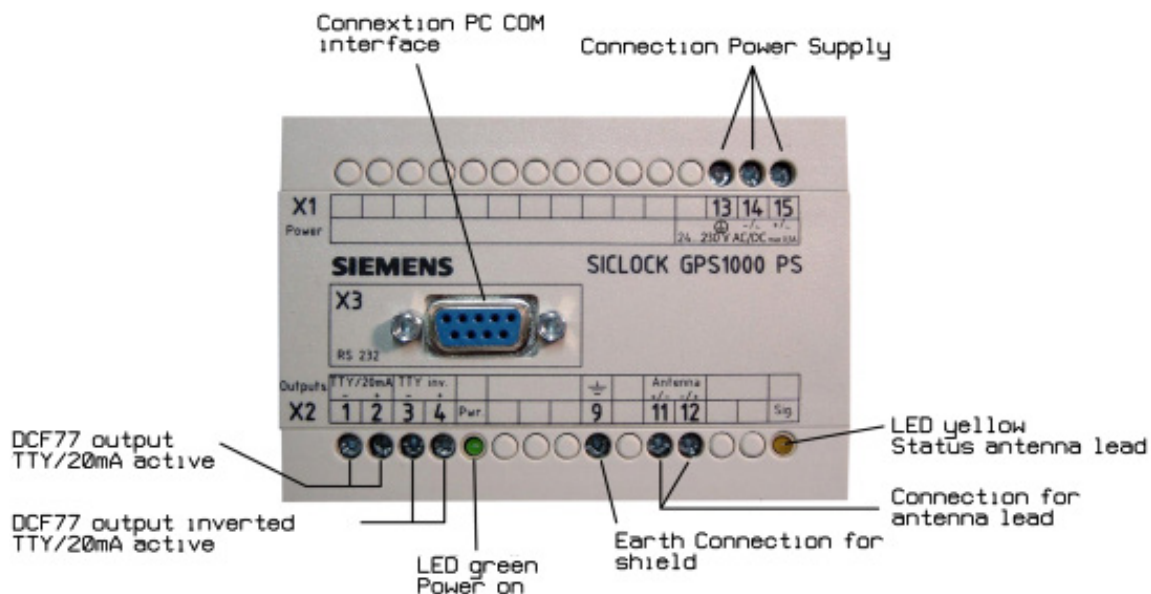


Figure 1: Front view of GPS1000 PS

Direct operation at a SICLOCK TC400/TC100/TS

After the power supply of the SICLOCK TC400/TC100/TS has been applied the receiver unit integrated in the wireless receiver searches for available GPS satellites and initializes time reception. Depending on the number of receivable satellites, this process takes between 15 and 30 minutes. In the case of an unfavorable reception location for the antenna or wireless receiver, it may also take longer than 30 minutes until the required number of satellites is received. The initialization process therefore takes longer. During the initialization process the SICLOCK GPS2000 sends the heartbeat signal.

Normal operation then starts. The SICLOCK2000 now constantly makes DCF77 message frames available with UTC.

The SICLOCK GPS2000 wireless receiver operates maintenance-free.

2. Installation variants

2.1. Connection to SICLOCK TM or PC

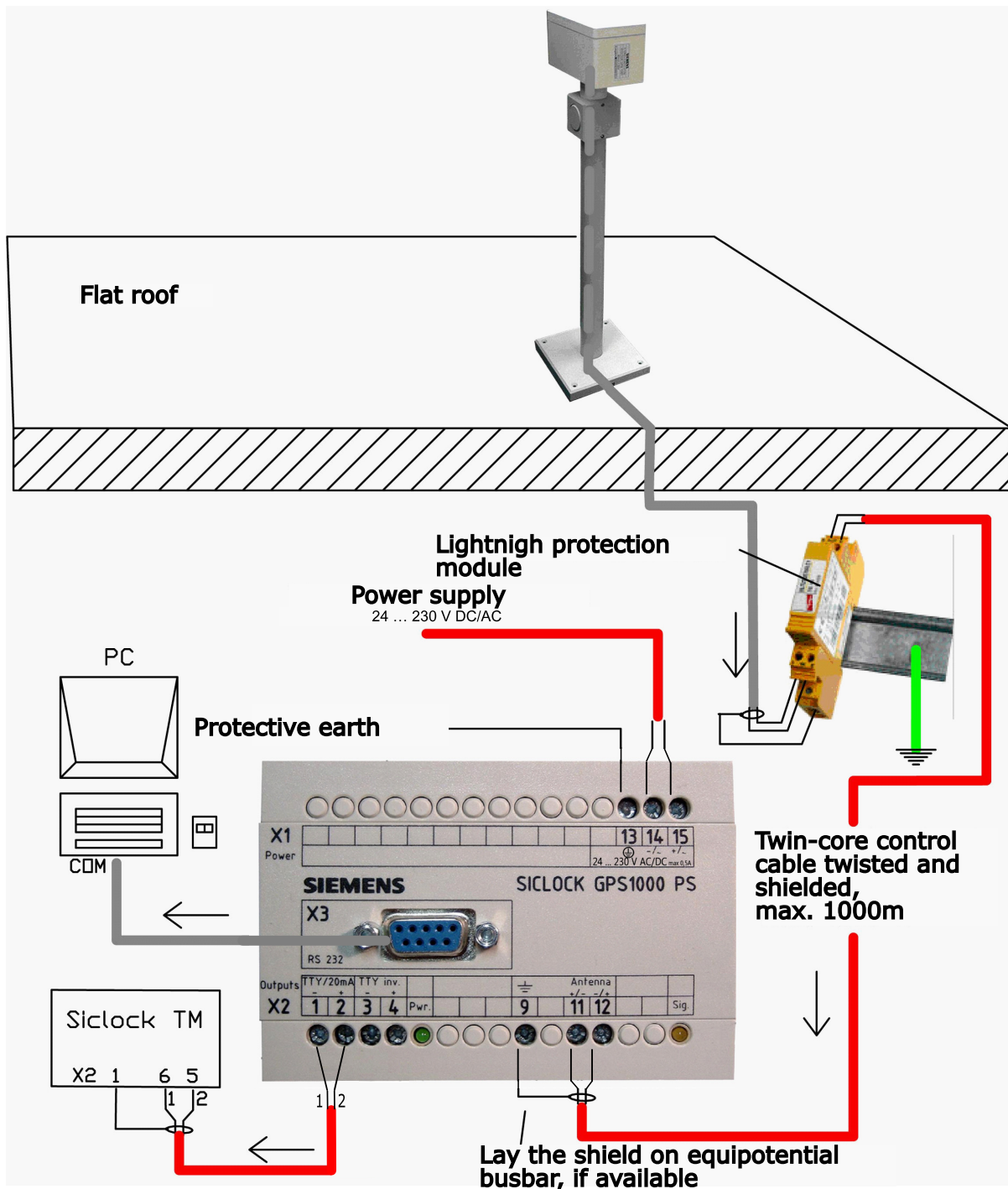


Figure 2: Installation diagram for SICLOCK TM and PC with lightning protection module

⚠ Warning

Operation without a lightning protection module may result in damage to your plant.

Required parameter assignment for SICLOCK TM:

1. Set input E1 to DCF passive.
2. Select the time zone depending on your location in relation to UTC (see SICLOCK TM Operating Instructions).

Figure 2 shows a diagram of the connection of GPS2000 to SICLOCK TM or a PC with the lightning protection module 2XV9450-1AR83. The parts illustrated in the photograph and the gray cables are included in the scope of delivery for the complete package SICLOCK GPS2000 (including the lightning protection module). You must provide the red and green cables.

The lightning protection module should be installed in the immediate vicinity of the entry point in the building of the cable coming from the wireless receiver. **Note:** When connecting the lightning protection module, please pay attention to the input (terminal strips 1 and 2) and the output (terminal strips 1' and 2')! The input points to the SICLOCK GPS2000 wireless receiver.

Important
It is absolutely essential that the earth cable shown in green and connected to the DIN rail (cross-section 25mm ² or more) is connected via the shortest route and as straight as possible to a foundation earth.

2.2. Connection to SICLOCK TC400 / TC100 OR TS

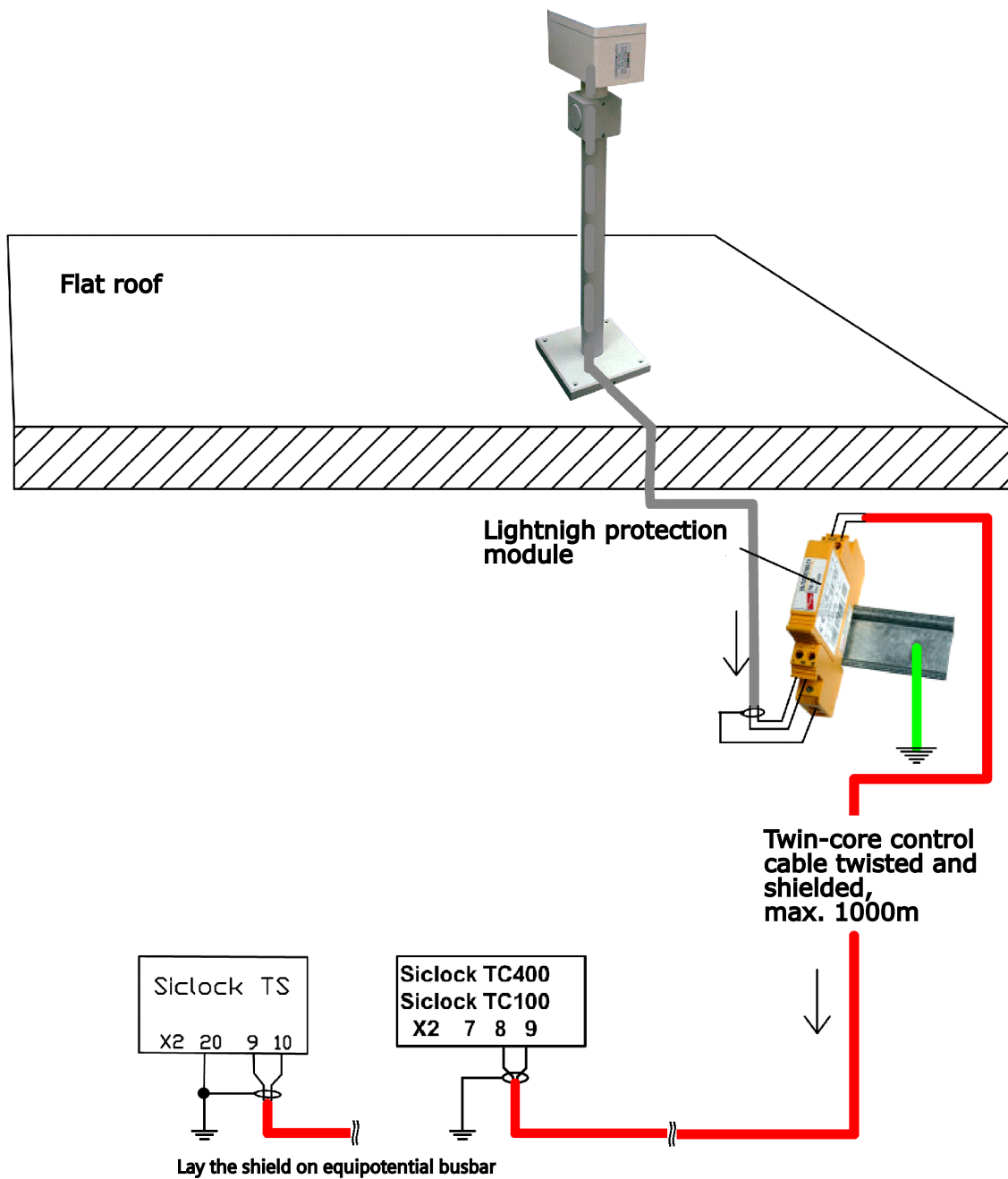


Figure 3: Installation diagram for SICLOCK TC400 / TC100 OR TS with lightning protection module

⚠ Warning

Operation without a lightning protection module may result in damage to your plant.

Required parameter assignment for SICLOCK TC400 / TC100 OR TS:

1. Set input E1 to "GPS1000". (See also SICLOCK TS Operating Instructions)
2. Select the time zone depending on your location in relation to UTC.
3. There is nothing else to take into account when connecting the GPS2000 wireless receiver to the SICLOCK TC400 / TC100.

Figure 3 shows a schematic diagram of the connection of the GPS2000 wireless receiver to the SICLOCK TC400 / TC100 and SICLOCK TS with the lightning protection module 2XV9450-1AR83. The parts illustrated in the photograph and the gray cables are included in the scope of delivery for the complete package SICLOCK GPS2000 (including the lightning protection module). You must provide the red and green cables.

The lightning protection module should be installed in the immediate vicinity of the entry point in the building of the cable coming from the wireless receiver. **Note:** When connecting the lightning protection module, please pay attention to the input (terminal strips 1 and 2) and the output (terminal strips 1' and 2')! The input points to the SICLOCK GPS2000 wireless receiver.

Important
It is absolutely essential that the earth cable shown in green and connected to the DIN rail (cross-section 25mm ² or more) is connected via the shortest route and as straight as possible to a foundation earth.

3. Lightning protection

When exterior antennae are used in industrial areas, a reliable lightning protection is of the utmost importance for operating the system safely.

The installation of a lightning protection unit alone is not sufficient. The wireless receiver and antenna cable must be installed in such a way that a direct lightning strike or flashover in these parts is not possible. Otherwise it would not be possible to prevent the destruction of parts of the unit.

3.1. Lightning theory

Recordings made with high-speed cameras have shown that lightning does not cover the distance between the storm cloud and the point of impact at a continuous and constant speed but travels intermittently at intervals on average of 20 to 40 meters in length. Between these lightning advancing distances there are holding points of a few microseconds, during which time further energy is built up (see Figure 4).

The possible locations of the subsequent holding points lie within a sphere (in this case referred to as a ball of lightning) around the previous holding point with 20 to 40 meter radius. Upon reaching the last holding point before the impact, parts of the earth's surface lie within the ball of lightning and possibly also protruding elevated parts lying on earth potential (e.g. parts of buildings). Lightning then strikes exactly at the point at the shortest distance from the last holding point.

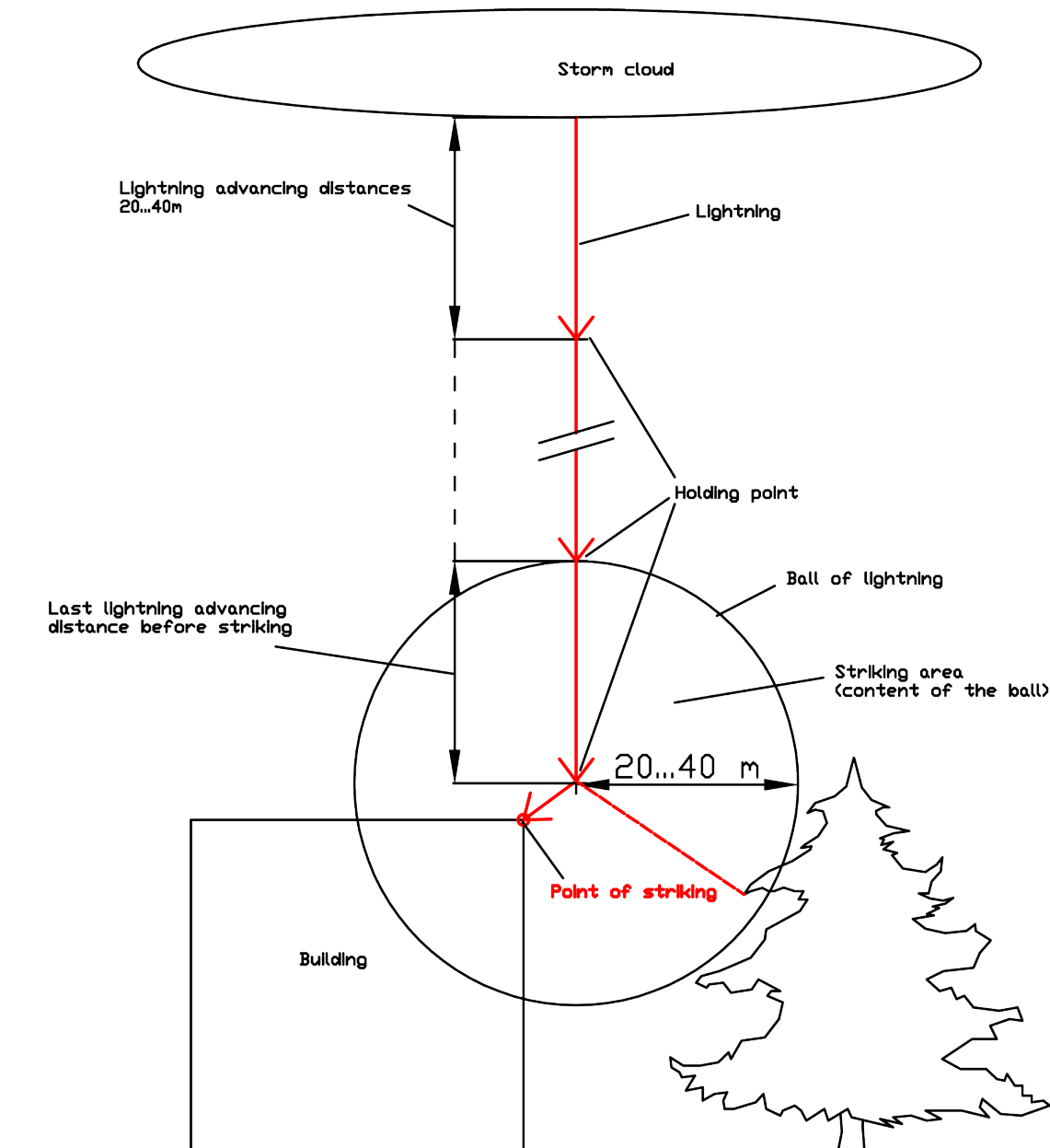


Figure 4: The course of a lightning strike

3.2. Parts of buildings in danger of being struck by lightning

Potential areas in danger of being struck by lightning can now be determined in a simple manner by conjuring up a mental picture of the ball of lightning rolling over all the surfaces and edges of the building to be examined (see Figure 5 and Figure 6).

All the areas where the ball of lightning touches surfaces or edges are in danger of being struck by lightning (shown in red).

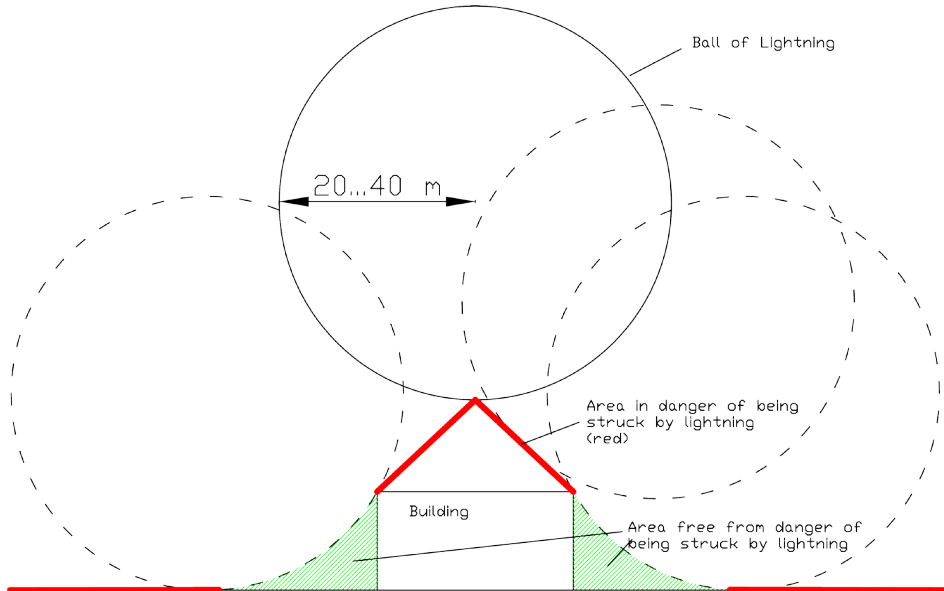


Figure 5: Determination of potential areas where lightning could strike (normal buildings)

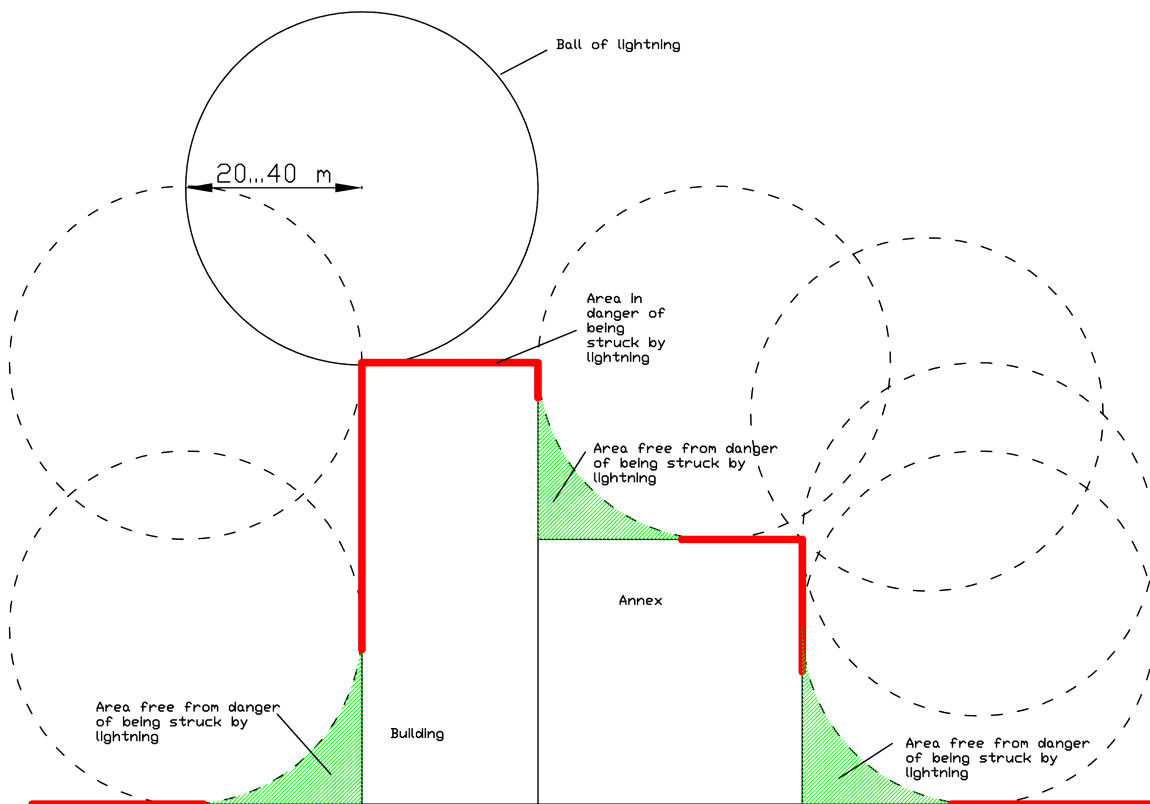


Figure 6: Determination of potential areas where lightning could strike (industrial buildings)

3.3. Induction effect during lightning strikes

The second important influencing parameter for the choice of location is the induction effect, which arises from lightning conductors or building parts where current flows through.

When lightning strikes a lightning conductor, within a few hundred nanoseconds voltages of several megavolts are built up, which result in conducted currents of up to several 10,000 amps with correspondingly steep current leading edges (depending on the inductive resistance of the conductor). The fields that generate induction voltages in the kilovolt range at a distance of 2 meters from the antenna or antenna cable produce are correspondingly strong.

Furthermore, when the distance is too short, there is a danger of flashover from the lightning conductor to parts of the antenna unit.

3.4. Choosing a safe location

Caution
<p>From the information outlined in the previous chapter, the factors below should be taken into account when choosing a location, with regard to protection against lightning strikes:</p> <ol style="list-style-type: none">1. The wireless receiver and antenna cable should always be installed at a distance of at least 2 meters from lightning conductors and areas in danger of being struck by lightning, in conformity with Figure 5 and Figure 6 in the green area - never in the red area)!2. Lead the antenna cable inside the building via the shortest route.3. Lay the antenna cable in principle at right angles to nearby lightning conductors, as then the induction effect is at its lowest.4. Make sure there is always 2m distance between lightning conductors and antenna cables laid inside the building; with many walls there is still a danger of the lightning striking through the wall.5. Install the lightning protection module for conduction of induced surge voltage inside the building, directly at the entry point of the antenna cable.

3.5. Installation of the lightning protection module 2XV9450-1AR83

The lightning protection module 2XV9450-1AR83, provided for the conduction of induction voltage (not included under the scope of delivery of SICLOCK GPS2000) consists of a base part and a lightning conductor module which can be inserted in the base part. Connect the DIN rail supplied with the unit to the earth cable. Basically, you should install the lightning protection module inside the building at the place where the antenna cable enters the building. Ideally at this point of entry, there should be a straight connection lead to a separate foundation earth.

Several changes of direction with small radii and rolling up the reserve cable in front of the foundation earth are extremely detrimental to the conduction effect.

For details of installation, please consult the instructions enclosed with the lightning protection module.

4. Installing the wireless receiver

4.1. Procedure for selecting the installation location

The best reception is achieved when the wireless receiver is installed in the open.

This however, means that there are possible associated dangers of lightning striking and so the selection criteria in 3.4 are of the utmost importance!

With regard to the best properties for reception, the following points must especially be taken into account when selecting a suitable location:

The antenna should "see" as much sky as possible, i.e. it should not be overshadowed by large buildings, or be installed underneath parts of buildings etc. A preferred location for the antenna for example, would be on a flat roof.

Preferred locations inside a building are underneath large (!) window frontages or under glass domes.

4.2. Mounting procedures

The following figures show the assembly of the antenna for wall or flat roof mounting.

Due to sealing problems with regard to roofs, wall mounting is generally preferable to flat roof mounting.

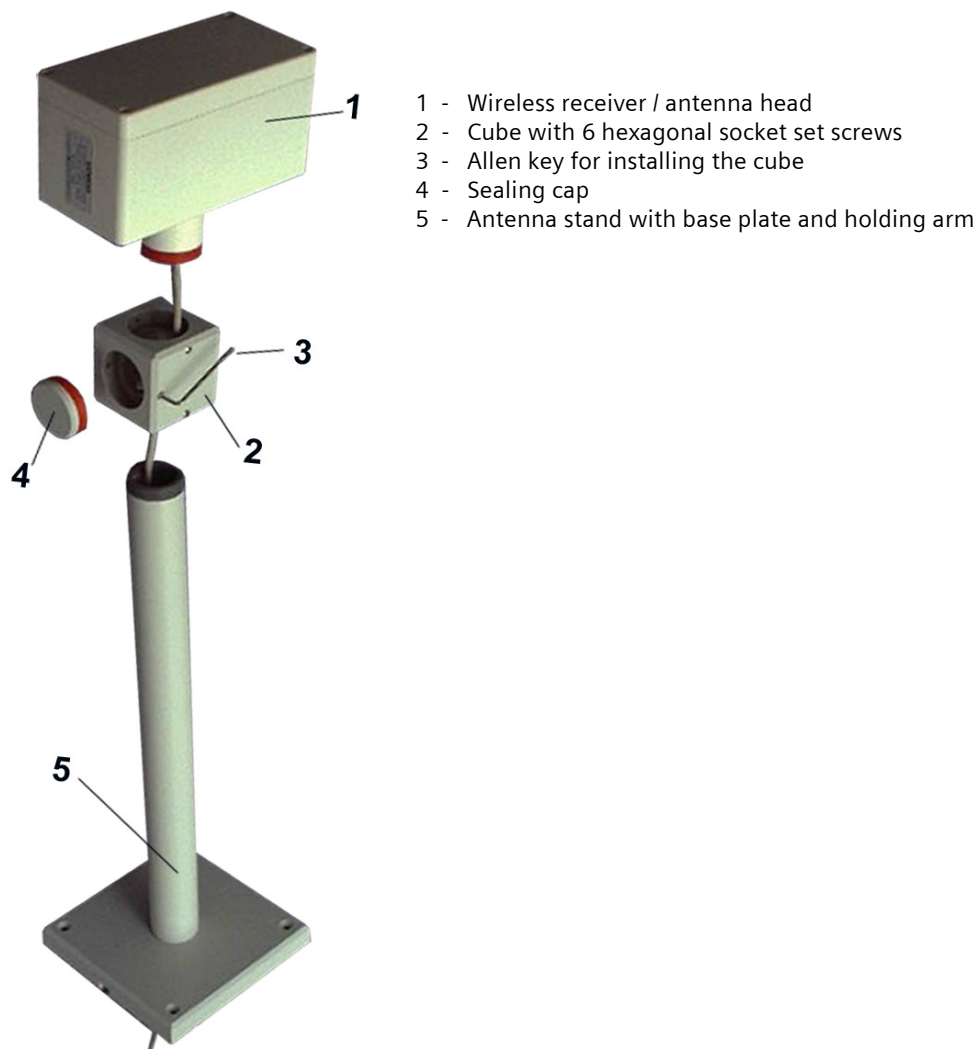


Figure 7: Flat roof installation

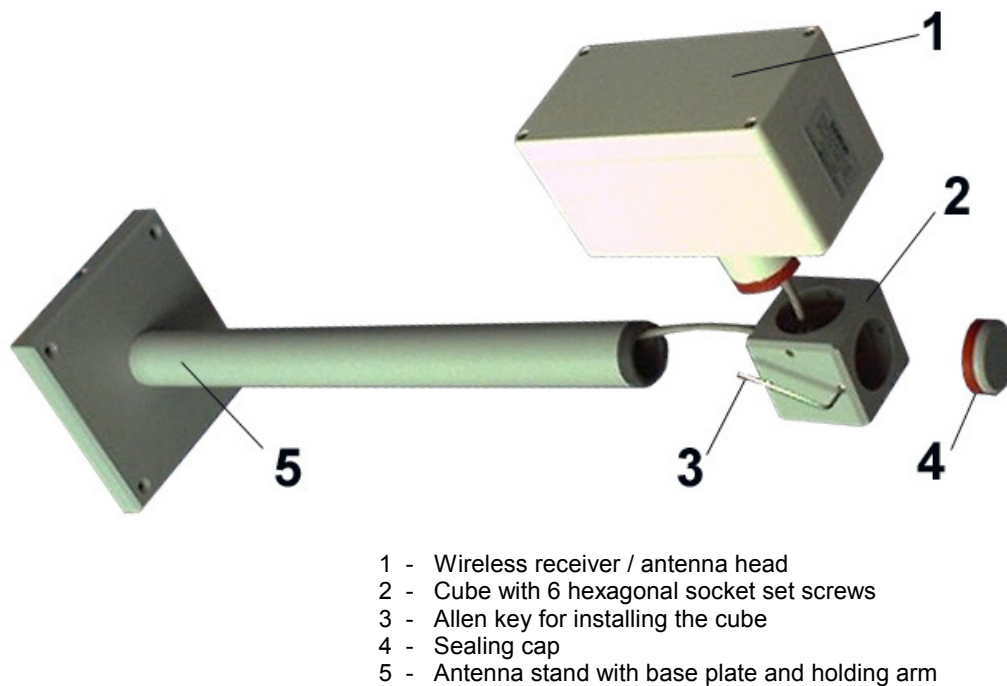


Figure 8: Wall mounting

- (a) Mark the position of the holes for mounting in the intended place with the aid of the base plate (5) before drilling the holes and inserting the dowels.
- (b) When preparing to install the antenna, it must be taken into account whether the antenna is to be assembled for wall mounting or flat roof installation.
 - When installing the antenna on a flat roof (Figure 7), insert the connecting cable of the wireless receiver (1) in a straight line through 2 opposite openings of the cube (2). Push the antenna head support of the wireless receiver into the opening of the cube as far as it goes, and gently tighten on the left and on the right with the two hexagonal socket set screws as provided. Insert the connecting cable from above through the antenna stand (5). Push the cube (2) with the already installed wireless receiver (1) as far as it goes on the holding arm and tighten it gently on the left and on the right on the holding arm with the 2 hexagonal socket set screws as provided. Now adjust the wireless receiver radially (this has no influence on the reception properties). To do this, loosen the hexagonal socket set screws again. After this, tighten the hexagonal socket set screws again. Finally, close the opening in the cube (2) with the sealing cap (4) and then gently tighten the two hexagonal socket set screws on the left and right.
 - When installing the antenna on a wall (Figure 8), insert the connecting cable of the wireless receiver (1) in a straight line through 2 opposite openings of the cube (2). Push the antenna head support of the wireless receiver into the opening of the cube as far as it goes, and gently tighten on the left and on the right with the two hexagonal socket set screws as provided. Insert the connecting cable from above through the antenna stand (5). Push the cube (2) with the already installed wireless receiver (1) as far as it goes on the holding arm and tighten it gently on the left and on the right on the holding arm with the 2 hexagonal socket set screws as provided. Now place the stand in position, loosen the hexagonal socket set screws again so that you can align the cover surface of the antenna head parallel to one edge of the base plate and then tighten the hexagonal socket set screws again. Finally, close the opening in the cube (2) with the sealing cap (4) and then gently tighten the two hexagonal socket set screws on the left and right.
- (c) The drill hole through the wall or through the roof is best made in the middle underneath the base plate. Now insert the connecting cable through the drill hole and screw on the complete antenna stand. Alternatively, you can also lay the connecting cable through the slot in the base plate and lead it outside the base plate through the wall or roof.

5. Appendix

5.1. Technical Data

SICLOCK GPS2000

Wireless receiver with mounting stand

Operating frequency:	1.574 GHz
Precision (room temperature):	static delays are compensated. A total jitter of around ± 100 ns remains. The precision also depends on the power supply source and the connecting cable. (See Chapter 5.3)
Time transferred:	UTC
Assignment of parameters:	not necessary
Antenna cable (coaxial):	not necessary
Connecting cable:	shielded twin-core control cable
Connection extension:	via a shielded twin-core control cable and conduit box supplied
Maximum cable length:	1000m
Time message frame transmitted:	DCF77 signal without summertime bits
Power supply:	Line current via connecting cable directly from SICLOCK TC400 / TC100 / TS (20 mA) or from GPS1000 PS (max. 40 mA)
Power consumption:	< 1 W
Dimensions	(W x H x D)
Antenna frame:	160 x 630 x 160mm
Antenna head:	160 x 85 x 80mm
Degree of protection:	IP 65
Operating temperature:	-40°C to +60°C
Operating height:	< 2000m above sea level
Mounting antenna stand:	With 4 screws, can be mounted and oriented in any position

SICLOCK GPS1000 PS

Power supply unit for operation with a SICLOCK TM or a PC or an S7

Power supply:	24-230 V AC/DC
Power consumption:	0.5 A – 0.03 A
Power supply GPS2000:	48 V / 40 mA
DCF77 outputs:	2
SICLOCK TM, PCON, EOPC:	TTY / 20 mA
PC (COM port):	RS232
Dimensions (W x H x D):	100 x 75 x 125mm
Degree of protection:	IP 40
Operating temperature:	0°C to +50°C
Operating height:	< 2000m above sea level
Installation:	35mm DIN rail

5.2. Ordering Data

Hardware packages:

For details see Chapter 1.2 Scope of Delivery

SICLOCK GPS2000 GPS Wireless Receiver package with lightning protection	2XV9450-1AR84-0AA0
Antenna holding frame for universal mounting	2XV9450-1AR03
SICLOCK GPS2000 GPS with GPS1000 PS package	2XV9450-1AR82-0AA0
SICLOCK GPS2000 GPS with TC400	2XV9450-2AR10-0AA0
SICLOCK GPS2000 GPS with TC100	2XV9450-2AR50-0AA0
SICLOCK GPS2000 GPS with 20 m cable	2XV9450-2AR82-0AB0

Software:

DCF77 receiving service for Windows:	2XV9450-1AR28
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The DCF77 receiving service for SIMATIC S7 is included on the Operating Instructions CD German/English

Accessories:

Lightning protection antenna cable:	2XV9450-1AR83
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Replacement part:

SICLOCK GPS2000 antenna head	2XV9450-1AR88-0AA0
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5.3. Precision:

The achievable precision is system-dependent, i.e. it depends on the constellation of the SICLOCK GPS2000 wireless receiver and the downstream components.

GPS2000 Wireless Receiver

The GPS receiver in the SICLOCK GPS2000 has a system-related precision of ± 100 ns.

GPS2000 in conjunction with TC400

If the SICLOCK GPS2000 is supplied with power from a SICLOCK TC400, the accuracy (due to the total jitter) is around ± 100 ns at the output of the GPS2000 at room temperature.

GPS2000 in conjunction with TC100

If the SICLOCK GPS2000 is supplied with power from a SICLOCK TC100, the accuracy (due to the total jitter) is around ± 150 ns at the output of the GPS2000 at room temperature.

GPS2000 in conjunction with GPS1000 PS

As the SICLOCK GPS1000 PS does not have any internal compensation, in the case of operation with the GPS1000 PS you must generally carry out compensation of the received signal.

Furthermore, for the case where the GPS1000 PS is connected to a PLC (S7), the resolution due to the sampling intervals of the PLC (> 1 ms) is significantly restricted.

GPS jamming/ spoofing

Spoofing: No measures necessary

Jamming: No measures necessary As soon as the signal is sufficiently disturbed, the GPS2000 wireless receiver changes to the "heartbeat mode" (2-second pulses).

5.4. Antenna stand

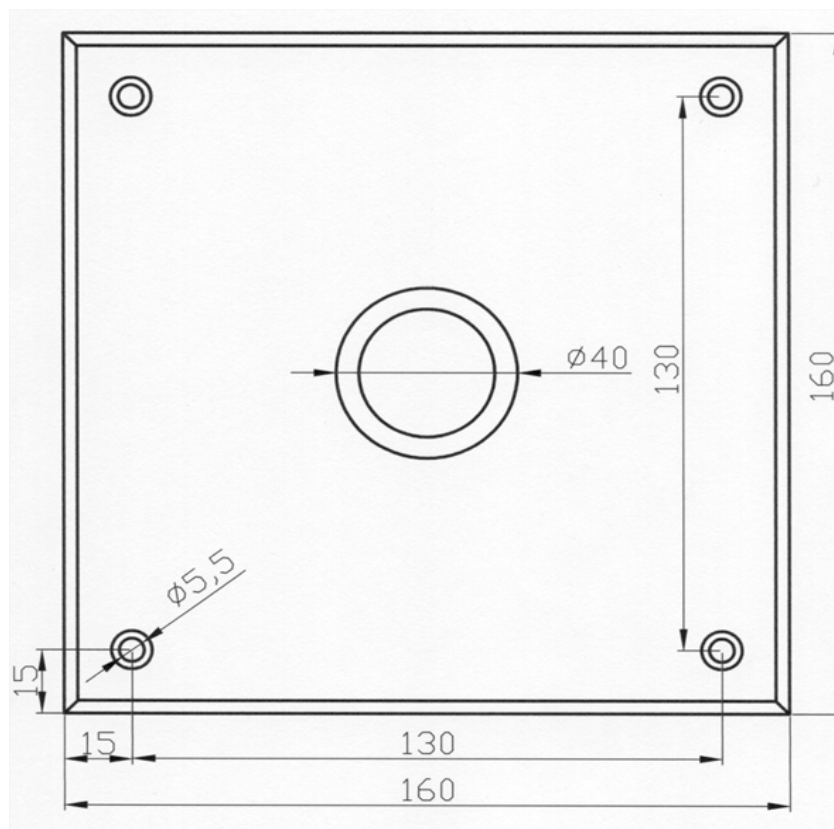


Figure 9: Dimensions of the antenna stand (not to scale)

The stand is fixed by means of 4 5mm countersunk head screws.

Notes:

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