The Synchronization Experts.

TECHNICAL REFERENCE

microSync

HR701/DC

December 1, 2023

Meinberg Funkuhren GmbH & Co. KG

Table of Contents

1 Imprint

Meinberg Funkuhren GmbH & Co. KG
Lange Wand 9, 31812 Bad Pyrmont, Germany

Phone:+ 49 (0) 52 81 / 93 09 - 0
Fax:+ 49 (0) 52 81 / 93 09 - 230

Website: https://www.meinbergglobal.com
Email: info@meinberg.de

Date: December 1, 2023

Manual
Version: 1.04

2 Copyright and Liability Exclusion

At the time of writing of this document, reasonable effort was made to carefully review links to third-party websites to ensure that they were compliant with the laws of the Federal Republic of Germany and relevant to the subject matter of the document. Meinberg accepts no liability for the content of websites not created or maintained by Meinberg, and does not warrant that the content of such external websites is suitable or correct for any given purpose.

While Meinberg makes every effort to ensure that this document is complete, suitable for purpose, and free of material errors or omissions, and periodically reviews its library of manuals to reflect developments and changing standards, Meinberg does not warrant that this specific document is up-to-date, comprehensive, or free of errors. Updated manuals are provided at **www.meinbergglobal.com** and **www.meinbergsupport.com**.

You may also write to **techsupport@meinberg.de** to request an updated version at any time or provide feedback on errors or suggested improvements, which we are grateful to receive.

Meinberg reserves the right to make changes of any type to this document at any time as is necessary for the purpose of improving its products and services and ensuring compliance with applicable standards, laws & regulations.

3 Presentation Conventions in this Manual

3.1 Conventions for the Presentation of Critical Safety Warnings

Warnings are indicated with the following warning boxes, using the following signal words, colors, and symbols:

Caution!

This signal word indicates a hazard with a **low risk level**. Such a notice refers to a procedure or other action that may result in **minor injury** if not observed or if improperly performed.

Warning!

This signal word indicates a hazard with a **medium risk level**. Such a notice refers to a procedure or other action that may result in **serious injury or even death** if not observed or if improperly performed.

Danger!

This signal word indicates a hazard with a **high risk level**. Such a notice refers to a procedure or other action that will very likely result in **serious injury or even death** if not observed or if improperly performed.

3.2 Secondary Symbols Used in Safety Warnings

Some warning boxes may feature a secondary symbol that emphasizes the defining nature of a hazard or risk.

The presence of an "electrical hazard" symbol is indicative of a risk of electric shock or lightning strike.

The presence of a "fall hazard" symbol is indicative of a risk of falling when performing work at height.

This "laser hazard" symbol is indicative of a risk relating to laser radiation.

3.3 Conventions for the Presentation of Other Important Information

Beyond the above safety-related warning boxes, the following warning and information boxes are also used to indicate risks of product damage, data loss, and information security breaches, and also to provide general information for the sake of clarity, convenience, and optimum operation:

Important!

Warnings of risks of product damage, data loss, and also information security risks are indicated with this type of warning box.

Information:

Additional information that may be relevant for improving efficiency or avoiding confusion or misunderstandings is provided in this form.

3.4 Generally Applicable Symbols

The following symbols and pictograms are also used in a broader context in this manual and on the product.

The presence of the "ESD" symbol is indicative of a risk of product damage caused by electrostatic discharge.

Direct Current (DC) *(symbol definition IEC 60417-5031)*

Alternating Current (AC) *(symbol definition IEC 60417-5032)*

Ground Connection *(symbol definition IEC 60417-5017)*

Protective Earth Connection *(symbol definition IEC 60417-5019)*

Disconnect All Power Connectors *(symbol definition IEC 60417-6172)*

4 Important Safety Information

The safety information provided in this chapter as well as specific safety warnings provided at relevant points in this manual must be observed during every installation, set-up, and operation procedure of the device, as well as its removal from service.

Any safety warnings affixed to the device itself must also be observed.

Any failure to observe this safety information, these safety warnings, and other safety-critical operating instructions in the product documentation, or any other improper usage of the device may result in unpredictable behavior from the product, and may result in injury or death.

Depending on your specific device configuration and installed options, some safety information may not be applicable to your device.

Meinberg accepts no responsibility for injury or death arising from a failure to observe the safety information, warnings, and safety-critical instructions provided in the product documentation.

It is the responsibility of the operator to ensure that the product is safely and properly used.

Should you require additional assistance or advice on safety-related matters for your product, Meinberg's Technical Support team will be happy to assist you at any time. Simply send a mail to **techsupport@meinberg.de**.

4.1 Appropriate Usage

The device must only be used appropriately in accordance with the specifications of the product documentation! Appropriate usage is defined exclusively by this manual as well as any other relevant documentation provided directly by Meinberg.

Appropriate usage includes in particular compliance with specified limits! The device's operating parameters must never exceed or fall below these limits!

4.2 Product Documentation

The information in this manual is intended for readers with an appropriate degree of safety awareness.

The following are deemed to possess such an appropriate degree of safety awareness:

- **skilled persons** with a familiarity with relevant national safety standards and regulations,
- **instructed persons** having received suitable instruction from a skilled person on relevant national safety standards and regulations

Read the product manual carefully and completely before you set the product up for use.

If any of the safety information in the product documentation is unclear for you, do **not** continue with the set-up or operation of the device!

Safety standards and regulations change on a regular basis and Meinberg updates the corresponding safety information and warnings to reflect these changes. It is therefore recommended to regularly visit the Meinberg website at **https://www.meinbergglobal.com** or the Meinberg Customer Portal at **https://meinberg.support** to download up-to-date manuals.

Please keep all product documentation, including this manual, in a safe place in a digital or printed format to ensure that it is always easily accessible.

Meinberg's Technical Support team is also always available at **techsupport@meinberg.de** if you require additional assistance or advice on safety aspects of your system.

4.3 Safety during Installation

This rack-mounted device has been designed and tested in accordance with the requirements of the standard IEC 62368-1 (*Audio/Video, Information and Communication Technology Equipment—Part 1: Safety Requirements*). Where the rack-mounted device is to be installed in a larger unit (such as an electrical enclosure), additional requirements in the IEC 62368-1 standard may apply that must be observed and complied with. General requirements regarding the safety of electrical equipment (such as IEC, VDE, DIN, ANSI) and applicable national standards must be observed in particular.

The device has been developed for use in industrial or commercial environments and may only be used in such environments. In environments at risk of high environmental conductivity ("high pollution degree" according to IEC 60664-1), additional measures such as installation of the device in an air-conditioned electrical cabinet may be necessary.

If the unit has been brought into the usage area from a cold environment, condensation may develop; in this case, wait until the unit has adjusted to the temperature and is completely dry before setting it up.

When unpacking & setting up the equipment, and before operating it, be sure to read the information on installing the hardware and the specifications of the device. These include in particular dimensions, electrical characteristics, and necessary environmental conditions.

Fire safety standards must be upheld with the device in its installed state.

The device with the highest mass should be installed at the lowest position in the rack in order to position the center of gravity of the rack as a whole as low as possible and minimize the risk of the rack tipping over. Further devices should be installed from the bottom, working your way up.

The device must be protected against mechanical & physical stresses such as vibration or shock.

Never drill holes into the device to mount it! If you are experiencing difficulties with rack installation, contact Meinberg's Technical Support team for assistance!

Inspect the device housing before installation. The device housing must be free of any damage when it is installed.

4.4 Connection of Protective Earth Conductor/Grounding

In order to ensure that the device can be operated safely and to meet the requirements of IEC 62368-1, the device must be correctly connected to the protective earth conductor via the protective earth connection terminal.

If an external ground connection is provided on the housing, it must be connected to the grounding busbar (earthing busbar) for safety reasons before connecting the power supply. Like this, any possible leakage current on the housing is safely discharged to earth.

The screw, washer and toothed lock washer necessary for mounting the grounding cable are located at the grounding point of the housing. A grounding cable is not included in the contents of delivery.

Note: Please use a grounding cable with cross-section $\geq$ 1.5 mm^2, as well as a suitable grounding clamp/lug. Always ensure that the connection is properly crimped!

4.5 Electrical Safety

This Meinberg product is operated at a hazardous voltage.

This system may only be set up and connected by a skilled person, or by an instructed person who has received appropriate technical & safety training from a skilled person.

Custom cables may only be assembled by a qualified electrician.

Never work on cables carrying a live current!

Never use cables or connectors that are visibly damaged or known to be defective! Faulty, defective, or improperly connected shielding, connectors, or cables present a risk of injury or death due to electric shock and may also constitute a fire hazard!

Before operating the device, check that all cables are in good order. Ensure in particular that the cables are undamaged (for example, kinks), that they are not wound too tightly around corners, and that no objects are placed on the cables.

Cables must be laid in such a way that they do not present a tripping hazard.

The power supply should be connected using a short, low-inductance cable. Avoid the use of power strips or extension cables if possible. If the use of such a device is unavoidable, ensure that it is expressly rated for the rated currents of all connected devices.

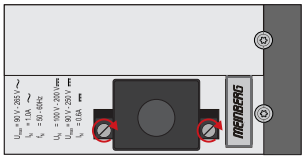
Never connect or disconnect power, data, or signal cables during a thunderstorm! Doing so presents a risk of injury or death, as cables and connectors may conduct very high voltages in the event of a lightning strike!

Device cables must be connected or disconnected in the order specified in the user documentation for the device. Connect all cables only while the device is de-energized before you connect the power supply.

Always pull cable connectors out at **both** ends before performing work on connectors! Improperly connecting or disconnecting this Meinberg system may result in electric shock, possibly resulting in injury or death!

When pulling out a connector, **never** pull on the cable itself! Pulling on the cable may cause the plug to become detached from the connector or cause damage to the connector itself. This presents a risk of direct contact with energized components.

5-Pin MSTB Connector



3-Pin MSTB Connector

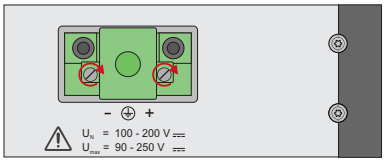


Illustration: Lock screws on an MSTB plug connector; in this case on a LANTIME M320

Ensure that all plug connections are secure. In particular, when using plug connectors with lock screws, ensure that the lock screws are securely tightened. This is especially important for power supply connectors where 3-pin or 5-pin MSTB connectors with lock screws are used (see illustration).

Before the device is connected to the power supply, the device housing must be grounded by connecting a grounding conductor to the grounding terminal of the device.

When installing the device in an electrical enclosure, it must be ensured that adequate clearance is provided, minimum creepage distances to adjacent conductors are maintained, and that there is no risk of short circuits.

Protect the device from the ingress of objects or liquids!

If the device malfunctions or requires servicing (for example, due to damage to the housing, power supply cable, or the ingress of liquids or objects), the power supply may be cut off. In this case, the device must be isolated immediately and physically from all power supplies! The following procedure must be followed in order to correctly and reliably isolate the device:

- Pull the power supply plug from the power source.
- Loosen the locking screws of the MSTB power supply plug on the device and pull it out of the device.
- Contact the person responsible for your electrical infrastructure.
- If your device is connected to one or more uninterruptible power supplies (UPS), the direct power supply connection between the device and the UPS solution must be first be disconnected.

4.5.1 Special Information for Devices with DC Power Supply

In accordance with IEC 62368-1, it must be possible to disconnect the appliance from the supply voltage from a point other than the appliance itself (e.g., from the primary circuit breaker).

The power supply plug may only be fitted or dismantled while the appliance is isolated from the power supply (e.g., disconnected via the primary circuit breaker).

Power supply cables must have adequate fuse protection and have an adequate wire gauge size (1 mm^2 – 2.5 mm^2 / 17 AWG – 13 AWG)

The power supply of the device must have a suitable on-demand disconnection mechanism (i.e., a switch). This disconnection mechanism must be readily accessible in the vicinity of the appliance and marked accordingly as a disconnection mechanism for the appliance.

4.6 Safety when Handling SFP Modules

The SFP modules recommended by Meinberg are equipped with a Class 1 laser.

- Only use fiber-optic SFP modules that are compliant with the definition of a Class 1 laser in accordance with IEC standard 60825-1. Fiber-optic products that are not compliant with this standard may emit radiation capable of causing eye injuries.
- Never look into an unconnected connector of a fiber-optic cable or an unconnected SFP port.
- Unused fiber-optic connectors should always be fitted with a suitable protective cap.
- The safety information and manufacturer specifications relating to the SFP modules used must be heeded.
- The SFP module used must be capable of providing protection against voltage spikes in accordance with IEC 62368-1.
- The SFP module used must be tested and certified in accordance with applicable standards.

4.7 Safety when Maintaining and Cleaning the Device

Only use a soft, dry cloth to clean the device.

Never use liquids such as detergents or solvents to clean the device! The ingress of liquids into the device housing may cause short circuits in the electronic circuitry, which in turn can cause a fire or electric shock!

Neither the device nor its individual components may be opened. The device or its components may only be repaired by the manufacturer or by authorized personnel. Improperly performed repairs can put the user at significant risk!

In particular, **never** open a power supply unit or module, as hazardous voltages may be present within the power supply device even after it is isolated from the upstream voltage. If a power supply unit or module is no longer functional (for example due to a defect), it can be returned to Meinberg for repair.

Some components of the device may become very hot during operation. Do not touch these surfaces!

If maintenance work is to be performed on the device and the device housing is still hot, switch off the device beforehand and allow it to cool.

4.8 Battery Safety

The integrated CR2032 lithium battery has a service life of at least ten years.

Should it be necessary to replace the battery, please note the following:

- The battery may only be replaced by the same type or a comparable type recommended by the manufacturer.
- The battery may only be replaced by the manufacturer or authorized personnel.
- The battery must not be exposed to air pressure levels outside of the limits specified by the manufacturer.

Improper handling of the battery may result in the battery exploding or in leakages of flammable or corrosive liquids or gases.

- **Never** short-circuit the battery!
- **Never** attempt to recharge the battery!
- **Never** throw the battery in a fire or dispose of it in an oven!
- **Never** dispose of the battery in a mechanical shredder!

5 Important Product Information

5.1 CE Marking

This product bears the CE mark as is required to introduce the product into the EU Single Market.

The use of this mark is a declaration that the product is compliant with all requirements of the EU directives effective and applicable as at the time of manufacture of the product.

These directives are listed in the EU Declaration of Conformity, appended to this manual as Chapter **14**.

5.2 UKCA Marking

This product bears the British UKCA mark as is required to introduce the product into the United Kingdom (excluding Northern Ireland, where the CE marking remains valid).

The use of this mark is a declaration that the product is in conformity with all requirements of the UK statutory instruments applicable and effective as at the time of manufacture of the product.

These statutory instruments are listed in the UK Declaration of Conformity, appended to this manual as Chapter **15**.

5.3 Ensuring the Optimum Operation of Your Device

- Ensure that ventilation slots are not obscured or blocked by dust, or else heat may build up inside the device. While the system is designed to shut down safely and automatically in the event of temperature limits being exceeded, the risk of malfunctions and product damage following overheating cannot be entirely eliminated.
- The device is only deemed to be appropriately used and EMC limits (electromagnetic compatibility) are only deemed to be complied with while the device housing is fully assembled in order to ensure that requirements pertaining to cooling, fire safety, electrical shielding and (electro)magnetic shielding are upheld.

5.4 Maintenance and Modifications

Important!

Before performing any maintenance work on or authorized modification to your Meinberg system, we recommend making a backup of any stored configuration data (e.g., to a USB flash drive from the Web Interface).

5.4.1 Replacing the Battery

Your device's clock module is fitted with a lithium battery (type CR2032) that is used to locally storage almanac data and sustain operation of the real-time clock (RTC) in the reference clock.

This battery has a life of at least ten years. However, if the device exhibits the following unexpected behaviors, the voltage of the battery may have dropped below 3 V, and the battery will need to be replaced:

- The reference clock has the wrong date or wrong date when the system is started.
- The reference clock repeatedly starts in Cold Boot mode (i.e., upon starting, the system has no ephemeris data saved whatsoever, resulting in the synchronization process taking a very long time due to the need to rediscover all of the visible satellites).
- Some configuration options relating to the reference clock are lost every time the system is restarted.

In this case you should not replace the battery on your own. Please contact the Meinberg Technical Support team, who will provide you with precise guidance on how to perform the replacement.

5.5 Disposal

Disposal of Packaging Materials

The packaging materials that we use are fully recyclable:

Material	Used for	Disposal
Polystyrene	Packaging frame/filling material (e.g., polystyrene peanuts)	Recycling Depot
PE-LD (Low-density polyethylene)	Accessories packaging, bubble wrap	Recycling Depot
Cardboard	Shipping packaging, accessories packaging	Paper Recycling

For information on the proper disposal of packaging materials in your specific country, please inquire with your local waste disposal company or authority.

Disposal of the Device

This product falls under the labeling obligations of the Waste Electrical and Electronic Equipment Directive 2012/19/EU ("*WEEE Directive*") and thus bears this WEEE symbol. The presence of this symbol indicates that this electronic product may only be disposed of in accordance with the following provisions.

Important!

Do not dispose of the product or batteries via the household waste. Inquire with your local waste disposal company or authority on how to best dispose of the product or battery if necessary.

This product is considered to be a "**B2B**" product for the purposes of the WEEE Directive and is also classified as "**IT and Telecommunications Equipment**" in accordance with Annex I of the Directive.

It can be returned to Meinberg for disposal. In this case, the shipping costs are to be borne by the customer, while Meinberg will cover the costs for disposal. If you wish for Meinberg to handle disposal for you, please get in touch with us. Otherwise, please use the return and collection systems provided within your country to ensure that your device is disposed of in a compliant fashion to protect the environment and conserve valuable resources.

Disposal of Batteries

Please consult your local waste disposal regulations for information on the correct disposal of batteries as hazardous waste.

6 microSync Introduction

The **microSync** is Meinberg's versatile and powerful synchronization solution in a compact design. Depending on customer requirements, the microSync system is available with familiar input and output signals, such as PPS (pulse per second), Time Code AM and Time Code DCLS and programmable pulses, as well as with industry-specific signals such as Blackburst, DARS, Word Clock, etc. Furthermore, the microSync enables the synchronization of NTP clients and PTP slaves.

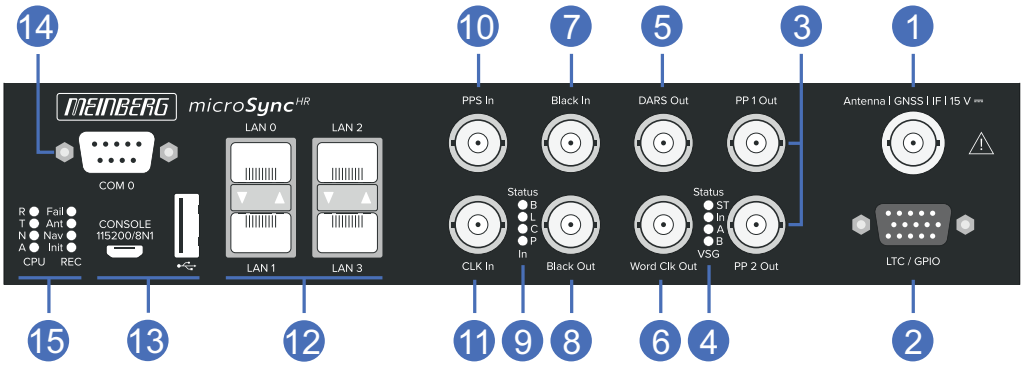
The device has four 100/1000 MBit network interfaces and can provide both, optical and electrical network connections by using SFP modules. It is possible to use different receiver variants, e.g. the 72-channel GNSS receiver for GPS, Galileo, GLONASS and BeiDou.

The sync optimized operating system supports NTP, PTP IEEE 1588 and a variety of protocols for management tasks.

Product Highlights

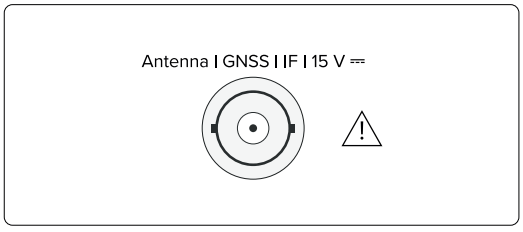
- Powerful IEEE 1588 PTP Time Server incl. IEC/IEEE 61850-9-3 & IEEE C.37.238
- High performance (S)NTP server
- Half rack solution for a space efficient design
- Different Oscillator options for advanced holdover performance
- Meinberg Device Manager for configuration and status monitoring
- Three-year manufacturer's warranty
- Unlimited technical support including firmware updates

7 microSync HR701/DC - Connectors



7.1 GPS Antenna

Antenna input
GPS: Antenna circuit electrically isolated



Dielectric strength: 1000 V

Mixed frequency
Reference clock to antenna
(GPS-converter): 10 MHz [1]

IF frequency
Antenna (GPS-converter)
to reference clock: 35.4 MHz [1]

1) these frequencies are transfered via the antenna cable

Output voltage: 15 V, 100 mA (via antenna cable)

Connection type: BNC-female/N-standard female

Cable type: Coaxial cable, shielded, max. 300 m to RG58 / max. 700 m to RG213

Warning!

Do not work on the antenna system during thunderstorms!

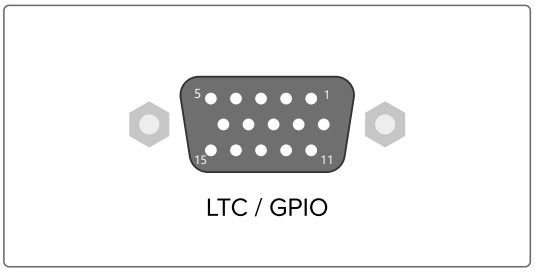
Danger of death from electric shock!

- Do not carry out any work on the antenna system or the antenna cable if there is a risk of lightning strike.
- Do not carry out any work on the antenna system if it is not possible to maintain the prescribed safe distance to exposed lines and electrical substations.

7.2 LTC/GPIO

Signal: LTC-Reader (25 fps)

Signal level: TTL; 2,5 V_{ss} (MARK/SPACE)
at 50 Ohm



Pin Assignment:

1.	LTC out - LTC symmetric Lo Pot. Output
2.	LTC_out + LTC symmetric Hi Pot. Output
3.	LTC_in + LTC symmetric Hi Pot. Input
4.	LTC in - LTC symmetric Lo Pot. Input
5.	LTC TTL in LTC, TTL-Level, Input
6.	GND
7.	GND
8.	GND
9.	GND
10.	GND
11.	DARS + DARS symmetric Hi Pot. Output
12.	DARS - DARS symmetricLo-Pot. Output
13.	n.c. not connected
14.	TIME_SYN TS-Output, TTL-Level
15.	LTC TTL out LTC-Output, TTL-Level

Connection type: D-SUB female

Cable: Coaxial cable, shielded

7.3 Programmable Pulse Output

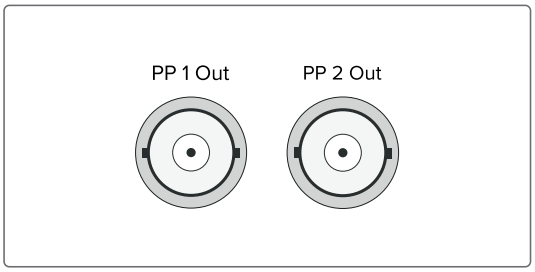
Signal output Programmable pulses

Signal level: TTL; 2.5 V into 50 Ohm

Connector: BNC, female

Cable: Coaxial cable, shielded

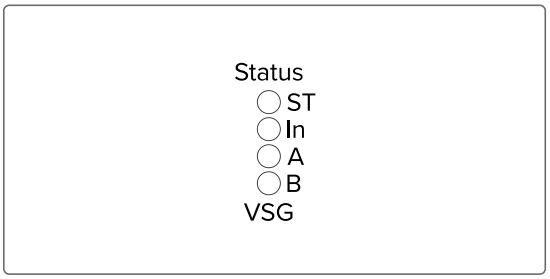
Mode:
Idle
Timer
Single Shot
Cyclic Pulse
Pulse Per Second
Pulse Per Minute
Pulse Per Hour
DCF77 Marks
Position OK
Time Sync
All Sync
DCLS Time Code
Serial Time String
10 MHz Frequency
DCF77-like M59
Synthesizer Frequency
PTTI 1 PPS
1 MHz Frequency
5 MHz Frequency



7.4 Status LEDs - VSG Signals

Status indicator

LED St:	Status of the internal VSG
LED In:	Synchronization status
LED A:	Status of the blackburst output
LED B:	Status of the LTC output



The status messages of the LEDs result as follows:.

LED St:

Blue	During initialization
Green	During operation

LED In:
Shows status after initialization

Green	Accurate (accuracy of $\leq$ 200 ns to reference).
Green Flashing	Timesync
Yellow	Insufficient quality of the reference signal.
Red	Reference signal not available / internal VSG is not synchronous

LED A - Status *Black Out*
1 sec Red -> 1 sec Yellow -> 1 sec Green -> 1 sec Off

Off	Output switched off
Green blinking	Timing pattern of the signal is corrected
Yellow flashing	Timing pattern of the signal is corrected
Green on	Output on, control is in 'warmed up' state (fine control)
Yellow light	Output on, control not yet in 'warmed up' state (coarse control)

LED B - Status *LTC Out*
1 sec red -> 1 sec yellow -> 1 sec green -> 1 sec off

Off	Output switched off
Green blinking	Timing pattern of the signal is corrected
Yellow flashing	Timing pattern of the signal is corrected
Green on	Output on, control is in 'warmed up' state (fine control)
Yellow glowing	Output on, control not yet in 'warmed up' state (coarse control)

7.5 DARS Output

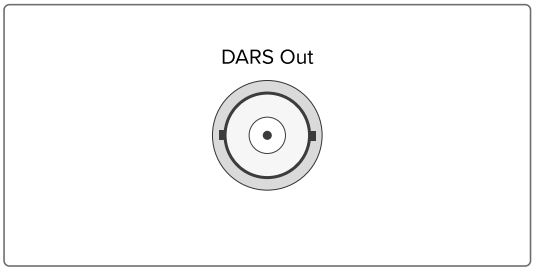
Output signal: DARS

Signal level: TTL; 2.5 V_{ss}
into 75 ohms

Signal type: Base frequencies: 44.1 kHz and 48 kHz

Connection type: BNC female connector

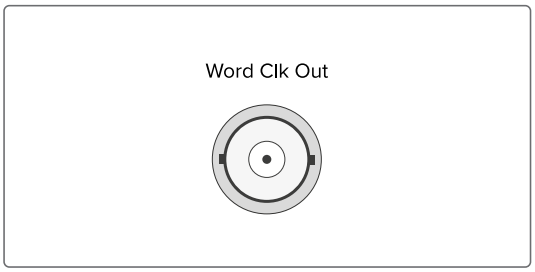
Cable: Coaxial cable, shielded



7.6 Word Clock Output

Output signal: Word Clock

Signal level: TTL; 2.5 V_{ss}
into 75 ohms



Base frequency: 44.1 kHz

Frequency range: 1.378125 kHz ... 1.4112 MHz

Multipliers: 1/32, 1/16, 1/8, 1/4, 1/2,
1, 2, 4, 8, 16, 32

Base frequency: 48 kHz

Frequency range: 1.5 kHz ... 1.536 MHz

Multipliers: 1/32, 1/16, 1/8, 1/4, 1/2,
1, 2, 4, 8, 16, 32

Connection type: BNC female connector.

Cable: Coaxial cable, shielded

7.7 Blackburst Input

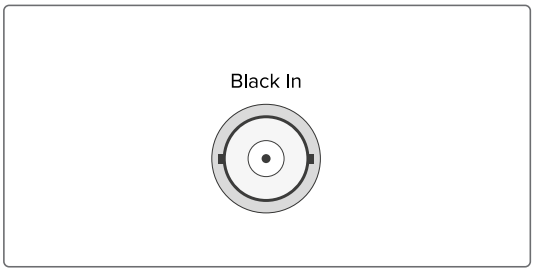
Input Signal Black Burst (PAL)
Input with VITC Reader
Input with Prescaler mode
(Frequency only)

Signal level: 300 mV_{ss}
into 75 ohms (unbalanced)

Time Code Formats: PAL SMPTE259M / ITU-R BT.470-6
SMPTE12M-1 / SMPTE ST309M

Connection type: BNC female connector

Cable: Coaxial cable, shielded



7.8 Blackburst Output

Output Signal: PAL, NTSC Black Burst
with VITC Support

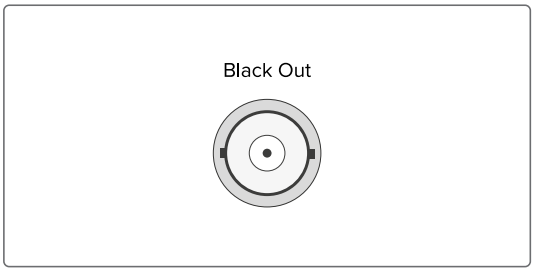
Signal level: 300 mV_{ss}
into 75 ohms (unbalanced)

Formats: Black Burst:
PAL (SMPTE259M/ITU-R BT.470-6)
NTSC (SMPTE170M/ITU-R BT.470-7)
VITC (SMPTE12M-1/SMPTE ST309M)

Tri-Level Sync:
720p 50 Hz (SMPTE296M3)
1080i 25 Hz (SMPTE274M6)
720p 59.94 Hz (SMPTE296M1)
1080i 29.97 Hz (SMPTE274M7)

Connection type: BNC female connector

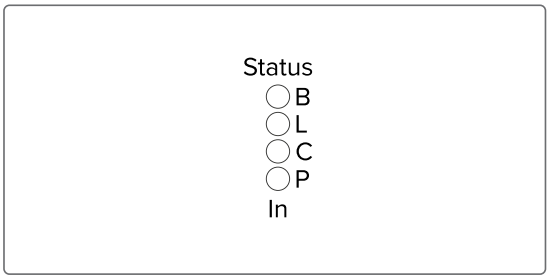
Cable: Coaxial cable, shielded



7.9 Status LEDs - input signals

Status indicator

LED B:	Status of the blackburst input signal.
LED L:	Status of the LTC input signal
LED C:	Status of the Word Clock input signal
LED P:	Status of the PPS input signal



The status messages of the LEDs are as follows:.

LED B (Blackburst In).
1 sec Red -> 1 sec Yellow -> 1 sec Green -> 1 sec Off.

Blue	During initialization
Green	During operation
Yellow	Insufficient quality of reference signal.
Red	Reference signal not available / signals not synchronous

LED L (LTC In)
1 sec Red -> 1 sec Yellow -> 1 sec Green -> 1 sec Off

Blue	During initialization
Green	During operation
Yellow	Insufficient quality of reference signal
Red	Reference signal not available / signals not synchronous

LED C (Word Clock In)
1 sec Red -> 1 sec Yellow -> 1 sec Green -> 1 sec Off

Blue	During initialization
Green	During operation
Yellow	Insufficient quality of the reference signal
Red	Reference signal not available / signals not synchronous

LED P (PPS In)
1 sec Red -> 1 sec Yellow -> 1 sec Green -> 1 sec Off

Blue	During initialization
Green	During operation
Yellow	Insufficient quality of reference signal
Red	Reference signal not available / signals not synchronous

7.10 Pulse Per Second Input

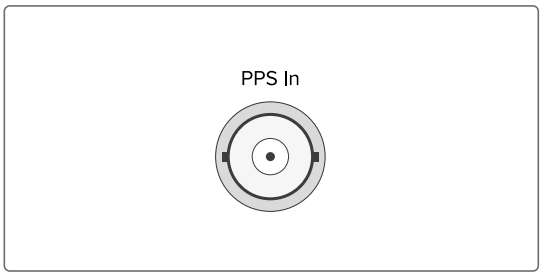
Input signal PPS (pulse per second)

Signal level: TTL

Pulse lenght: $\geq 5\ \mu$s, active high

Connection type: BNC, female

Cable: Coaxial cable, shielded



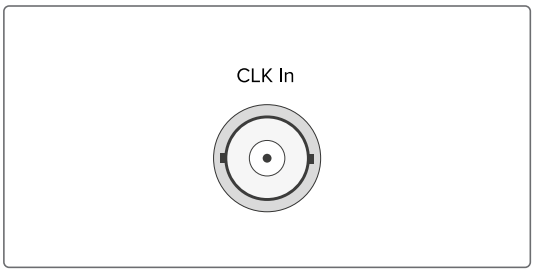
7.11 Word Clock Input

Input signal: Word Clock Input with programmable frequency range

Signal level: TTL

Frequency range: 1 kHz - 10 MHz

Cable: Coaxial cable, shielded



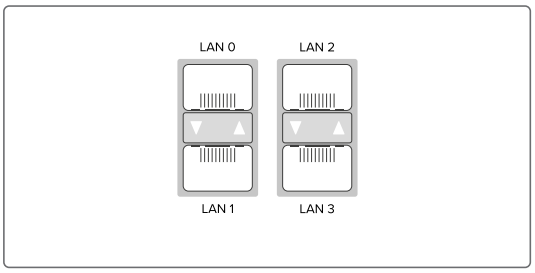
7.12 LAN Network Interfaces

Gigabit Ethernet (GbE), 100/1000 MBit - SFP

LAN 0, 1: Management / NTP
10/100/1000Mbit RJ45 or 1000FX

LAN 2, 3: Management
10/100/1000Mbit RJ45 or 1000FX
NTP / PTP

Synchronous Ethernet:
Master and Slave Capability
Compliant to ITU-T G.8261, G.8262 and G.8264
Ethernet Synchronization Messaging Channel (ESMC)



Available SFP Modules

SFP Tranceivers Recommended and Tested by Meinberg

Output Type	Manufacturer Designation
Multi Mode:	Avago AFBR-5710PZ Finisar FTLF8524P3BNL Cisco GLC-SX-MMD
Single Mode:	Avago AFCT-5710PZ Finisar FTLF1318P3BTL
RJ-45:	Avago ABCU-5740RZ Finisar FCLF8521P2BTL

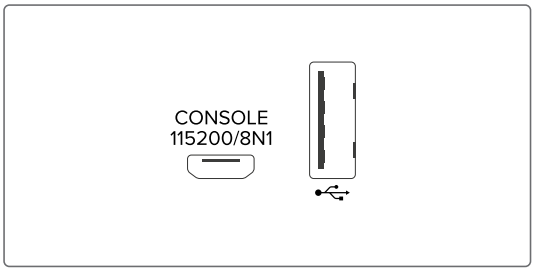
Warning!

Prevention of Eye Injuries

- Fiber optic SFP modules that are not compliant with the definition of a Class 1 laser in accordance with IEC standard 60825-1 may emit radiation capable of causing eye injuries.
- Never look into an unconnected connector of a fiber optic cable or an unconnected SFP port, and ensure that unused fiber optic connectors are always fitted with a suitable protective cap.

7.13 USB Interface

Signal	Signal Type	Connector
USB Terminal	USB-to-serial console	Micro-USB Type B
USB Host	USB connector management CPU	USB Type A

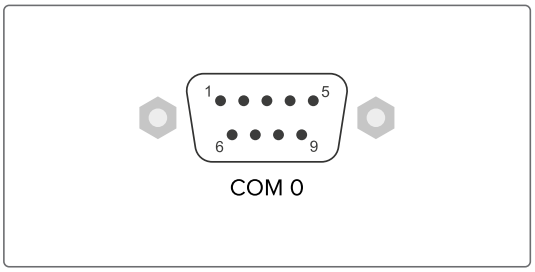


7.14 RS-232 COMx Timestring

Data transfer: serial

Baudrate/framing: 19200 / 8N1 (default)

Time-string: Meinberg Standard (default)



Assignment:
Pin 2: RxD (receive)
Pin 3: TxD (transmit)
Pin 5: GND (ground)

Connector: 9pin D-SUB male

Cable: data cable (shielded)
PC connector 1:1

Synchronization with PPS + String:
Pin 1 - PPS In

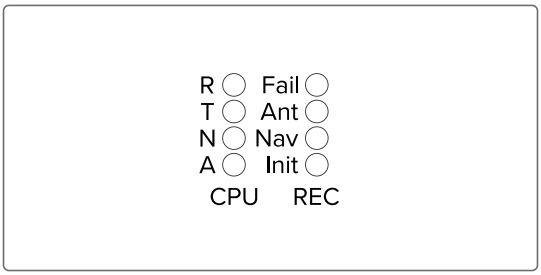
Signal level: TTL

Pulse length: $\geq$5 μs (active high)

Pin 2 - String* In (RxD)

* The following timestrings (time telegrams) can be used:
NMEA RMC
NMEA ZDA
Meinberg Standard
Uni Erlangen

7.15 Status Indicators - CPU and Receiver



CPU:

R (Receiver)

green:	The reference clock (e.g. build-in GPS) provides a valid time
red:	the reference clock does not provide a valid time

T (Time Service)

green:	NTP is synchronized to the reference clock, e.g. GPS
red:	NTP is not synchronized or switched to the "local clock"

N (Network)

green:	All monitored network interfaces are connected ("Link up")
red:	At least one of the monitored network interfaces is faulty

A (Alarm)

off:	No error
red:	General error

REC:

Fail

red:	No synchronization

Ant

red:	No synchronization resp. no antenna connected or short circuit on the antenna line
green:	Antenna connected and clock is synchronized

Nav

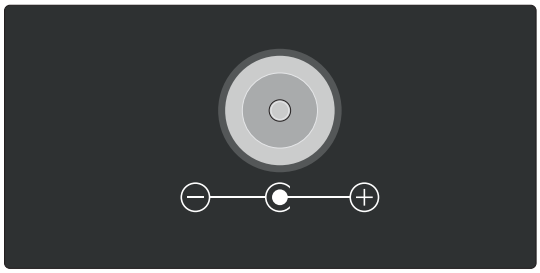
green:	Positioning complete

Init

blue:	Initialisation phase
green:	"warmed up" - oscillator is adjusted

7.16 Power supply and protective earth connection

A: Power supply connection



Connection type:	Hollow socket/low voltage socket		
Polarity:	Positive internal conductor		
Input parameters			
Nominal voltage range:	U_N	=	10-36 V ⎓
Max. Voltage range:	U_{max}	=	9-36 V ⎓
Nominal current:	I_N	=	1.25 A
Output parameters			
Max. Power:	P_{max}	=	30 W
Max. Thermal energy:	E_{therm}	=	108.00 kJ/h (102.37 BTU/h)

A high-quality desktop AC adapter is included in the scope of delivery.

Caution!

Please note when connecting a power adapter for the microSync^{HR}, always follow the input voltage range specifications above.

Please use the included desktop AC power adapter which is approved by Meinberg for powering your microSync^{HR} system.

For damage caused to the microSync^{HR} by using an unsuitable AC adapter, Meinberg assumes no liability and warranty claims are also lost as a result.

Model:	TRH50A240		
Input Parameters.			
Max. Voltage range:	U_{max}	=	90-264 V ~
Max. Input current:	I_{max}	=	1.2 A
Max. Frequency range:	f_{max}	=	47-63 Hz
Output parameters			
Nominal voltage:	U_N	=	24 V ⎓
Nominal current	U_N	=	2.1 A

Other specifications:

Cable length (output): 1800 mm

DC connector (right angle): (Ø 5.5/Ø 2.5) L10.5 mm

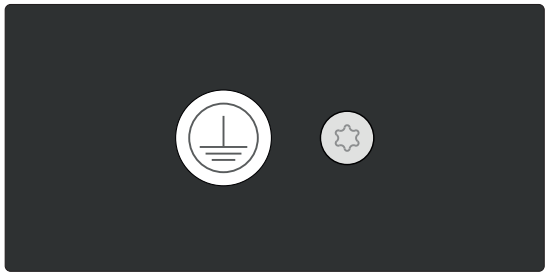
AC input: IEC320/C14

Approval: IEC62368-1, UL62368-1, EN62368-1

For more detailed information about the desktop AC adapter,
download the manufacturer's datasheet:
https://www.meinbergglobal.com/download/docs/other/Datasheet-TRH50A.pdf

protective earth conductor

(see chapter Connection of Protective Earth Conductor/Grounding)



8 Information on Satellite Reception

8.1 GPS Satellite Receiver

Your system is fitted with the GPS, a 12-channel satellite receiver clock based on GPS technology that has been specially developed from the ground up for time and frequency synchronization. The GPS receiver serves as a high-accuracy time reference and high-precision frequency reference for your Meinberg system and is designed to receive signals from the United States GPS (Global Positioning System), allowing your Meinberg system to be used practically anywhere in the world.

Meinberg's range of products include satellite receiver clocks for the most established satellite constellations, encompassing not only the GPS but also the Russian GLONASS (GLObal NAvigation Satellite System), the European Galileo system, and the Chinese BeiDou system.

8.2 How Satellite Navigation Works

The use of a receiver for location tracking and time synchronization relies on the ability to measure the satellite-to-receiver propagation delay as precisely as possible. It is necessary to have simultaneous reception from four satellites so that the receiver can determine its relative spatial position in three dimensions (x, y, z) and measure the deviation of its clock against the system clock. Monitoring stations around the planet track the orbital trajectory of the satellites and detect deviations between the local atomic clocks and the system time. The collected data is transmitted up to the satellites, which then send navigation data back to Earth.

The high-precision trajectory data of each satellite, known as the satellite's ephemeris, is needed by the receiver to continuously calculate the precise location of the satellites in space. A roughly defined ephemeridal schedule based on empirical data, referred to as an almanac, is used by a receiver to identify which satellites are visible above the horizon given a known approximate location and time. Each satellite transmits its own ephemeridal schedule as well as the almanacs of all existing satellites.

Satellite Systems

GPS was installed by the United States Department of Defense (US DoD) and operates at two performance levels: the Standard Positioning Service, or SPS, and the Precise Positioning Service, or PPS. The structure of the messages transmitted by the SPS has been openly published and reception is provided for public use. The timing and navigation data of the more precise PPS is encrypted and is thus only accessible to certain (usually military) users.

GLONASS was originally developed by the Russian military for real-time navigation and ballistic missile guidance systems. GLONASS satellites also send two types of signal: a Standard Precision Signal (SP) and an encrypted High Precision Signal (HP).

BeiDou is a Chinese satellite navigation system. The second-generation system, officially referred to as the BeiDou Navigation Satellite System (BDS) and also known as "COMPASS", consists of 35 satellites. BeiDou entered service in December 2011 with ten satellites and was made available to users in the Asia-Pacific region. The system was completed in June 2020 with the launch of the final satellite.

Galileo is an in-development global European satellite navigation and time reference system controlled by a civilian authority (European Union Agency for the Space Programme, EUSPA). Its purpose is the worldwide delivery of high-precision navigation data and is similarly structured to the American GPS, Russian GLONASS and Chinese BeiDou systems. The main differences in the systems lie in their approaches to frequency usage & modulation and the satellite constellation.

8.2.1 Time Zones and Daylight Saving Time

GPS System Time is a linear timescale that was synchronized with the international UTC timescale (Coordinated Universal Time) when the satellite system became operational in 1980. Since it has entered service, however, several leap seconds have been introduced to the UTC timescale to adjust UTC time to irregularities in the Earth's rotation. While GPS System Time deviates from UTC time by several seconds for this very reason, satellite messages do incorporate the number of seconds by which these timescales deviate from one another, allowing GPS receivers to be synchronized internally with the international UTC timescale.

The receiver's microprocessor can identify any time zone based on UTC time and automatically apply Daylight Saving Time adjustments over several years if so configured by the user.

9 Antenna Installation

The following chapters explain how to select a suitable location for your antenna, how to fit the antenna, and how to implement effective anti-surge protection for your antenna installation.

9.1 Selecting the Antenna Location

There are essentially two ways a compatible Meinberg GPS Antenna (such as a GPSANTv2) can be installed using the accessories included:

1. Mounted on a pole

2. Mounted on a wall

In either case, the location must be selected to ensure that the view of the sky is not obstructed in any direction (see Fig. 1) in order to ensure that enough satellites can be received.

To ensure that your antenna has the best 360° view possible, Meinberg recommends mounting the antenna on a roof on a suitable metal pole (see Fig. 1, antenna illustration on right). If this is not possible, the antenna may be mounted on the wall of a building, but must be high enough above the edge of the roof (see Fig. 1, antenna illustration on left).

This prevents the line of sight between the antenna and the satellites from being partially or fully obstructed and limits the impact of GNSS signal reflections from other surfaces such as house walls.

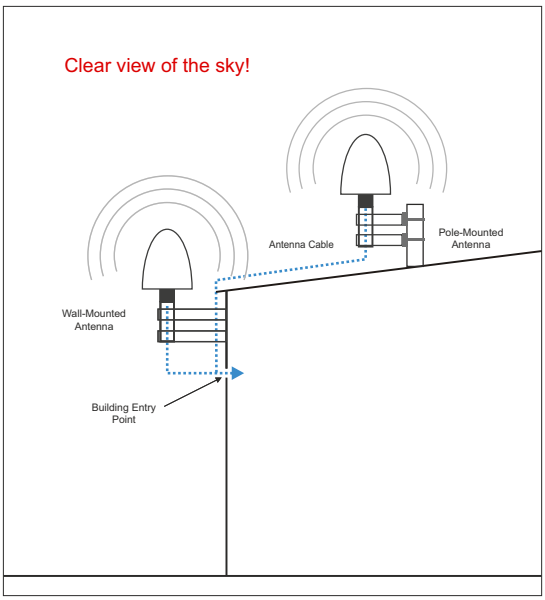


Fig. 1: Ideal Positioning

If there is a solid obstacle (a building or part of a building) in the line of sight between the antenna and each of the satellites (see Fig. 2), it is likely that the satellite signals will be partially or fully obstructed or reflected signals will cause interference, causing problems with signal reception.

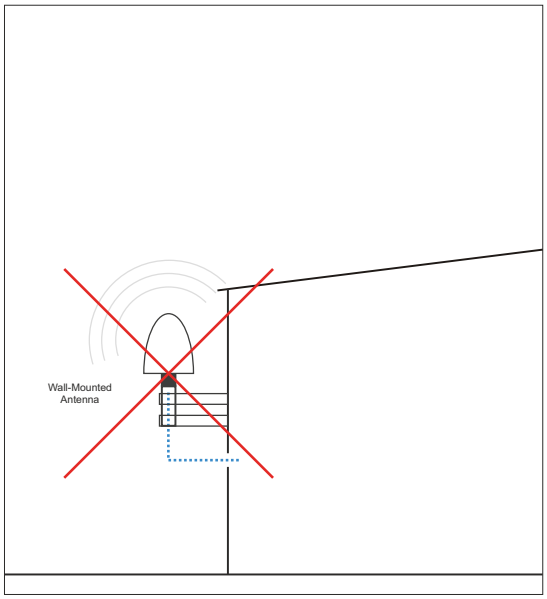


Fig. 2: Poor positioning of a wall-mounted antenna

There must also be no conductive objects, overhead power lines, or other electrical lighting or power circuits within the signal cone of the antenna (approx. 120 degrees), as these can cause interference in the already weak signals transmitted in the frequency band of the satellites.

Other Installation Criteria for Optimum Operation:

- Vertical installation of antenna (see Fig. 1)
- At least 50 cm (1.5 ft) distance to other antennas
- A clear view towards the equator
- A clear view between 55th north and 55th south parallels (satellite orbits).

Information:

Problems may arise with the synchronization of your Meinberg time server if these conditions are not met, as four satellites must be located to calculate the exact position.

9.2 Installation of the Antenna

Please read the following safety information carefully before installing the antenna and ensure that it is observed during the installation.

Danger!

Do not mount the antenna without an effective fall arrester!

Danger of death from falling!

- Ensure that you work safely when installing antennas!
- Never work at height without a suitable and effective fall arrester!

Danger!

Do not work on the antenna system during thunderstorms!

Danger of death from electric shock!

- Do not carry out any work on the antenna installation or the antenna cable if there is a risk of lightning strike.
- Do not perform any work on the antenna installation if it is not possible to maintain the prescribed safety distance from exposed power lines or electrical substations.

Mount the Meinberg GPS Antenna (as shown in Fig. 3) at a distance of at least 50 cm to other antennas using the mounting kit provided, either onto a vertical pole of no more than 60 mm diameter or directly onto a wall.

Item	Description	QTY
1	Antenna	1
2	Antenna pole	1
3	M4 hex nut	8
4	M4 x 12 phillips-head screw	8
5	threaded U-bolt (pole diameter max. 60 mm)	2
6	M6 spacer	4
7	M6 hex nut	4
8	pole clamp halves	4
9	pole bracket	2

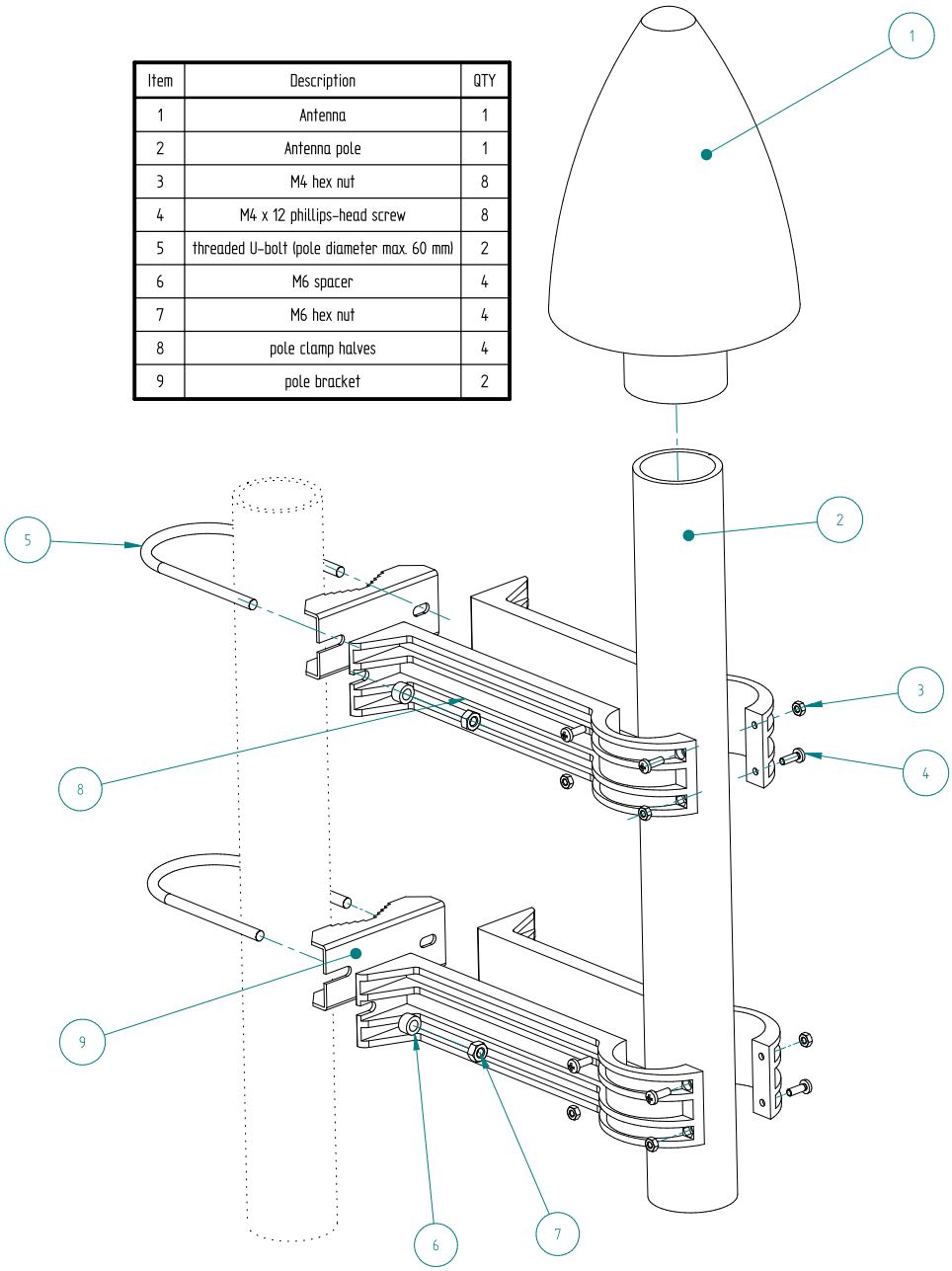


Fig. 3: Mounting a Meinberg GPS Antenna onto a Pole

Fig. 3 illustrates the mounting of a Meinberg GPS Antenna on a pole by way of example. When mounting the antenna on a wall, the four wall plugs and M6x45 screws should be used to mount the two halves of the pole clamp (Fig. 3, Pos. 9) using the provided screw slits.

The next chapter explains how the antenna cable should be laid.

9.3 Antenna Cable

Selecting the Appropriate Cable

Meinberg provides suitable cable types with its antennas and these are ordered together with the antenna to match the length you need from your antenna to your Meinberg reference clock. The route to be covered for your antenna installation should be determined and the appropriate cable type selected accordingly before confirming your order.

The cable is shipped with both ends fitted with the appropriate connectors as standard, although the cable can also be shipped without any pre-fitted connectors if so requested.

The table below shows the specifications of the supported cable types for the transmission of the 35 MHz intermediate frequency:

Cable Type	RG58C/U	RG213	H2010 (Ultraflex)
Signal Propagation Time at 35 MHz	503.6	509.61	387.45
Attenutation at 35 MHz (dB/100 m)	8.48	3.46	2.29
DC Resistance (Ohm/100 m)	5.3	1.0	1.24
Cable Diameter (mm)	5	10.3	7.3
Max. Cable Length (m)	300	700	1100

Table: Specifications of Cable Types Recommended by Meinberg

** The propagation times are specified on the basis of 100 m cable; these values can be used as a reference to calculate the propagation time of any other arbitrary length of cable.*

Important!

Please avoid using a mixture of different cable types for your antenna installation. This should be taken into consideration in particular when purchasing additional cable, for example to extend an existing cable installation.

Laying the Antenna Cable

When laying the antenna cable, ensure that the specified maximum cable length is not exceeded. This length will depend on the selected cable type and its attenuation factor.

If the specified maximum length is exceeded, correct transmission of the synchronization data and thus proper synchronization of the reference clock can no longer be guaranteed.

Lay the coaxial cable from the antenna to the point of entry into the building. Like any other metallic object in the antenna installation (antenna and pole), the antenna cable must be integrated into the grounding infrastructure of the building and also connected to the other metallic objects.

Caution!

When laying the antenna cable, ensure that sufficient distance is maintained from live cables (such as high-voltage power lines), as these can cause severe interference and compromise the quality of the antenna signal significantly. Surges in power lines (caused, for example, by lightning strike) can generate induced voltages in a nearby antenna cable and damage your system.

Further Points to Consider when Laying Antenna Cable:

- The minimum bend radius of the cable must be observed.[1]
- Any kinking, crushing, or other damage to the external insulation must be avoided.
- Any damage or contamination of the coaxial connectors must be avoided.

[1] *The bend radius is the radius at which a cable can be bent without sustaining damage (including kinks).*

The next chapter "**Surge Protection and Grounding**" explains how to implement effective surge protection for an antenna installation.

Compensating for Signal Propagation Time

The propagation of the signal from the antenna to the receiver (reference clock) can incur a certain delay. This delay can be compensated for in the meinbergOS Web Interface by entering a fixed offset in nanoseconds under "Bias".

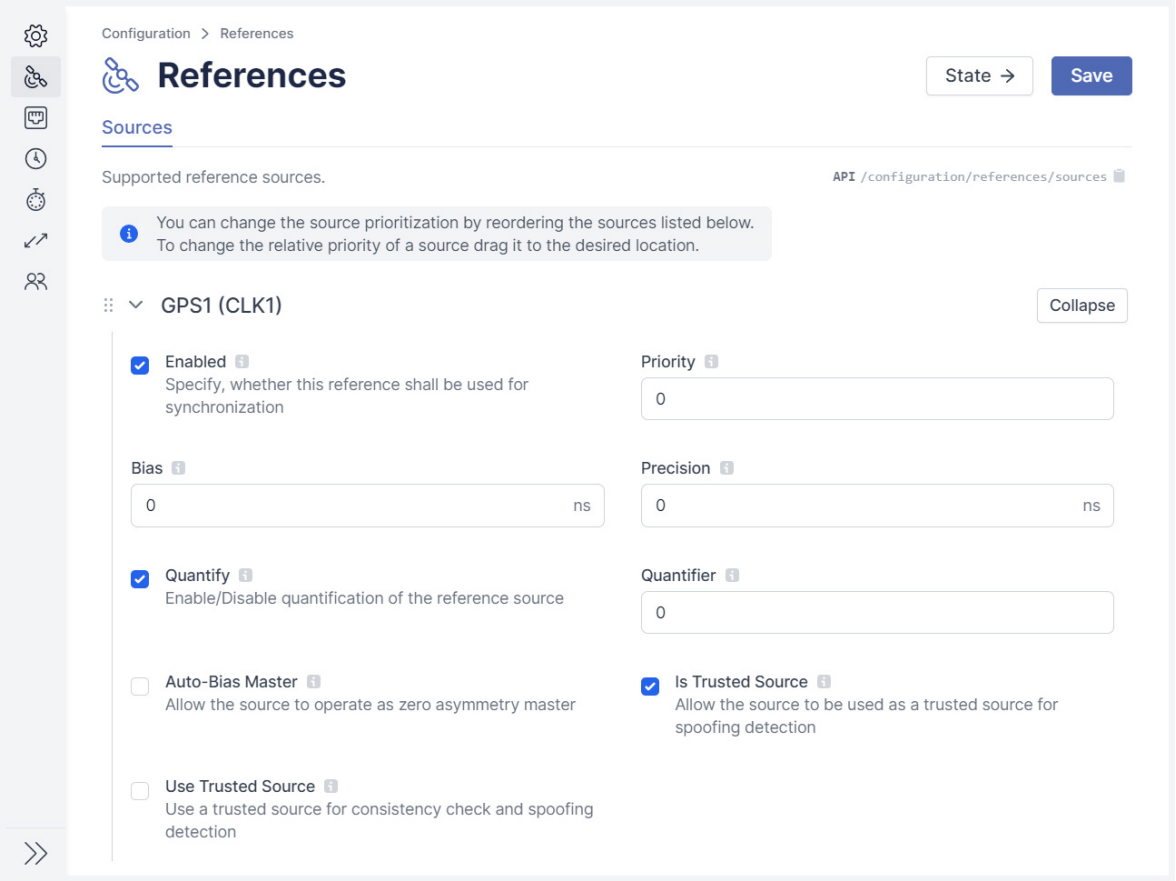


Fig. 4.2: "References" menu in meinbergOS Web Interface

9.4 Surge Protection and Grounding

The greatest risk to an antenna installation and the electronic devices connected to it is exposure to lightning strikes. An indirect lightning strike in the vicinity of the antenna or coaxial cable can induce significant surge voltages in the coaxial cable. This induced surge voltage can then be passed to the antenna and to the building interior, which can damage or even destroy both your antenna and your Meinberg system.

Warning!

Surge protection and lightning protection systems may only be installed by persons with suitable electrical installation expertise.

This is why antennas and antenna cables must always be integrated into a building's equipotential bonding infrastructure as part of an effective lightning protection strategy to ensure that voltages induced by lightning strikes directly on or indirectly near the antenna are redirected safely to ground.

Meinberg GPSANTv2

Meinberg's new-generation "GPSANTv2" antenna features integrated surge protection in accordance with IEC 61000-4-5 Level 4 to reliably shield the antenna against surge voltages.

However, in order to preserve the safety of the building and to protect your Meinberg system, Meinberg recomends the use of the MBG-S-PRO surge protector, which is addressed in more detail later in this chapter.

Surge Protection

VDE 0185-305 (IEC 62305) (relating to buildings with lightning protection systems) and VDE 0855-1 (IEC 60728-11) (addressing bonding strategies and the grounding of antenna installations in buildings with no external lightning protection system) are the lightning protection standards applicable to antenna installations on a building. Antennas must generally be integrated into a building's lightning protection system or bonding infrastructure.

If the antenna represents the highest point of a building or pole, the lightning protection strategy should incorporate a safe zone (e.g., formed by a lightning rod) positioned above the antenna. This increases the likelihood of lightning being 'caught' by the lightning rod, allowing surge currents to be safely passed from the lightning rod along a grounding conductor to ground.

Electrical Bonding

Electrical bonding is the connection of all metallic, electrically conductive elements of the antenna installation in order to limit the risk of dangerous voltages for people and connected devices.

To this end, the following elements should be connected and integrated into a bonding system:

- the antenna cable shielding using cable shield bonding connectors*
- the core conductor of the antenna cable using surge protection devices
- antennas, antenna poles
- Ground electrodes e.g., foundation electrode)

*Minimum IP rating IP X4 when using bonding connectors outdoors.

The drawings below illustrate how a Meinberg GPS Antenna can be installed in accordance with the above conditions on a pole (e.g. antenna pole) or building roof.

Antenna Installation without Insulated Lightning Rod System

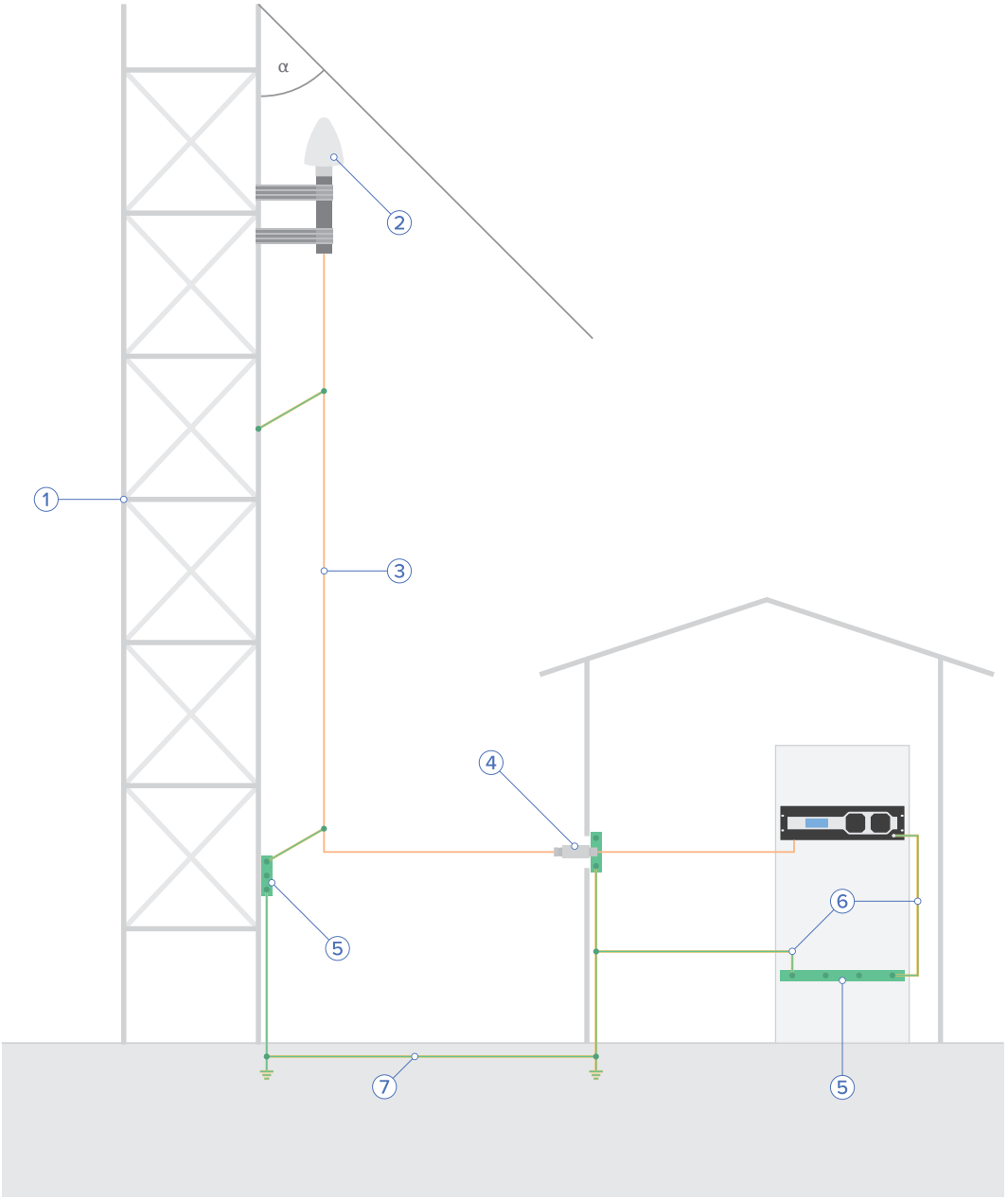


Fig. 5: Installation on a Pole

1 Antenna Pole
2 Meinberg GPS Antenna
3 Antenna Cable
4 MBG-S-PRO Surge Protector
5 Bonding Bar
6 Bonding Conductor
7 Foundation Electrode
α Safety Zone

Antenna Installation with Insulated Lightning Rod System

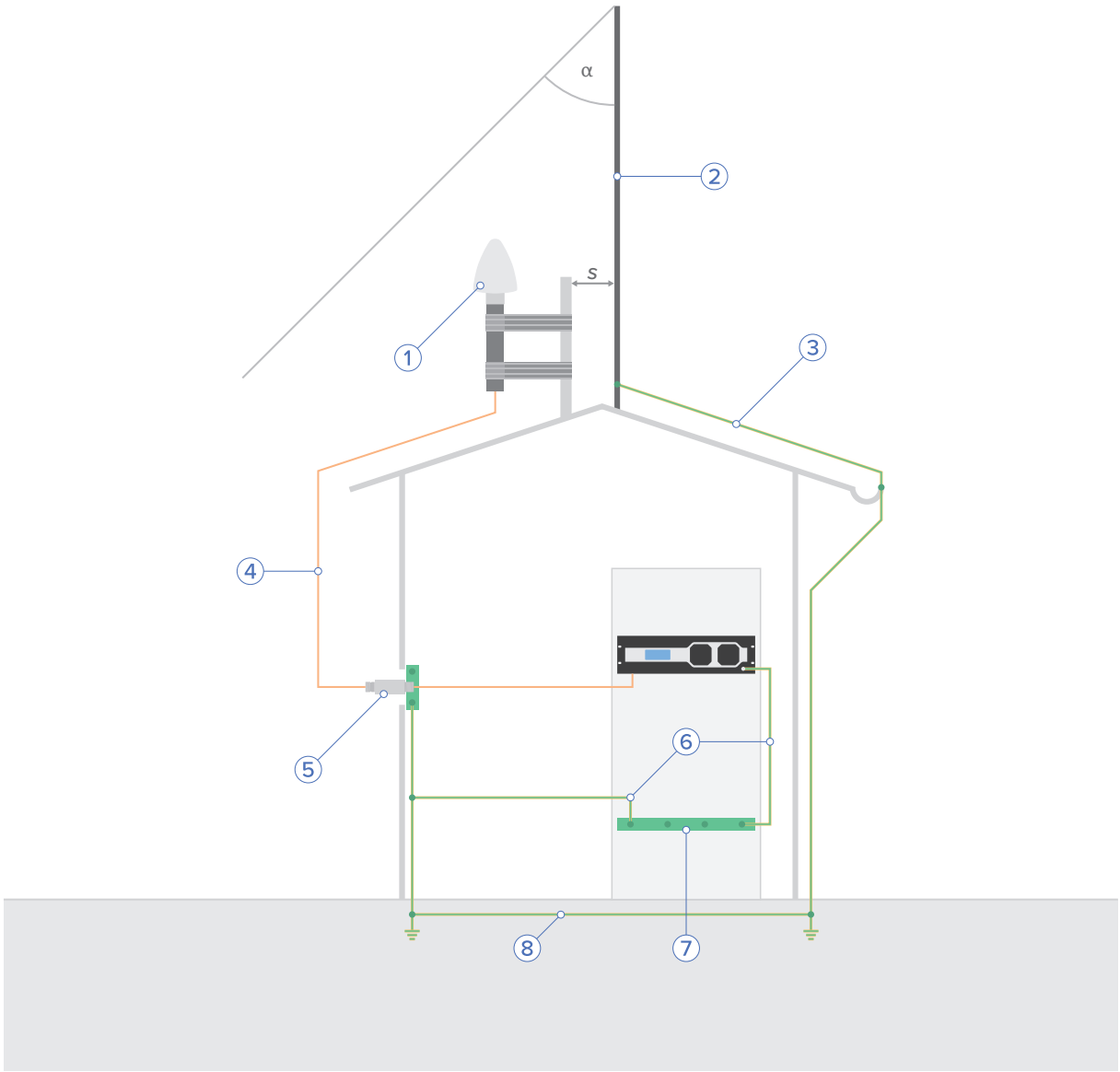


Fig. 6: Roof Installation

1 Meinberg GPS Antenna
2 Lightning Rod
3 Lightning Rod Conductor
4 Antenna Cable
5 MBG-S-PRO Surge Protector
6 Bonding Conductor
7 Bonding Bar
8 Foundation Electrode
α. Safety Zone
s. Safe Distance (between lightning rod and antenna installation)

MBG S-PRO Surge Protector

Information:

The surge protector and suitable coaxial cable are not included as standard with a Meinberg GPS Antenna, but can be ordered as an optional accessory.

Construction

The MBG-S-PRO is a surge protector (Phoenix CN-UB-280DC-BB) for coaxial connections. It is patched directly into the antenna line and consists of a replaceable gas discharge tube that redirects the energy from the cable shielding to the ground potential when ignited.

Installation Conditions

To protect the building from possible surge voltages, the MBG-S-PRO is installed at the point of entry of the antenna cable into the building. The MBG-S-PRO must be shielded against water spray and water jets by means of either a suitable enclosure (IP65) or a protected location.

Ideal Installation Conditions:

- Installation of the point of entry of the antenna cable into the building
- Ground conductor cable from surge protector to bonding bar as short as possible

Installation and Connection

This surge protector has no dedicated input or output polarity and therefore has no preferred installation orientation. It features Type-N female connectors at both ends.

Installation

1.
Fit the surge protector to the supplied mounting bracket as shown in the illustration.

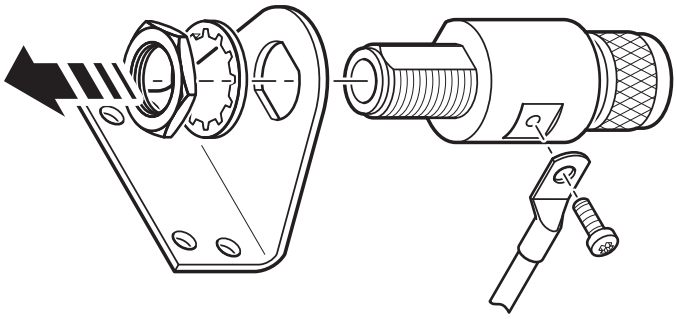


Fig. 7: Installation of the surge protectorrotector

2.
Connect the MBG-S-PRO to a bonding bar using a ground conductor cable that is as short as possible. It is also important for the bonding connection of the surge protector to be connected to the same bonding bar as the connected Meinberg system to prevent destructive potential differences.

3.
Connect the coaxial cable from the antenna to one of the surge protector connectors, then connect the other surge protector connector to the coaxial cable leading to the Meinberg reference clock.

Caution!

For safety reasons, the antenna cable must not exceed a certain length if there are no other devices such as a power distributor between the surge protector and the downstream electronic device with integrated surge protection at the mains connector level.

Please refer to the document "**Technical Specifications: MBG-S-PRO Surge Protector**" in the appendix as well as the manufacturer's data sheet for detailed installation instructions and technical specifications for the surge protector.

Data Sheet (Download):
https://www.meinbergglobal.com/download/docs/shortinfo/german/cn-ub-280dc-bb_pc.pdf

10 Starting of Operation

10.1 Initial Network Configuration

Once the microSync has been successfully started, the initial setup process can be performed.

The microSync is shipped with DHCP disabled and a statically configured IP address. This means that a network connection must be manually established to be able to setup the device fully.

There are three ways to perform the basic network configuration of your microSync:

- Configuration via a serial connection, see Chapter **10.1.1**.
- Configuration via the Web Interface, see Chapter **10.1.2**.
- Configuration via Meinberg Device Manager, see Chapter **10.1.3**.

10.1.1 Network Configuration via Serial Connection

The initial network configuration of the microSync can also be performed via a serial USB connection. You can connect the USB port on the PC with the micro-USB port of the microSync using a standard USB cable (Micro-USB Type B to USB-A). Your PC will recognize this connection as a serial connection.

Under Windows, you can identify which COM interface is used to communicate by opening the Device Manager. The information is usually provided under the group "*Ports (COM & LPT)*".

In many commonly used Linux distributions, the output of the terminal command *dmesg* can be used to identify which serial interface is to be used to communicate with the microSync. The relevant entry would look something like this:

```
[77833.359948] usb 1-1.2.1.6.3:  FTDI USB Serial Device converter now
attached to ttyUSB0
```

This reveals, for example, that you should establish a connection via /dev/ttyUSB0.

You can now use a terminal client such as PuTTY to establish a serial connection with the system.

Use the following connection parameters:

Conn. Type: Serial

Serial Line: The serial interface identified as above (e.g., *COM13* or */dev/ttyUSB0*)

Speed: 115200

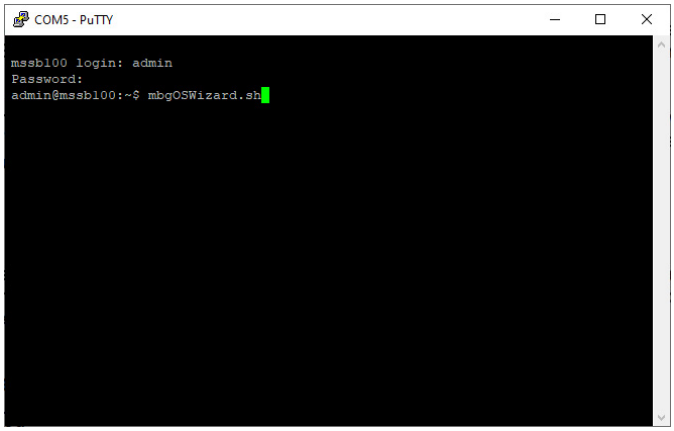
Framing: 8N1

Once the connection has been detected, you will be prompted to enter a username and password. User: *admin* / Password: *timeserver*. Press the Enter key after each entry.

Once a connection has been successfully established, you can use the meinbergOS Wizard to perform the initial network configuration.

First, launch the wizard by entering *mbgOSWizard.sh*; this will prompt you to enter the password (Default: *timeserver*).

You can now select the physical network interface that you wish to use for management purposes. The next step is to enter the IPv4 address that you wish to assign to the selected port. The final step is to enter the subnet mask (e.g., 255.255.255.0). You can then confirm your entries with '*y*'.



The initial network configuration process is now complete and you can close the setup wizard. All further configuration can be performed using the Web Interface or Meinberg Device Manager.

Information:

If the microSync's network configuration has already been previously performed using the Web Interface or Meinberg Device Manager, you will not be able to do this using *mbgOSWizard.sh*.

10.1.2 Network Configuration via Web Interface

The network configuration for the microSync can be performed via the Web Interface. In its factory-shipped state, the microSync has the following network configuration:

Network Port LAN 0

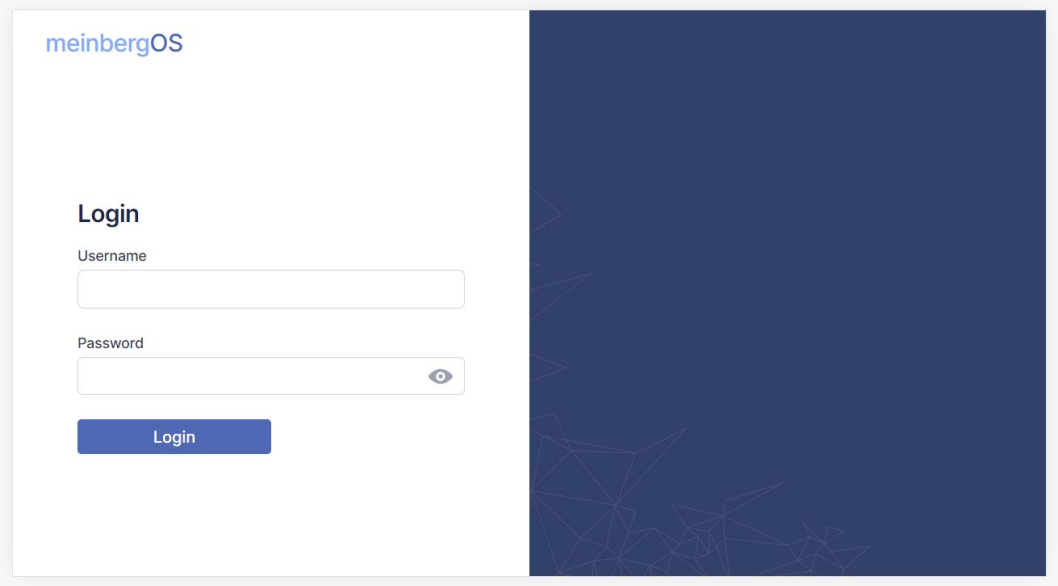
IPv4 Address: *192.168.19.79*

Subnet Mask: *255.255.255.0*

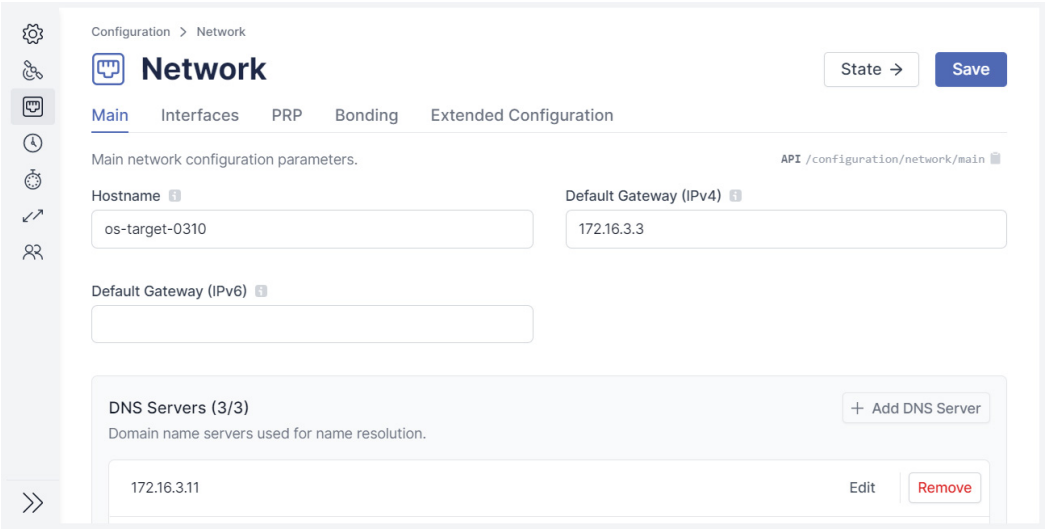
Gateway: Not defined

DHCP: Disabled

The PC from which the Web Interface will be accessed via a browser must be able to establish a network connection with the above address in the appropriate subnet. If the PC's network configuration or the network's topology or addressing prevent a connection from being established with the microSync, the network configuration of the PC will need to be (temporarily) changed and a different physical connection may need to be established (e.g. a direct network connection).



Open a web browser of your choice and open the address *https://192.168.19.79*. This should bring up the login page. Enter "*admin*" as the username and "*timeserver*" as the password.



As soon as the Dashboard appears, click on the "**Configuration**" section in the Header Bar, then select the "**Network**" tile. Be sure in particular to correctly configure the network settings for the intended management interface ("**Interfaces**" tab) to ensure that it is accessible within the subnet.

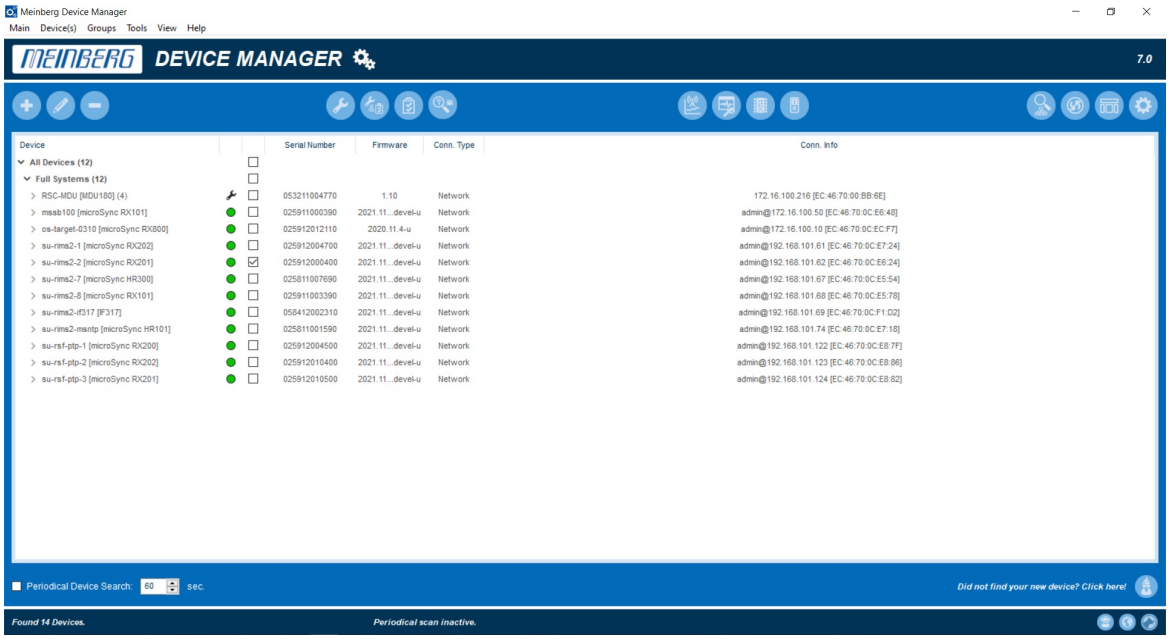
Once you have performed the configuration, click on "**Save**" to store the changes.

10.1.3 Network Configuration via Meinberg Device Manager

Meinberg Device Manager

The Meinberg Device Manager software is a graphical desktop application that allows to configure Meinberg modules and assembly groups over an encrypted network connection or a local USB or serial connection. A great advantage of the Meinberg Device Manager is that various modules/assembly groups can be configured and monitored simultaneously. The Meinberg Device Manager for Windows can be used under Windows 7 and all newer versions. Supported Linux distributions include Ubuntu, Mint Linux, Debian, SUSE Linux, CentOS, and others.

The software does not need to be installed or copied on the PC. The Meinberg Device Manager can be started directly from an USB storage device. The computer must be connected to the network in which the microSync system is connected.



The Meinberg Device Manager software is downloadable free of charge from our homepage:
https://www.meinbergglobal.com/english/sw/mbg-devman.htm

Information:

You can download a complete and detailed manual about the Meinberg monitoring software on our homepage:
https://www.meinbergglobal.com/download/docs/manuals/english/meinberg-device-manager.pdf

The network configuration for the microSync can be performed using Meinberg Device Manager - see chapter "Additional Software" in the microSync installation manual.

In its factory-shipped state the microSync has the following network configuration:

Netzwerkport LAN 0

IPv4 Adresse *192.168.19.79*

Netzmaske: *255.255.255.0*

Gateway: Not defined

DHCP: Disabled

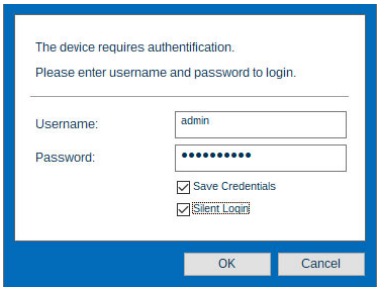
The PC on which Meinberg Device Manager is used must be able to establish a network connection with the above address in the appropriate subnet. If the PC's network configuration or the network's topology or addressing prevent a connection from being established with the microSync, the network configuration of the PC will need to be (temporarily) changed and a different physical connection may need to be established (e.g. a direct network connection).

Important!

Please ensure that any effective firewalls or other security solutions allow network traffic to pass through TCP port *10002*.

Clicking on the button "**Search Devices**" will cause all Meinberg products accessible over the network connection to be detected and then listed.

Select the device with which you wish to establish a connection. With the microSync, you will then be prompted to enter your account details. When setting the device up for the first time, please enter "*admin*" as the username and "*timeserver*" as the password.

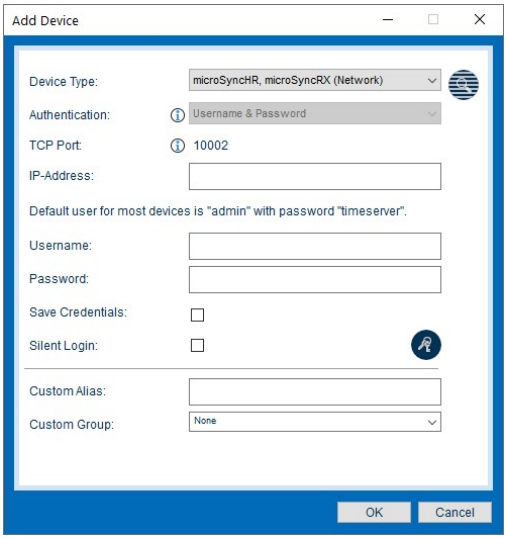


If the inserted microSync cannot be found via the automatic search, the **Add Device** button can be used to set up the connection manually.

Manual Setup

Select the connection type **microSyncHR, microSyncRX (Network)**.

Then enter the IPv4 address of the microSync (*192.168.19.79*). Enter "*admin*" as the username and "*timeserver*" as the password.



Once the network connection has been established, open the "**Network**" section of the left "**Config**" panel, then make the appropriate adjustments to the network settings. Be sure in particular to correctly configure the network settings for the intended management interface ("**Interfaces**" tab) to ensure that it is accessible within the subnet.

Once you have performed the configuration, click on "**Apply Configuration**" (the check mark) to store the changes.

10.2 Initial Start of Operation

10.2.1 Start of Operation with meinbergOS Web Interface

microSync systems with meinbergOS Version *2022.05.1* or later provide a feature-rich Web Interface that can be used to perform most configuration processes easily and also allows you to monitor your device's status and condition.

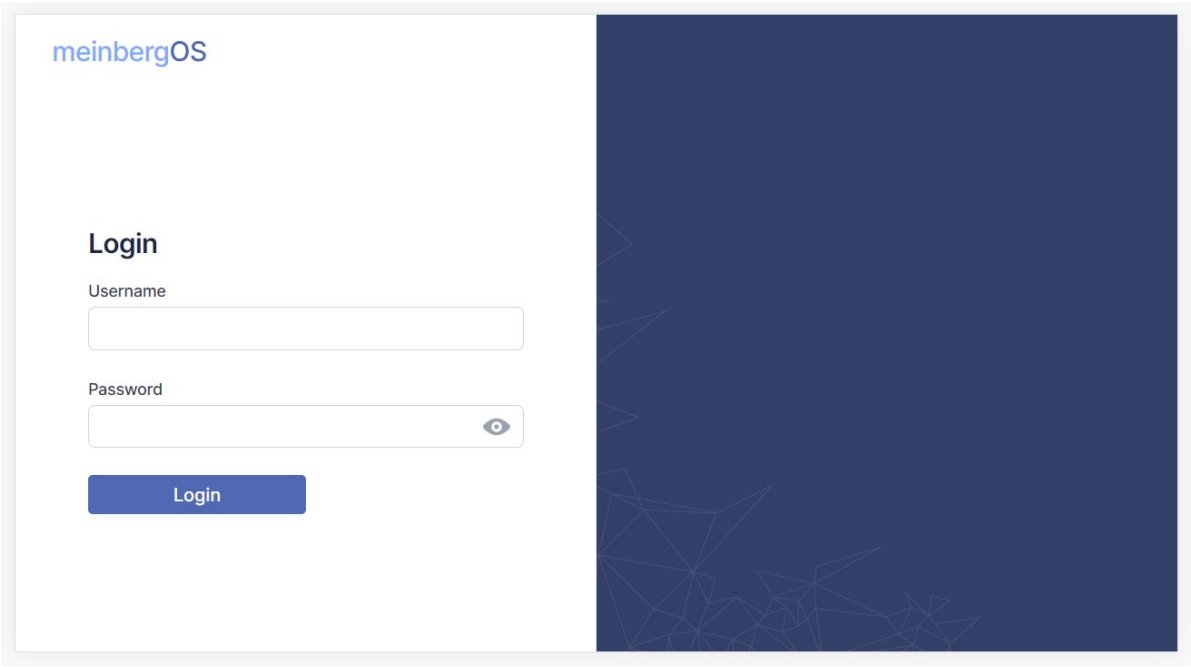


Figure 10.1: Login Page of meinbergOS Web Interface

Once you have entered the IP address of your meinbergOS device into the address bar of your web browser, the login page will appear (Figure 10.1).

The default settings are:

Username: *admin*
Password: *timeserver*

Further information about the meinbergOS web interface in the chapter "The meinbergOS Web Interface" to be found in the microSync installation manual:

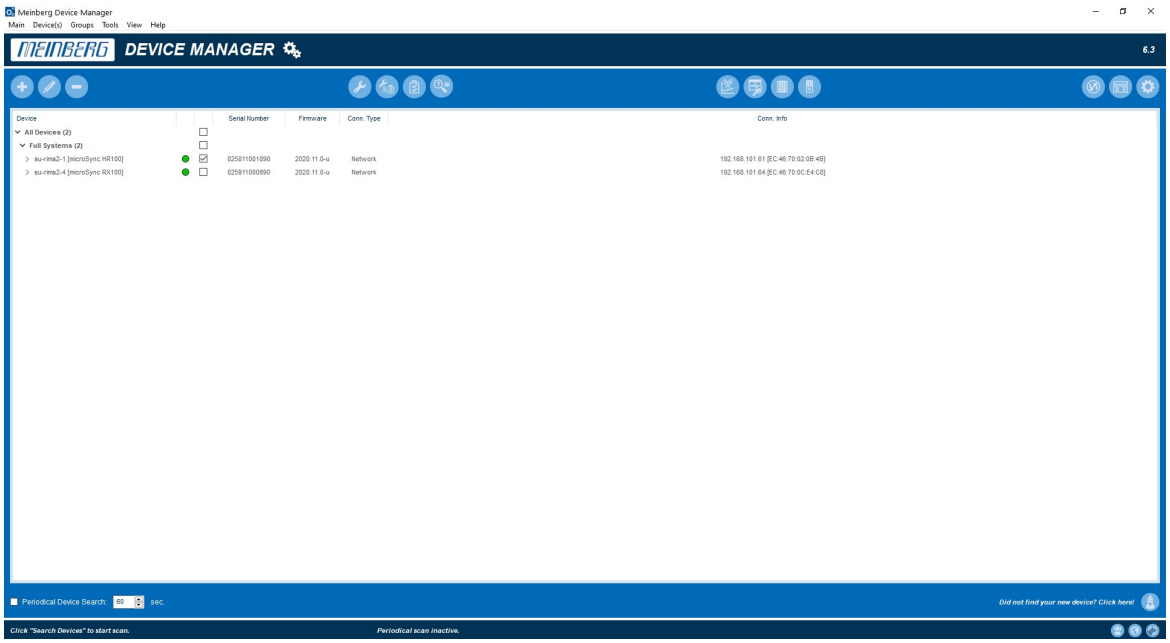
https://www.meinberg.de/download/docs/manuals/english/microsync.pdf

10.2.2 Start of Operation with Meinberg Device Manager Software

First install the Meinberg Device Manager software. After the setup, start the program. If you do not wish to install the software on your local PC, you can also download the "Portable Version" of Meinberg Device Manager and launch it directly from a portable USB storage medium.

The Meinberg Device Manager software is freely available for download from our website:
https://www.meinbergglobal.com/english/sw/mbg-devman.htm

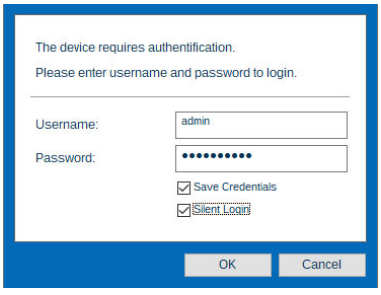
A comprehensive manual of the Meinberg Device Manager software can be downloaded here:
https://www.meinbergglobal.com/download/docs/manuals/english/meinberg-device-manager.pdf



By clicking on the Search Devices button, all available microSync systems that have a serial or a network connection are recognized by the Meinberg Device Manager and will be listed then.

- Found systems are displayed with a green dot.
- Modules that are no longer recognized are displayed with a red dot.
- Modules whose password or password/user name combination is unknown will be marked with a red x.

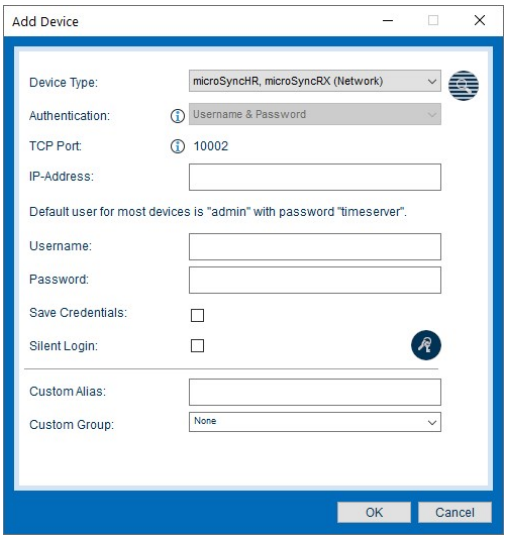
Use the corresponding checkbox to select the device with which you want to establish a connection. With a microSync system you will then be prompted to enter your connection data. At the initial start please use "**admin**" for user and "**timeserver**" as password.



If the connected system was not found by the automatic search, a connection can be established manually by **Add Device**.

Establishing a Network Connection

Select the connection type *Network*. Then enter the IPv4 address of the system you want to connect to.



Authentication

Select the authentication option. The option Username & Password is only supported on systems with MeinbergOS.

TCP Port

The TCP port is used to communicate with your system. Please make sure that the port is not blocked by your firewall configuration.

Save Credentials

With this checkbox you ensure that the Device Manager has remembered the login for this system. When the program is restarted, the User and Password fields are already filled out.

Silent Login

You have the option that the Meinberg Device Manager does not ask for a user name and password every time you log in.

Custom Alias

Assign a custom alias for better identification of individual systems/modules in Device Manager.

Custom Group

Assign the module/assembly to a previously created group.

11 Technical Appendix

11.1 Technical Specifications microSync Chassis

Protection Rating: IP30

Operating Temperature: –20 to 55 °C (–4 to 131 °F)
As tested per IEC 60068-2-1, Cold: –40 °C (–40 °F)
As tested per IEC 60068-2-2, Dry Heat: 85 °C (185 °F)

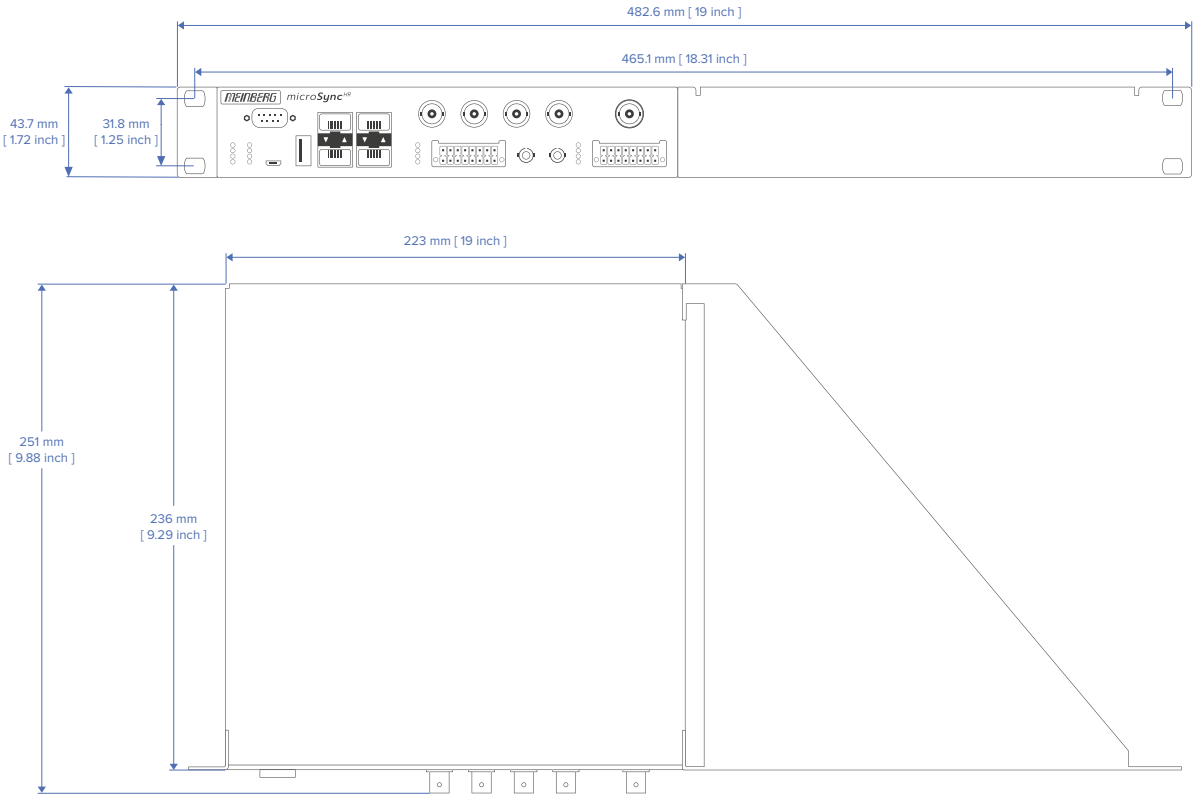
Storage Temperature: –30 to 70 °C (–22 to 158 °F)

Relative Humidity: 5 to 95 % (non-condensing) at 40 °C (104 ° F)

Operating Altitude: up to 4,000 m (13,123 ft) above sea level

Atmospheric Pressure: 615 to 1,600 hPa

Physical Dimensions:



11.2 Technical Specifications GNSS Receiver

Time to Sychronization:
one minute with known receiver position and valid almanac
12 minutes if invalid battery buffered memory

Pulse Outputs:
HR and RX systems: eight programmable outputs (PP 1 - PP 8)
Timer, Single Shot, Cyclic Pulse, Pulse Per Second / Minute / Hour, DCF77 Marks, Position OK, Time Sync, All Sync, DCLS Time Code, Serial Time String, 10 MHz Frequency, Synthesizer Frequency, PTTI 1PPS

DC-insulated by optocouplers
U_{CEmax} = 55 V, I_{Cmax} = 50 mA, P_{tot} = 150 mW, V_{iso} = 5000 V

pulse delay: t_{on} e.g. 20 μsec (I_C = 10 mA)
t_{off} e.g. 3 μsec (I_C = 10 mA)

Accuracy of Pulses:
after synchronization and 20 minutes of operation
OCXO SQ/MQ/HQ/DHQ: better than ±50 nsec

better than ±2 μsec during the first 20 minutes of operation

Frequency Outputs:
10 MHz, TTL level into 50 Ohm
1 MHz, TTL level
100 kHz, TTL level

Frequency Synthesizer:
1/8 Hz up to 10 MHz

Accuracy of Synthesizer:
base accuracy depends on system accuracy
1/8 Hz to 10 kHz — Phase syncron with pulse output P_SEC
10 kHz to 10 MHz — frequency deviation < 0.0047 Hz

Synthesizer Outputs:
F_SYNTH: TTL level

Serial Ports:
asynchronous serial port RS-232
Baud Rate: 300, 600, 1200, 2400, 4800, 9600, 19200 Baud
Framing: 7E1, 7E2, 7N2, 7O1, 7O2, 8E1, 8N1, 8N2, 8O1

Default Setting:
COM 0: 19200, 8N1
Meinberg Standard time string, per second

Time Code Outputs:
Unbalanced modulated sine wave signal:
3 V_{pp} (MARK), 1 V_{pp} (SPACE) into 50 Ω

PWM DCLS-signal: TTL into 50 Ω, active-high or -low

GNS Receiver

Type of receiver:
GPS/GLONASS/Galileo/BeiDou receiver
Number of channels: 72
Frequency band: GNSS L1
GPS: 1575.42 ±10 MHz
GLONASS: 1602-1615 MHz
Galileo: 1542.5 MHz
BeiDou: 1561.09 MHz

Antenna:
Combined GPS/GLONASS antenna

3 dB Bandwidth:	1590 ±30 MHz
Impedance:	50 Ω
Gain:	40 ±4 dB

Cable length: max. 70 m — low-loss cable (Belden H155)

Antenna Connector: SMA female

Power Supply for Antenna:
5 V, 100 mA - continuous short circuit protection, automatic recovery
power supply via antenna cable

GPS Receiver

Receiver: 12 channel C/A code receiver with external antenna/converter unit

Antenna: antenna/converter unit with remote power supply

Cable length: max. 300 m (RG58 coax-cable)

Antenna Connector: BNC female

Power Supply for Antenna:
15 V DC, continuous short circuit protection, automatic recovery
isolation voltage 1000 VDC, provided via antenna cable

GNS-UC Receiver

Type of receiver:
72 channel receiver
GPS/Galileo

Frequency band:

GPS:	L1C/A
Galileo:	E1B/C

Cable length: max. 300 m (RG58 coax-cable)

Antenna Connector: BNC female

Power Supply for Antenna:
15 V DC, continuous short circuit protection, automatic recovery
isolation voltage 1000 VDC, provided via antenna cable

11.3 Configuration Options

Receiver Options

RECEIVER TYPE	SIGNAL TYPE	VALUE	CONNECTOR
Meinberg GPS IF, 12-channel	IF (Meinberg Antenna))	15 V DC	BNC
Meinberg GNS-UC GPS/Galileo IF	IF (Meinberg Antenna))	15 V DC	BNC
GNSS (GPS, GLONASS, Galileo, BeiDou), 72-Channel	L1/E1/B1 Band	5 V DC	SMA

Oscillator Options

TYP	HOLDOVER PERFORMANCE (1 DAY)	HOLDOVER PERFORMANCE (1 YEAR)
OCXO HQ	+- 22 μsec	+- 788 msec
OCXO DHQ	+- 4.5 μsec	+- 158 msec

11.4 Protocols and Profiles

NETWORK PROTOCOLS	IEEE 1588 PROFILES
IPv4, IPv6	IEEE 1588v2 Default Profile
NTPv3, NTPv4	IEEE C.37.238-2011 Power Profile
PTPv1, PTPv2	IEEE C.37.238-2017 Power Profile
IEC 62439-3 (PRP)	IEC/IEEE 61850-9-3 Power Utility Profile
DHCP, DHCPv6	Enterprise-Profile
DSCP	ITU-T G.8265.1, ITU-T G.8275.1, ITU-T G.8275.2 Telecom Profile
IEEE 802.1q VLAN Filtering/Tagging	SMPTE ST 2059-2 Broadcast Profile
IEEE 802.1p QOS	IEEE 802.1AS TSN/AVB Profile
SNMPv1/v2/v3	AES67 Media Profile
Remote Syslog Support (UDP)	DOCSIS 3.1

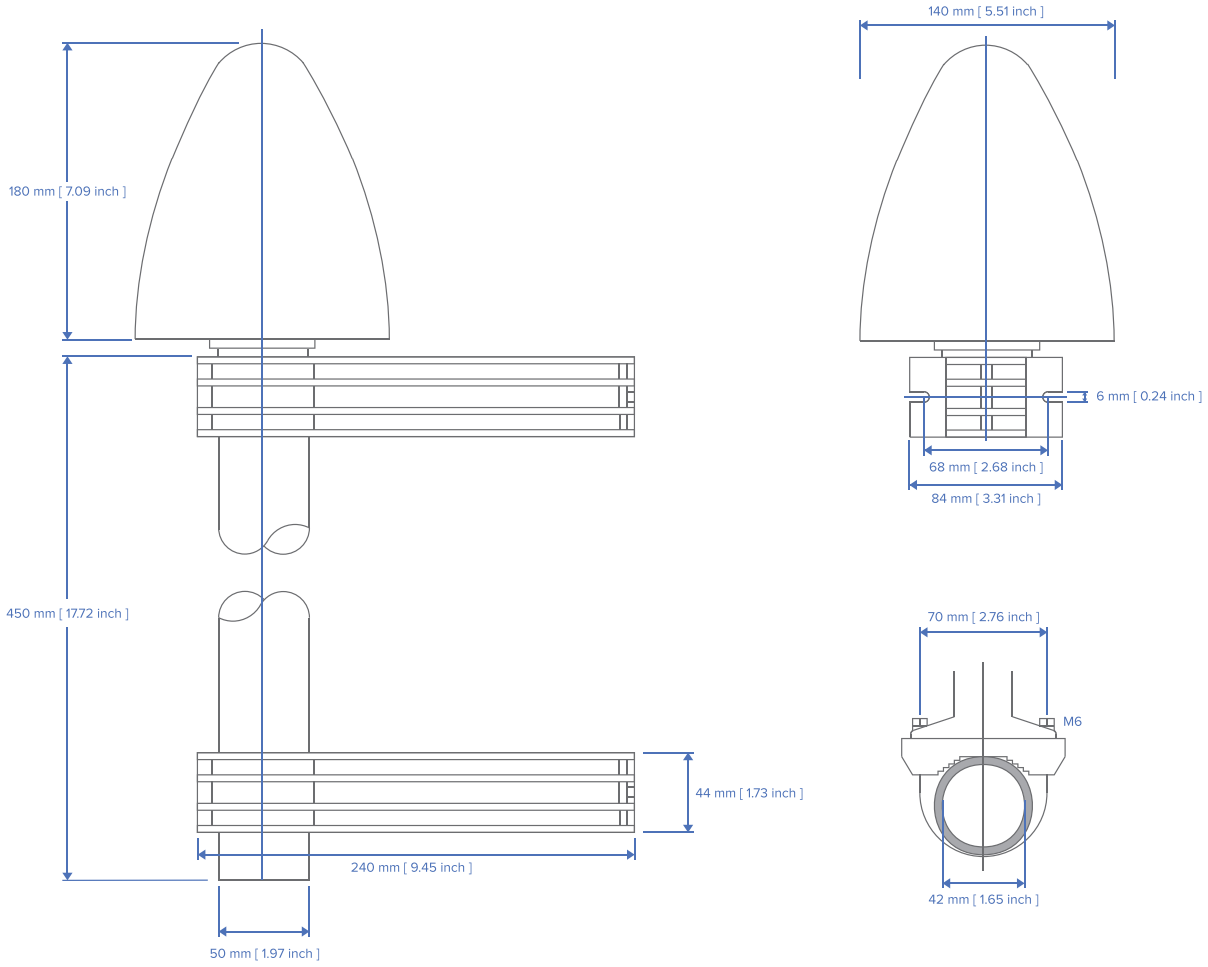
11.5 Compliances

Compliance	
CB Scheme	
CE	
FCC	
UL	
CSA	
WEEE	Waste of Electrical and Electronic Equipment
RoHS	Restriction of Hazardous Substances
REACH	Registration, Evaluation, Authorization and Restriction of Chemicals

12 Technical Appendix: GPS Antenna + Accessories

12.1 Technical Specifications: GPSANTv2 Antenna

Physical Dimensions:



Specifications:

Power Supply:	15 V, approx. 100 mA (provided via antenna cable)
Reception Frequency:	1575.42 MHz (GPS L1/Galileo E1 Band)
Bandwidth:	9 MHz
Frequencies:	Mixing Frequency: 10 MHz Intermediate Frequency: 35.4 MHz
Element Gain:	Typically 5.0 dBic at zenith
Polarization:	Right-Hand Circular Polarization
Axial Ratio:	$\leq$ 3 dB at zenith
Nominal Impedance:	50 Ω
VSWR:	$\leq$ 1.5 : 1
Conversion Gain:	56 dB $\pm$ 3 dB
Out-of-Band Rejection:	$\geq$ 70 dB @ 1555 MHz $\geq$ 55 dB @ 1595 MHz
Noise Figure:	Typically 1.8 dB max. 3 dB @ +25 °C
Surge Protection:	Level 4 (per IEC 61000-4-5) Test Voltage: 4000 V Max. Peak Voltage @ 2 Ω: 2000 A
ESD Protection:	Level 4 (per IEC 61000-4-2) Contact Discharge: 8 kV Air Discharge: 15 kV
Connector Type:	Type-N, Female
Housing Material:	ABS Plastic Case for Outdoor Installation
IP Rating:	IP65
Temperature Range:	–60 °C to +80 °C (-76 °F to 176 °F)
Weight:	1.4 kg (3.53 lbs), including mounting kit

12.2 Technical Specifications: MBG-S-PRO Surge Protector

The MBG-S-PRO is a surge protector (Phoenix CN-UB-280DC-BB) for coaxial connections. It is patched directly into the antenna line and consists of a replaceable gas discharge tube that redirects the energy from the cable shielding to the ground potential when ignited. Connect the MBG-S-PRO using a ground conductor cable that is as short as possible.

The MBG S-PRO has no dedicated input/output polarity and no preferred installation orientation.

Phoenix CN-UB-280DC-BB

Features:

- Excellent RF Performance
- Multiple Strike Capability
- 20 kA Surge Protection
- Bidirectional Protection

Contents of Package:	Surge Protector with Mounting Bracket and Accessories
Product Type:	Surge Protector for Transmission and Receiver Devices
Construction Type:	In-Line Breaker
Connector Types:	Type-N Female/Type-N Female

The original product page of the supplier (see link) of the CN-UB-280DC-BB surge protector provides detailed specifications, as well as a variety of product-specific documents under the link below:

Data Sheet (Download):
https://www.meinbergglobal.com/download/docs/shortinfo/german/cn-ub-280dc-bb_pc.pdf

13 RoHS Conformity

Conformity with EU Directive 2011/65/EU (RoHS)

We hereby declare that this product is compliant with the European Union Directive 2011/65/EU and its delegated directive 2015/863/EU "Restrictions of Hazardous Substances in Electrical and Electronic Equipment" and that no impermissible substances are present in our products pursuant to these Directives.

We warrant that our electrical and electronic products sold in the EU do not contain lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyls (PBBs), polybrominated diphenyl ethers (PBDEs), bis(2-ethylhexyl)phthalat (DEHP), benzyl butyl phthalate (BBP), dibutyl phthalate (DBP), or diisobutyl phthalate (DIBP) above the legal limits.

14 Declaration of Conformity for Operation in the European Union

EU-Konformitätserklärung

Doc ID: microSync HR701/DC-December 1, 2023

Hersteller *Manufacturer*	Meinberg Funkuhren GmbH & Co. KG Lange Wand 9, D-31812 Bad Pyrmont

erklärt in alleiniger Verantwortung, dass das Produkt,
declares under its sole responsibility, that the product

Produktbezeichnung *Product Designation*	**microSync HR701/DC**

auf das sich diese Erklärung bezieht, mit den folgenden Normen und Richtlinien übereinstimmt:
to which this declaration relates is in conformity with the following standards and provisions of the directives:

RED – Richtlinie *RED Directive* 2014/53/EU	ETSI EN 303 413 V1.2.1 (2021-04)
EMV – Richtlinie *EMC Directive* 2014/30/EU	ETSI EN 301 489-1 V2.2.3 (2019-11) ETSI EN 301 489-19 V2.2.1 (2022-09) DIN EN IEC 61000-6-2:2019 DIN EN IEC 61000-6-3:2021 DIN EN 55032:2015/AC:2016/A11:2020/A1:2020 DIN EN 55035:2017/A11:2020
Niederspannungsrichtlinie *Low Voltage Directive* 2014/35/EU	DIN EN IEC 62368-1:2020/A11:2020
RoHS – Richtlinie *RoHS Directive* 2011/65/EU + 2015/863/EU	DIN EN IEC 63000:2018

Bad Pyrmont, den December 1, 2023

S. Meinberg

Stephan Meinberg
Production Manager

15 Declaration of Conformity for Operation in the United Kingdom

UK Declaration of Conformity

Doc ID: microSync HR701/DC-December 1, 2023

Manufacturer	Meinberg Funkuhren GmbH & Co. KG Lange Wand 9 31812 Bad Pyrmont Germany

declares that the product

Product Designation	**microSync HR701/DC**

to which this declaration relates, is in conformity with the following standards and provisions of the following regulations under British law:

Radio Equipment Regulations 2017 (as amended) *SI 2017/1206*	ETSI EN 303 413 V1.2.1 (2021-04)
Electromagnetic Compatibility Regulations 2016 (as amended) *SI 2016/1091*	ETSI EN 301 489-1 V2.2.3 (2019-11) ETSI EN 301 489-19 V2.2.1 (2022-09) EN IEC 61000-6-2:2019 EN IEC 61000-6-3:2021 EN 55032:2015/AC:2016/A11:2020/A1:2020 EN 55035:2017/A11:2020
Electrical Equipment (Safety) Regulations 2016 (as amended) *SI 2016/1101*	EN IEC 62368-1:2020/A11:2020
The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 (as amended) *SI 2012/3032*	EN IEC 63000:2018

Bad Pyrmont, Germany, dated December 1, 2023

S. Meinberg

Stephan Meinberg
Production Manager