MEINBERG

The Synchronization Experts.

TECHNICAL REFERENCE

microSync

HR100/DC

August 11, 2022

Meinberg Funkuhren GmbH & Co. KG

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1 Imprint

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2 microSync Introduction

microSync is a multipurpose synchronization solution with compact design and high performance. The microSync system provides multiple output signals and allows synchronization of both 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

3 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:
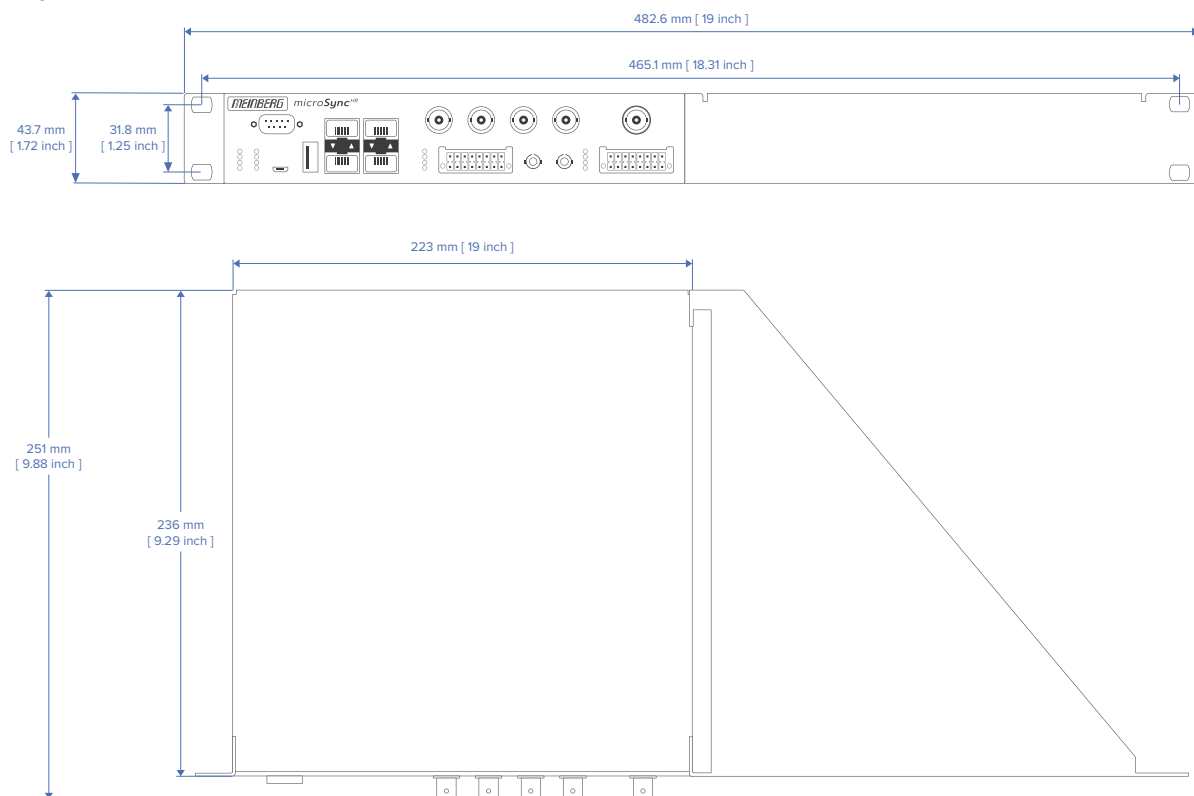
4 Important Safety Information

4.1 Important Safety Information and Safety Precautions

The following safety information must be observed whenever the device is being installed or operated. Failure to observe this safety information and other special warnings or operating instructions in the product manuals constitutes improper usage and may violate safety standards and the manufacturer's requirements.

Depending on the configuration of your device or installed options, some information may not specifically apply to your device.

The device satisfies the requirements of the following EU regulations: EMC Directive, Low Voltage Directive, RoHS Directive and—where applicable—the Radio Equipment Directive.

If a procedure is marked with the following signal words, you may only proceed with it if you have understood and fulfilled all requirements. Hazard notices and other relevant information are classified and indicated as such in this manual according to the following system:

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.

WARNING!
This signal 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.

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.

ATTENTION!
This signal word refers to a procedure or other action that may result in product damage or the loss of important data if not observed or if improperly performed.

4.2 Used Symbols

The following symbols and pictograms are used in this manual. Pictograms are used in particular to indicate potential hazards in all hazard categories.

Symbol	Beschreibung / Description
⎓	IEC 60417-5031 Gleichstrom / *Direct current*
∿	IEC 60417-5032 Wechselstrom / *Alternating current*
⏚	IEC 60417-5017 Erdungsanschluss / *Earth (ground) terminal*
⏛	IEC 60417-5019 Schutzleiteranschluss / *Protective earth (ground) terminal*
⚠	ISO 7000-0434A Vorsicht / *Caution*
⚡	IEC 60417-6042 Vorsicht, Risiko eines elektrischen Schlages / *Caution, risk of electric shock*
♨	IEC 60417-5041 Vorsicht, heiße Oberfläche / *Caution, hot surface*
⚙	IEC 60417-6056 Vorsicht, Gefährlich sich bewegende Teile / *Caution, moving parts*
	IEC 60417-6172 Trennen Sie alle Netzstecker / *Disconnect all power connectors*
	IEC 60417-5134 Elektrostatisch gefährdete Bauteile / *Electrostatic Discharge Sensitive Devices*
ⓘ	IEC 60417-6222 Information generell / *General information*
♻	2012/19/EU Dieses Produkt fällt unter die B2B Kategorie. Zur Entsorgung muss es an den Hersteller übergeben werden. *This product is handled as a B2B-category product. To ensure that the product is disposed of in a WEEE-compliant fashion, it must be returned to the manufacturer.*

4.3 Product Documentation

Detailed product documentation is provided on a USB flash drive delivered with the system. The manuals can also be downloaded from the Meinberg website at https://www.meinbergglobal.com, where you can enter your system name into the search box at the top of the page to find the relevant manual. Alternatively, contact Meinberg Support for further assistance.

This manual contains important safety instructions for the installation and operation of the device. Please read this manual thoroughly before using the device.

This device may only be used for the purpose described in this manual. In particular, the specified operating limits of the device must be heeded. The person setting up the device is responsible for safety matters in relation to any larger system in which the device is installed!

Failure to observe these instructions may have an adverse impact on device safety!

Please keep this manual in a safe place.

This manual is only intended to be used by qualified electricians, or by persons who have been appropriately instructed by a qualified electrician and who are familiar with applicable national standards and with safety rules & regulations. This device may only be installed, set up, and operated by qualified personnel.

4.4 Security during Installation

⚠️ WARNING!

Preparing for Commissioning
This built-in unit, has been designed and examined according to the requirements of the standard IEC 62368-1 "Audio/video, information and communication technology equipment – Part 1: Safety requirements".

When the built-in unit is used in a terminal (e.g., housing cabinet), additional requirements according to Standard IEC 62368-1 must be observed and complied with. In particular, the general requirements and the safety of electrical equipment (such as IEC, VDE, DIN, ANSI) as well as the applicable national standards are to be observed.

The device has been developed for use in the industrial sector as well as in residential areas and can only be used in such environments. For environments with higher levels of soiling, additional measures, e.g. Installation in an air-conditioned control cabinet required.

Transport, Unpacking, Installation
If the unit is brought into the operating room from a cold environment, condensation may occur, wait until the unit is temperature-controlled and absolutely dry before operating it.

When unpacking, setting up, and before operating the equipment, be sure to read the information on the hardware installation and the specifications of the equipment. These include, for example, dimensions, electrical characteristics, and necessary ambient and climatic conditions, etc.

The fire protection must be ensured in the installed state.

For mounting, the housing must not be damaged. No holes may be drilled in the housing.

For safety reasons, the device with the highest mass should be installed in the lowest position of the rack. Other devices must be placed from the bottom to the top.

The device must be protected against mechanical stress such as vibration or shock.

⚠️

Connecting Data Cables
During a thunderstorm, data transmission lines must not be connected or disconnected (risk of lightning).

When wiring the devices, the cables must be connected or disconnected in the order of the arrangement described in the user documentation accompanying the device. Always attach all cables to the plug during connection and removal. Never pull the cable itself. Pulling the cable can cause the cables to disconnect from the plug.

Install the cables in way that they do not constitute a hazard (danger of tripping) and are not damaged, i.e. kinked.

Connecting Power Supply
This equipment is operated at a hazardous voltage. Non-observance of the safety instructions in this manual may result in serious personal injury or property damage.

Before connecting to the power supply, a grounding cable must be connected to the earth connection of the device.

Before operation, check that all cables and lines work properly and are undamaged. Pay particular attention to the facts that the cables do not have kinks or that they are not too short around corners, and no objects are placed on the cables. Also make sure that all connections are secure.

Faulty shielding or cabling will endanger your health (electrical shock) and may destroy other equipment.

Ensure that all necessary safety precautions have been taken. Make all connections to a unit before turning on the power. Observe the safety instructions on the device (see safety symbols).

The metal housing of the device is grounded. It must be ensured that enough air and creepage distances to neighboring voltage-carrying parts are provided during assembly in the control cabinet and no short circuits are caused.

In the case of malfunctions or servicing (e.g. in the event of a damaged housing or power cable or when fluids or foreign objects enter), the current flow can be interrupted. Questions about the house installation, need to be clarified with your house administration.

The power supply should be connected with a short, low-inductance line.

DC Power Supply
Outside the assembly group the device must be disconnectable from the power supply in accordance with the provisions of IEC 62368-1 (e.g. by the primary line protection).

Installation and disassembly of the power supply plug is only permitted if the assembly group is switched off (e.g. by the primary line protection).

The supply lines must be adequately secured and dimensioned.

Connection Cross Section: $1 \text{ mm}^2 – 2.5 \text{ mm}^2$ 17 AWG – 13 AWG

The device must be supplied with a suitable disconnector (switch). The separation device must be easily accessible, placed near the device and marked as a separation device for the unit.

4.5 Safety Information for SFP Modules

This safety information describes how the SFP modules recommended by Meinberg should be handled to ensure safe usage. These SFP modules are hot-pluggable input/output devices (I/O devices) that are connected to a network via a fiber optic or electrical connection. The safety information below must be read and heeded before installing an SFP module in a Meinberg device, before setting up a Meinberg device equipped with SFP modules for use, or before performing maintenance on such a Meinberg device.

CAUTION!

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

Risk of injury from laser radiation!

- 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.
- This device may be installed, replaced, and maintained only by trained and qualified personnel.

ATTENTION!

- 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.

4.6 Connection of Protective Earth Conductor/Grounding

ATTENTION!

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 ≥ 1.5 mm^2, as well as a
suitable grounding clamp/lug. Always ensure that the connection is properly crimped!

4.7 Safety During Operation

WARNING!

Avoiding Short-Circuits
Protect the device against all ingress of solid objects or liquids. Ingress presents a risk of electric shock or short-circuiting!

Ventilation Slots
Ensure that the ventilation slots are clean and uncovered at all times. Blocked ventilation slots may cause heat to be trapped in the system, resulting in overheating. This may cause your device to malfunction or fail.

Appropriate Usage
The device is only deemed to be appropriately used and EMC limits (electriomagnetic compatibility) are only deemed to be observed if the chassis cover is properly fitted (thus ensuring that the device is properly cooled, fire-safe, and shielded against electrical, magnetic and electromagnetic fields).

Switching the Device Off in the Event of a Malfunction or when Repairs are Required
It is not sufficient to simply switch off the device itself in order to disconnect the power supply. If the device is malfunctioning, or if repairs become necessary, the device must be isolated from all power supplies immediately.

To do so, follow the procedure below:
- Switch off the device from the unit itself.
- Pull out all power supply plugs.
- Inform the person or department responsible for your electrical installation.
- If your device is connected to an Uninterruptible Power Supply (UPS), it will remain operational even after pulling the UPS power cable from the mains socket. In this case, you will need to shut down your UPS in accordance with the user documentation of your UPS system.

4.8 Safety During Maintenance

WARNING!

When modifying the device in any way, only use components that are approved for use with the system. Failure to comply with this requirement may result in violations of EMC or safety standards and cause the device to malfunction.

When modifying or removing components approved for the system, the force required to remove the components (approx. 60 N) presents a risk of injury to the hands. Information on which components are approved for installation can be obtained from Meinberg Technical Support.

The device must not be opened. Repairs to the device may only be performed by the manufacturer or authorized personnel. Improperly performed repairs expose the user to considerable risk (electric shock, fire hazard).

– Danger from moving parts. Keep away from moving parts.

– Parts of the device may get very hot during operation. Do not touch the surfaces of these! Switch off the device and allow it to cool if necessary before installing or removing any components.

4.9 Handling of Batteries

WARNING!

The lithium battery on the receiver modules has a life of at least ten years. Should it be necessary to replace it, please note the following:

Improper handling of the battery can lead to an explosion or to a leakage of flammable liquids or gases.

- Never short-circuit the battery.

- Never attempt to recharge the battery.

- Never throw the battery into a fire.

- The battery must only be exposed to the barometric pressure range specified by the battery manufacturer.

- The battery must only ever be replaced with one of the same type or a comparable type recommended by the manufacturer. The battery must only be replaced by the manufacturer or an authorized technician.

- Never dispose of the battery in a mechanical crusher or shredder, or in an open fire or furnace.

Please consult your local waste disposal regulations for information on how to dispose of hazardous waste.

IMPORTANT!

The battery is used to power components such as the RAM and the reserve real-time backup clock for the reference clock.

If the battery voltage drops below 3 V DC, Meinberg recommends having the battery replaced. If the battery voltage drops below the specified minimum, the following behavior may be observed in the reference clock:

- The reference clock may have the wrong date or wrong date upon power-up

- The reference clock repeatedly starts in Cold Boot mode

- Some of the configurations saved for the reference clock may be lost

4.10 Cleaning and Care

⚠️ **ATTENTION!**

Never clean the device using liquids! Water ingress is a significant safety risk for the user (e.g., electric shock).

Liquids can cause irreparable damage to the electronics of the device! The ingress of liquids into the device chassis may cause short circuits in the electronic circuitry.

Only clean with a soft, dry cloth. Never use solvents or cleaners.

4.11 Prevention of ESD Damage

⚠️ **ATTENTION!**

An ESDS device (electrostatic discharge-sensitive device) is any device at risk of damage or malfunction due to electrostatic discharges (ESD) and thus requires special measures to prevent such damage or malfunction. Systems and modules with ESDS devices usually bear the following symbol:

Symbol Indicating Devices with ESDS Components

The following measures will help to protect ESDS components from damage and malfunction.

When preparing to dismantle or install devices:
Ground your body (for example, by touching a grounded object) before touching sensitive devices.

Ensure that you wear a grounding strap on your wrist when handling such devices. These straps must in turn be attached to an uncoated, non-conductive metal part of the system.

Use only tools and devices that are free of static electricity.

When transporting devices:
Devices must only be touched or held by the edges. Never touch any pins or conductors on the device.

When dismantling or installing devices:
Avoid coming into contact with persons who are not grounded. Such contact may compromise your connection with the earth conductor and thus also compromise the device's protection from any static charges you may be carrying.

When storing devices:
Always store devices in ESD-proof ("antistatic") bags. These bags must not be damaged in any way. ESD-proof bags that are crumpled or have holes cannot provide effective protection against electrostatic discharges.

ESD-proof bags must have a sufficient electrical resistance and must not be made of conductive metals if the device has a lithium battery fitted on it.

4.12 Return of Electrical and Electronic Equipment

ATTENTION!

WEEE Directive on Waste Electrical and Electronic Equipment 2012/19/EU
(WEEE Waste Electrical and Electronic Equipment)

Waste Separation
Product Category: According to the device types listed in Annex I of the WEEE Directive, this product is classified as "IT and Telecommunications Equipment".

This product satisfies the labeling requirements of the WEEE Directive. The product symbol on the left indicates that this electronic product must not be disposed of in domestic waste.

Return and Collection Systems
When disposing of your old equipment, please use the national return or collection systems available to you. Alternatively, you may contact Meinberg, who will provide further assistance.

The return of electronic waste may not be accepted if the device is soiled or contaminated in such a way that it potentially presents a risk to human health or safety.

Return of Used Batteries
The EU Battery Directive prohibits the disposal of batteries marked with the WEEE trashcan symbol above in household waste.

5 microSync HR100/DC Connectors
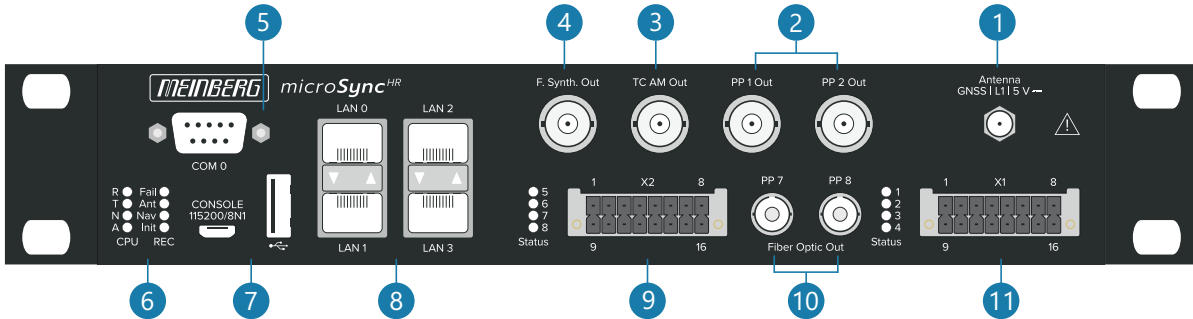
5.1 GNSS Antenna

Antenna type	Multi GNSS L1 antenna with integrated lightning protection
Receiver type	72-channel GPS/Galileo/Glonass/Beidou
Frequency band	L1 / E1 / B1 , 1575.42 +- 10 MHz / 1602-1615 MHz
Signal gain	40 dB
Antenna gain:	$\geq$ 3.5 dBic / $\geq$ 3 dBic
DC Voltage:	5 V (power supply via antenna cable)
DC Current:	max. 100 mA
Nominal impedance:	50 Ohm
Connection type:	SMA female
Cable:	shielded coaxial line, max. 70 m with Belden H155 coaxial cable
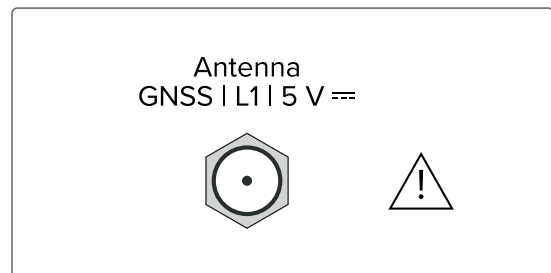
Danger!

Do not work on the antenna system during thunderstorms!

Danger of death from electric shock!

- Do <u>not</u> carry out any work on the antenna system or the antenna cable if there is a risk of lightning strike.
- Do <u>not</u> 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.

5.2 Programmable pulse output

Signal output   Programmable pulses

Signal level: TTL; 2.5 V into 50 Ohm

Connector: BNC, female

Cable: Coaxial cable, shielded

Pulse outputs: Pulse Per Second
Cyclic Pulse
Single Shot
Timer
Idle
All Sync
Time Sync
Position OK
DCF77 Marks
Pulse Per Hour
Pulse Per Min
DCLS Time Code
Serial Time String
10 MHz Frequency
Synthesizer Frequency
PTTI 1PPS
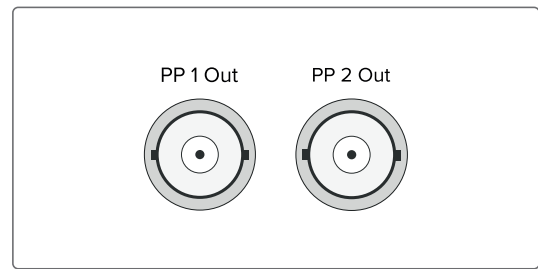
5.3 Time Code AM (modulated) Output

Signal outputs: Unbalanced sine wave-signal

Signal level: 3 V_{pp} / 1 V_{pp} (MARK/SPACE)
into 50 Ohm

Carrier frequency: 1 kHz (IRIG–B)

Connection type: BNC female

Cable: shielded coax line
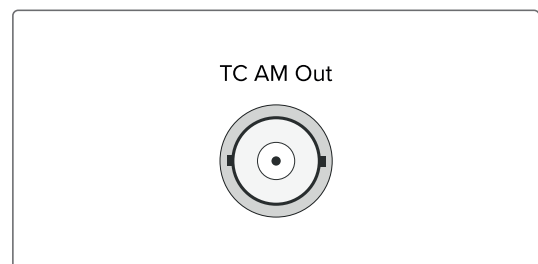
5.4 Frequency Synthesizer Output

Output signal	unbalanced sinusoidal signal
Frequency output:	0,1 Hz – 10 MHz
Signal Level:	3 V_{pp} into 50 Ω
Connection type:	BNC, female
Cable:	shielded coax line

F. Synth Out
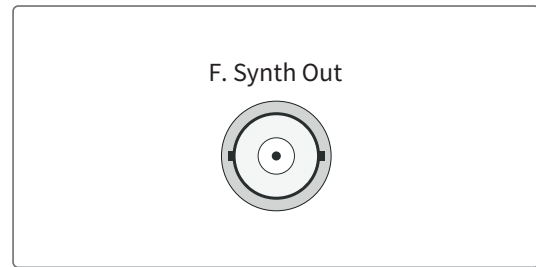
5.5 RS-232 COMx Timestring

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)
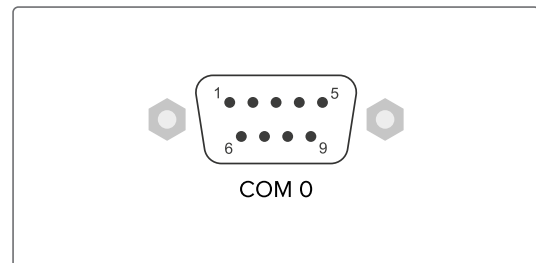
Connector: 9pin D–SUB male

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

COM 0

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

5.6 Status Indicators - CPU and Receiver

CPU:

———————————————————————————————

R (Receiver)
green: The reference clock
                   (e.g. build–in GNS)
                   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. GNS
red: NTP is not synchronized or
                   switched to the "local clock"
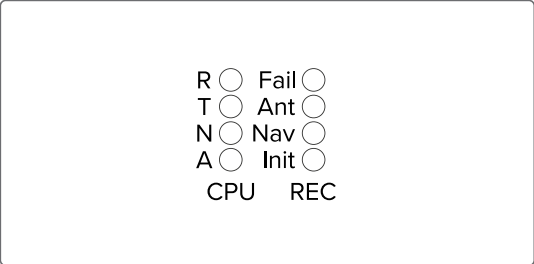
N (Network)
green: All monitored network interfaces
                   are connected ("Link up")
red: At least one of the monitored
                   network interfaces is faulty

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
———————————————————————————————

```
R ◯  Fail ◯
T ◯  Ant ◯
N ◯  Nav ◯
A ◯  Init ◯
  CPU    REC
```

5.7 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

CONSOLE
115200/8N1
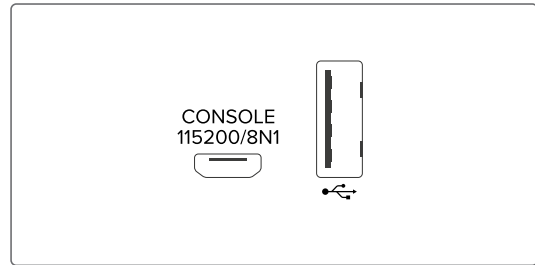
5.8 LAN Network Interfaces

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

LAN 0, 1:	Management / NTP 10/100/1000Mbit RJ45 or 1000FX
LAN 2:	Management 10/100/1000Mbit RJ45 or 1000FX NTP / PTP Master and Slave
LAN 3:	Management 10/100/1000Mbit RJ45 or 1000FX NTP / PTP Master

LAN 0   LAN 2

LAN 1   LAN 3
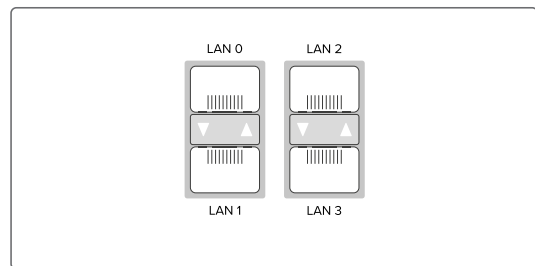
Available SFP Modules
SFP Tranceivers Recommended and Tested by Meinberg

Output Type	Manufacturer Designation
Multi Mode:	Avago AFBR-5710PZ
	Finisar FTLF8524P3BNL
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.

5.9 DMC X2 Terminal Connector

Note: The connector on the device side and the connection socket of the X2 terminal are provided with coding pins to avoid confusion with the X1 connection terminal.

Pin 1	PP 5+	programmable pulse (optocoupler)
Pin 2	PP 5	programmable pulse (RS–422A)
Pin 3	PP 5	programmable pulse (RS–422B)
Pin 4	PP 6	programmable pulse (RS–422A)
Pin 5	PP 6	programmable pulse (RS–422B)
Pin 6	+ TC In	Time Code DCLS (TTL, isolated)
Pin 7	+ TCA* Out	Time Code DCLS (TTL, isolated)
Pin 8	– TCA Out	Time Code DCLS (TTL, isolated)
		TTL active high 250mA, short circuit proof

* TCA = Time Code Amplified, DCLS output
with large output current.

Pin 9	PP 5–	program. pulse (optocoupler)
Pin 10	GND	ground
Pin 11	GND	ground
Pin 12	GND	ground
Pin 13	GND	ground
Pin 14	– TC In	Time Code DCLS (TTL, isolated)
Pin 15		not used
Pin 16		not used

Status-LEDs:
PP 5 ... PP 8   Status of Pulses Out

16-pin socket with retaining clip

To the X2 device connection

Cable inlet side
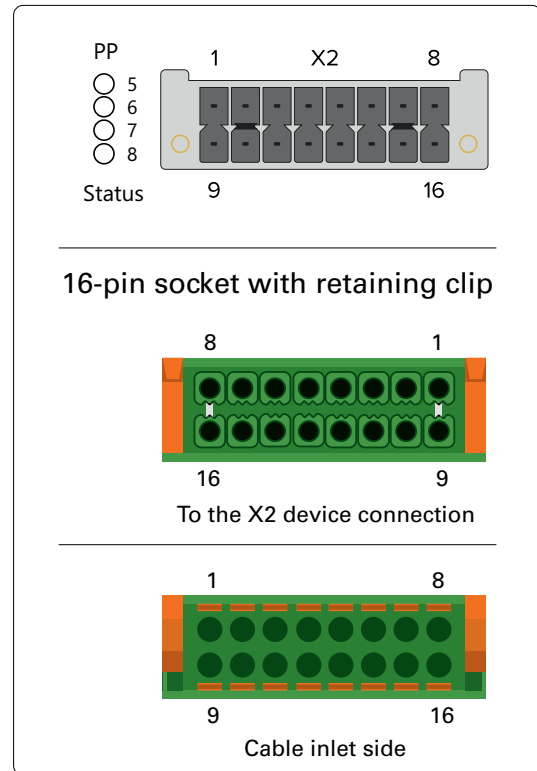
Scheme Terminal assignment
Programmable output PP 5
DC–insulated by optocouplers

U_{CEmax} = 55 V
I_{Cmax} = 50 mA
P_{tot} = 150 mW

Response time
Turn on Time: typ. $5\mu s$, max. $9\mu s$
Turn off Time: typ. $10\mu s$, max. $70\mu s$

Standard (Opto Coupler)

Channel 5

PP 5 –
PP 5 +

Pulse generator
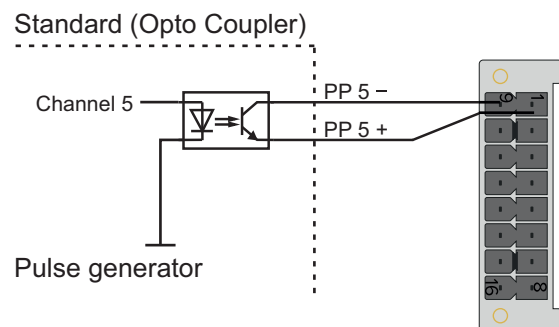
5.10 Fiber Optic - Programmable pulse Output

Output signal: Programmable pulses, fiber optic

Wave lenght: 850 nm (multi mode)

Connection type: ST-connector

GI 50/125 μm or

62.5/125 μm gradient fibre

Pulse outputs: Pulse Per Second
Cyclic Pulse
Single Shot
Timer
Idle
All Sync
Time Sync
Position OK
DCF77 Marks
Pulse Per Hour
Pulse Per Min
DCLS Time Code
Serial Time String
10 MHz Frequency
Synthesizer Frequency
PTTI 1PPS
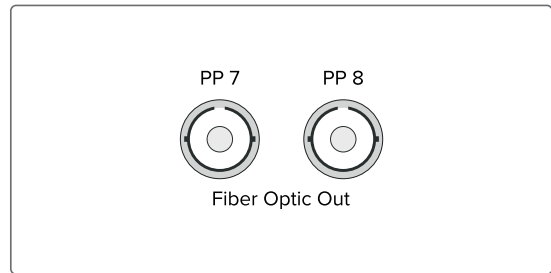
Caution!

The optical interface contains a light–emitting diode (LED).

Unused optical interfaces should always have a protective cap placed on them when not in use.

5.11 DMC X1 Terminal Connector / DC Power Supply

Note: The connector on the device side and the connection socket of the X1 terminal are provided with coding pins to avoid confusion with the X2 connection terminal.

Connection Type: DMC Connector

Power Supply: Pin 1:   –DC In
                           Pin 9:   +DC In

Input Parameter
_____

Nominal Voltage: U_N = 48 V ⎓

Max. Voltage Range: U_{max} = 20-60 V ⎓

Nominal Current: I_N = 0.63 A

Output Parameter
_____

Max. Power: P_{max} = 30 W

Max. thermal energy: E_{therm} = 108,00 kJ/h
                                    (102,37 BTU/h)

Pin 1	–DC In	negative potential of operating voltage
Pin 2		not used
Pin 3	PP 1–	programmable pulse
Pin 4	PP 2–	programmable pulse
Pin 5	PP 3–	programmable pulse
Pin 6	PP 4–	programmable pulse
Pin 7	REL–NO	Error/Relay (normally open)
Pin 8	REL–CO	Error/Relay (common)
Pin 9	+DC in	positive potential of the operating voltage
Pin 10		not used
Pin 11	PP 1+	programmable pulse
Pin 12	PP 2+	programmable pulse
Pin 13	PP 3+	programmable pulse
Pin 14	PP 4+	programmable pulse
Pin 15	not used	
Pin 16	REL–NC	Error–Relay (normally closed)

Status–LEDs:
PP 1 … PP 4   Status of the programmable Pulses Out

16-pin socket with retaining clip

To the X1 device connection

Cable inlet side
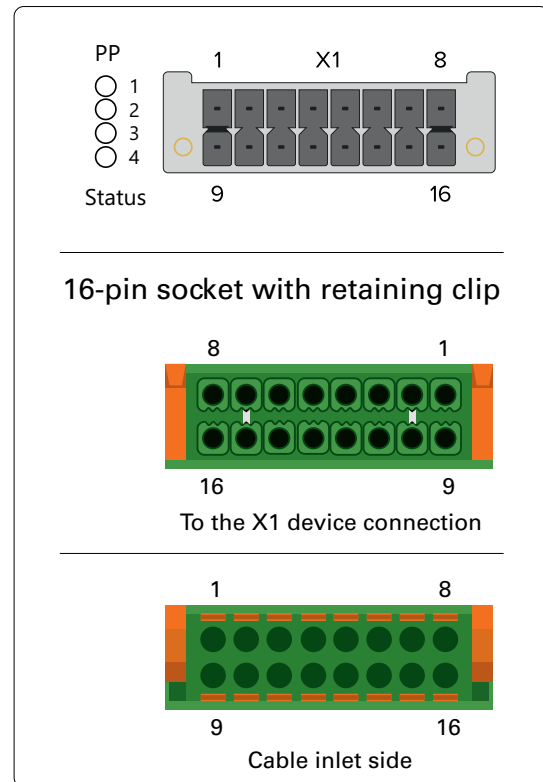
Scheme Terminal assignment
Programmable Pulses

Four programmable outputs (PP 1 – PP 4)
DC-insulated by optocouplers

U_{CEmax} $\quad$ = 55 V
I_{Cmax} $\quad$ = 50 mA
P_{tot} $\quad$ = 150 mW

Response time
Turn on Time: typ. 5μs, max. 9μs
Turn off Time: typ. 10μs, max. 70μs

Standard (Opto Coupler)

Channel 1 $\qquad$ PP 1 +
$\qquad$ PP 1 –

Channel 2 $\qquad$ PP 2 +
$\qquad$ PP 2 –

Channel 3 $\qquad$ PP 3 +
$\qquad$ PP 3 –

Channel 4 $\qquad$ PP 4 +
$\qquad$ PP 4 –

Pulse generator
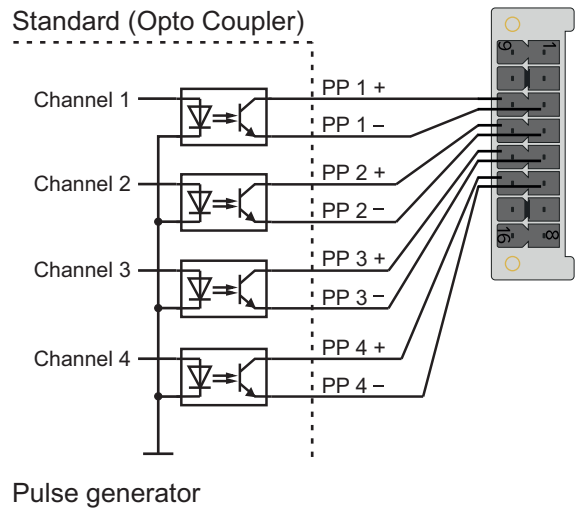
Error Relay
The X1 connector has a potential-free contact which is controlled directly by the used reference clock (GPS, GNS, GNS-UC). Normally, when the reference clock has synchronized, the the relay contact "NO" switch to active. If the reception is disturbed or the device is switched off, the relay contact "NC" is active.

Technical Specification

Switching Voltage max: $\qquad$ 60 V DC

Switching Current max: $\qquad$ I_{max}: $\quad$ 400mA

Switching Load max: $\qquad$ 24 W

Response Time: $\qquad$ ca.2ms

Normal Operation Mode:
CO - NO connected
(normally open)
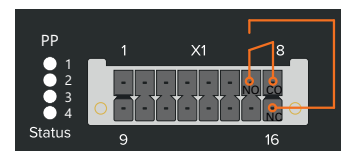
Error Mode:
CO - NC connected
(normally closed)
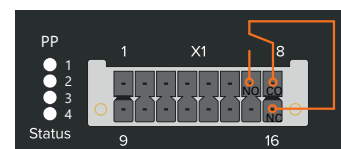
6 Information on Satellite Reception

6.1 Multi GNSS Satellite Receiver

Your system is fitted with the GNS, a 72-channel satellite receiver clock which 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), Russian GLONASS (GLObal NAvigation Satellite System), the European Galileo system, and the Chinese BeiDou system. This enables your Meinberg system to be used practically anywhere in the world.

The GNSS reference clock allows for simultaneous reception of signals from up to three of these systems, and the system can be configured to allow only signals from selected satellite systems. It is possible, for example, to exclude a certain system as needed, or restrict reception to a single satellite system.

6.2 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 specific 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.

6.2.1 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.

7 GNSS Antenna Installation

Two different antennas are available for our combined GPS/GLONASS/Galileo/BeiDou satellite receivers that are each designed to fulfill different tasks or applications.

The active Multi-GNSS L1 antenna is the standard accessory and can receive signals from the GPS, GLONASS, Galileo, and BeiDou satellite systems. This antenna is ideal for fixed-location systems, operates using a 5 V DC supply voltage supplied by the receiver, and features an integrated surge protector.

For mobile applications, such as cars, RVs, vans, ships, trains, and aircraft, we recommend the use of the RV-76G, an active GNSS antenna that is suitable for direct installation in an enclosure (chassis, panels, etc.)

7.1 Installation of the Multi-GNSS Antenna

Danger!

Do not mount the antenna without an effective fall arrester!

Danger of death from falling!

- Ensure that all necessary safety measures are taken when installing an antenna!
- In particular, <u>never</u> work without an effective fall arrester!

Danger!

Do not work on the antenna system during thunderstorms!

Danger of death from electric shock!

- <u>Do not</u> carry out any work on the antenna system or the antenna cable if there is a risk of lightning strike.
- <u>Do not</u> 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.

Selecting the Antenna Location

To avoid difficulties with synchronization, select a location that allows for an unobstructed view of the sky so as to ensure that enough satellites can be found. The line of sight between the antenna and satellites should not be obstructed in any way. The antenna must also not be installed under power lines or other electrical lighting or power circuits.

Installation Conditions for Optimum Operation:

- clear view of 8° above the horizon or
- clear view towards equator (if clear view of 8° not possible) or
- clear view between 55th north and 55th south parallels (satellite orbits).

Information:

Problems may arise if all of these views are obstructed, as four satellites must be located to calculate a new position.

Important Information Regarding Surge Protection

The following illustration is a visual representation of where there is a risk of hazardous voltage surges in the cable route (from antenna to Meinberg system). The examples below explain how you can protect your Meinberg system from these.
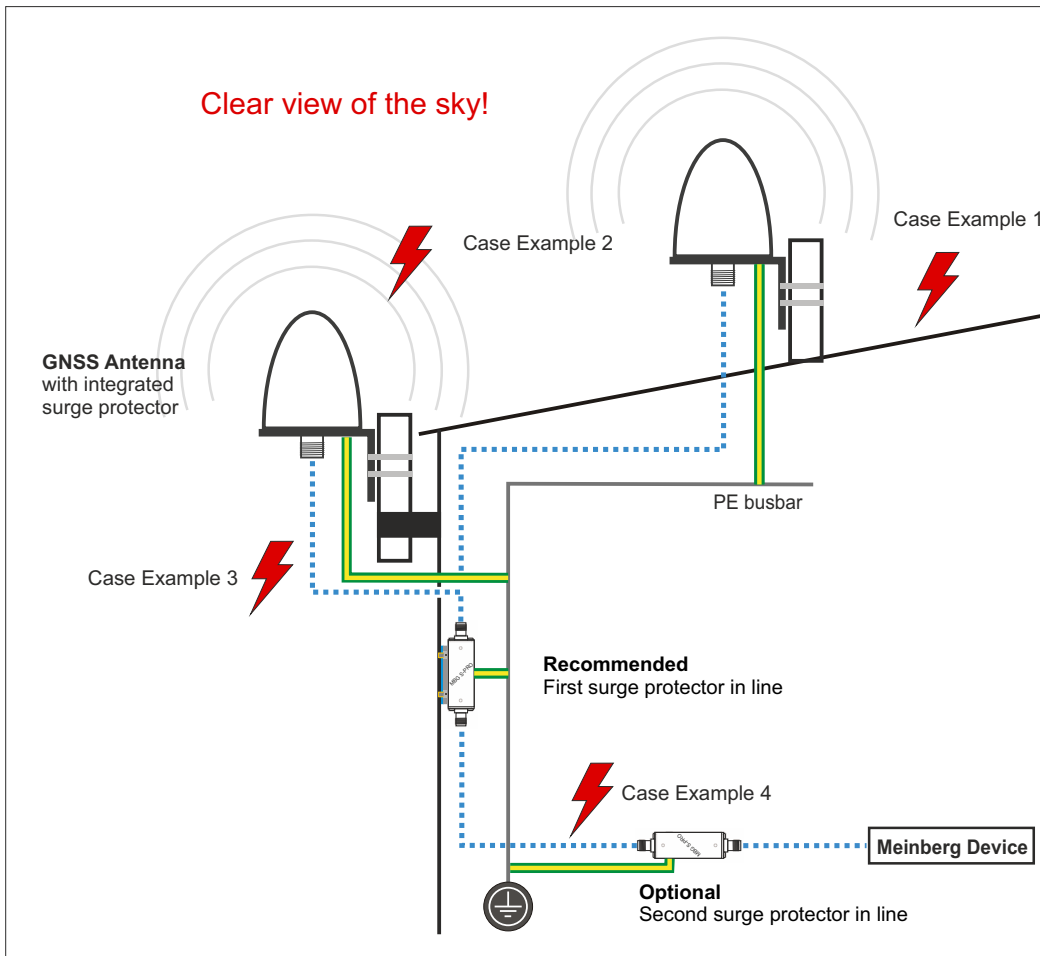
Case Example 1:
An indirect lightning strike near the antenna or coaxial cable may induce transient voltages ("spikes" or "surges"). These spikes can be carried via the coaxial cable to the inside of the building and consequently to the system's receiver. It is therefore strongly recommended to have the surge protector installed at the point directly after the cable enters the building.

Case Example 2:
In the event of a direct lightning strike on the antenna, the resultant transient voltage may be discharged via the PE busbar (GNS L1 antenna only). This prevents the transient voltage from being carried to the coaxial cable and subsequently to the system's receiver.

Case Example 3:
If the length of the coaxial cable between the antenna and point of entry into the building is rather long (e.g., 10 meters), there is a greater risk of transient voltages being introduced into the antenna cable as a result of lightning strike. In this case, the integrated surge protector of the GNSS antenna may not be adequate, so the installation of a surge protector immediately after the point of entry into the building is also strongly recommended here.

Case Example 4:
If the cable leading from the point of entry into the building to the Meinberg system is laid together with other cables (for example in a cable duct alongside high-voltage cables), transient voltages may "leak" into the antenna cable, causing damage to your system. To prevent this, a second surge protector can optionally be installed in the line just before the device.

Mounting the Antenna

1.

Use the included mounting kit to mount the L1 antenna at a distance of 50 cm from other antennas on a vertical pole of a diameter of between 60 mm and 215 mm ($2\frac{1}{2}$"–$8\frac{1}{2}$").

The antenna cable should then be connected to the Type-N connector of the antenna.

Clear view of the sky!

GNSS Antenna

Type-N (Female)

Type-N (Male)
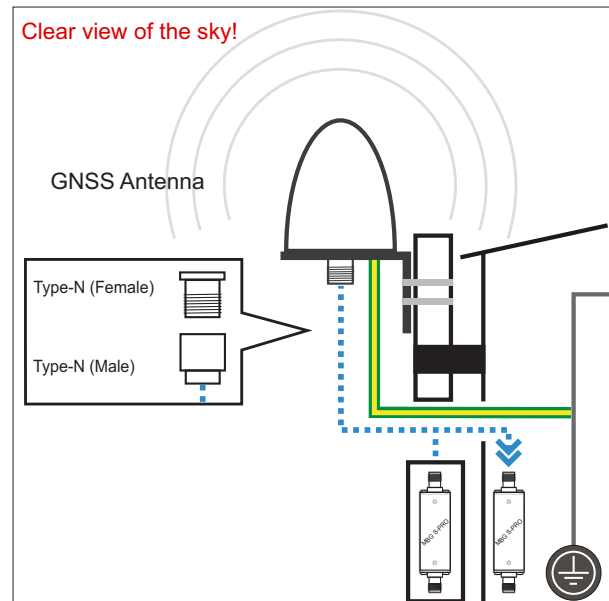
ℹ Information:

Make sure that the maximum cable length is not exceeded when installing the antenna cable between the antenna and receiver. The maximum length will depend on the type of cable used (RG213, RG58) and its attenuation factor.

2.

Voltage surges (e.g., caused by lightning strike) may be transmitted along the antenna cable and cause damage to the receiver. Using an MBG S-PRO surge protector can help to protect your receiver against such surges.

If installed in a waterproof housing, the MBG S-PRO can be installed outdoors. However, Meinberg recommends installing the surge protector indoors—as closely to the entrance point of the antenna cable as possible—in order to minimize the risk of surge damage (such as that caused by lightning strike).

Outdoor Installation
Inside a waterproof housing.

Indoor Installation (Recommended)
Directly after the point at which the antenna cable enters the wall.

Type-N (Male)

Type-N (Female)

Outside Wall of Building

MBG S-PRO

MBG S-PRO

Type-N (Female)

Type-N (Male)
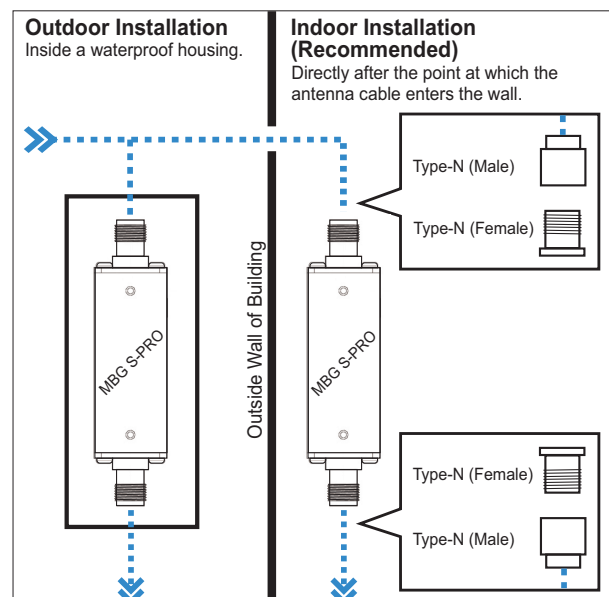
3.

To ground the antenna cable, connect the surge protec-
tor to a grounding busbar using a grounding conductor
(see illustration).

Once installation is complete, connect the other end of
the antenna cable to the surge protector female con-
nector.

**Grounding Conductor
to Grounding Busbar**
Conductor of diameter approx. 1.5 mm
attached to surge protector

As **short** as possible
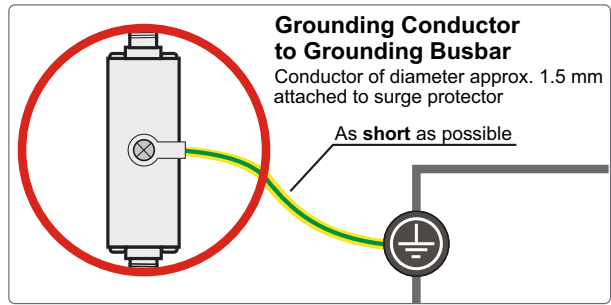
4.

The next step is to connect the supplied coaxial cable
from the surge protector to the receiver.
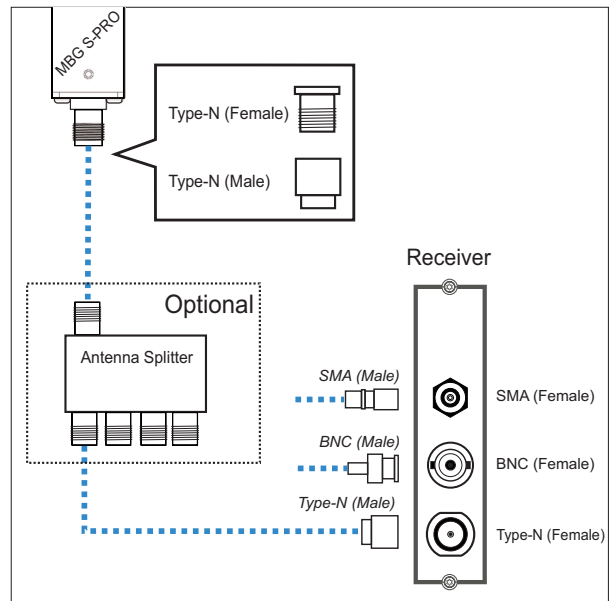
Optional Antenna Splitter

Multiple receivers can be connected to one antenna using the antenna splitter. When doing so, be aware that the total distance, comprising the cable from the antenna to the splitter, and from there to the receiver, must not exceed the maximum cable length. The splitter may be installed at any location between the surge protector and the receivers.

> **Information:**
>
> It is not possible to directly connect a Meinberg GPS antenna/converter unit to an L1 antenna splitter.

- ▪ ▪ ▪ ▪ Distance AB = 65 m (H155) - Total length „OK"
- ▪ ▪ ▪ ▪ Distance AC = 110 m (H155) - max. total length exceeded
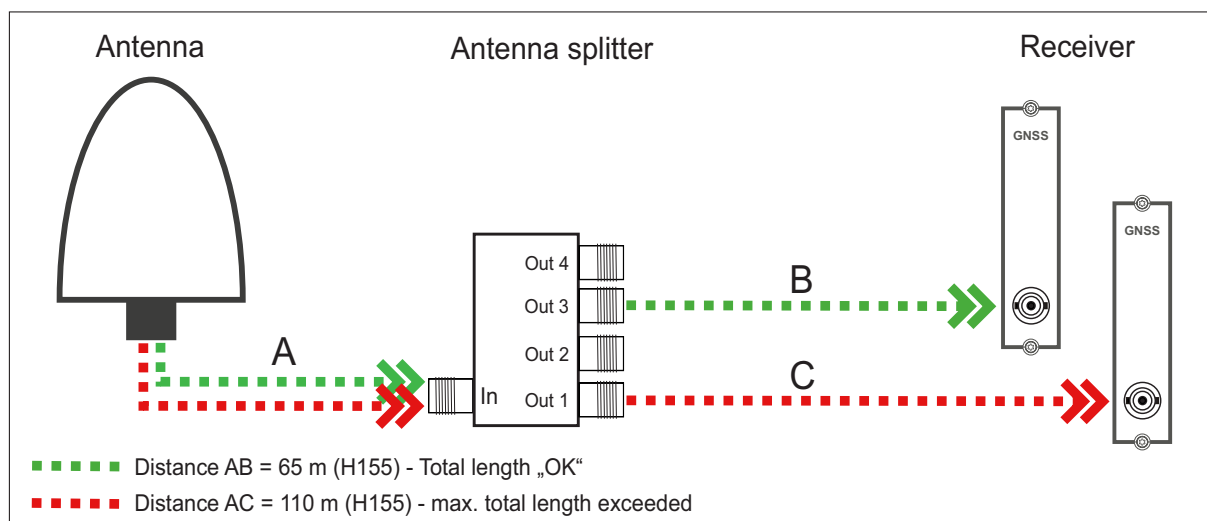
Compensating for Signal Propagation Delay in the Antenna Cable

To enable the connected receiver to compensate for the signal propagation delay inherent in the antenna cable, you will need to enter either the length of your antenna cable in meters or the offset time in nanoseconds into your receiver.

To do so, go to the web interface of your system to the menu "Clock" –> Status u. Configuration –> Miscellaneous

Antenna Cable Length (m):
The satellite signal reception is delayed as a result of coaxial cable used.

Cable	Delay	Usage
RG58U	5 ns/m	For GPS and GNS-UC receivers
H155	4 ns/m	For GNS and GNM receivers

The cable length entered (from antenna to receiver) is used by the system to calculate the delay time and to automatically compensate for propagation delay. A value of 20 m is set by default.

When using a different type of coaxial cable, please use the "**By Delay**" option. You will need to calculate the delay yourself using the information provided in the product specifications provided by the manufacturer of your coaxial cable.

7.2 Assembly of the RV-76G GPS/GLONASS Antenna for Mobile Applications

Installation of the Antenna
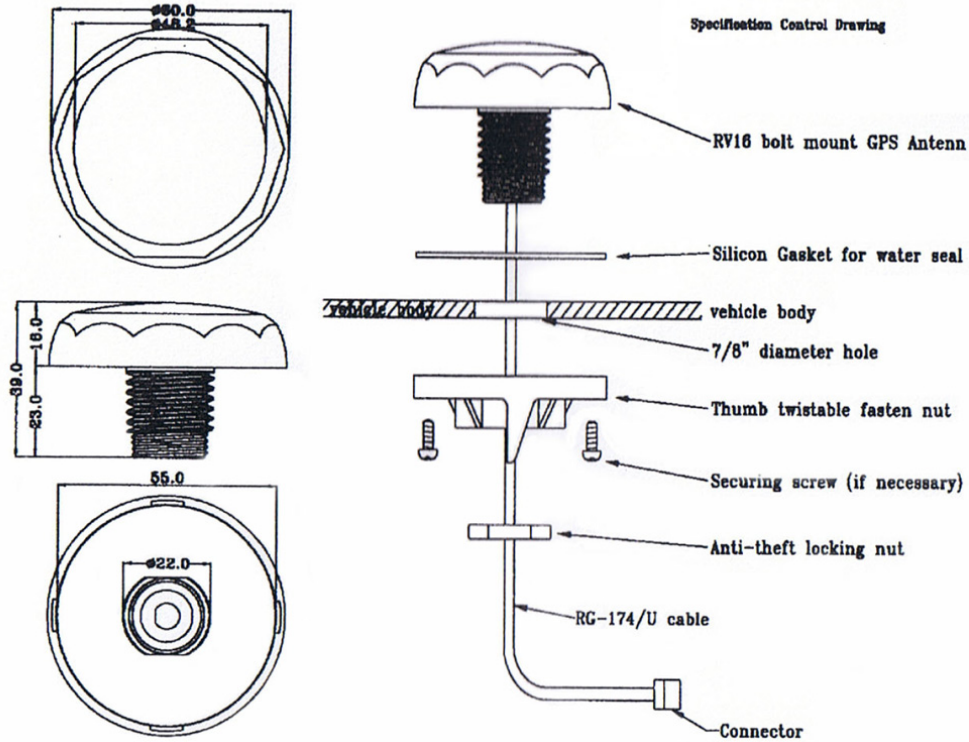
Further Information on the Product

Detailed specifications are provided in the manufacturer's data sheet.

Source: *Datasheet RV-76G_Catalog_V1.0_20130502 (Sanav)*

Download: *https://www.meinbergglobal.com/download/docs/other/rv-76g_en.pdf*

8 Starting of Operation

8.1 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 **8.1.1**.
- Configuration via the Web Interface, see Chapter **8.1.2**.
- Configuration via Meinberg Device Manager, see Chapter **8.1.3**.

8.1.1 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*'.
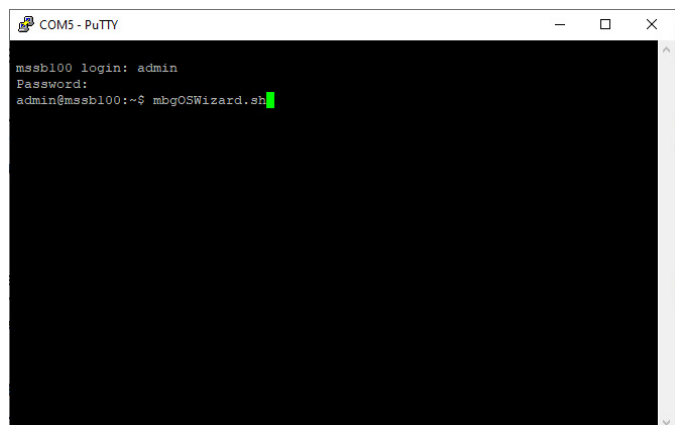
The initial network configuration process is now complete and you can close the setup wizard. All further configuration can be performed using the Web Interface or Meinberg Device Manager.

> **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*.

8.1.2 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).
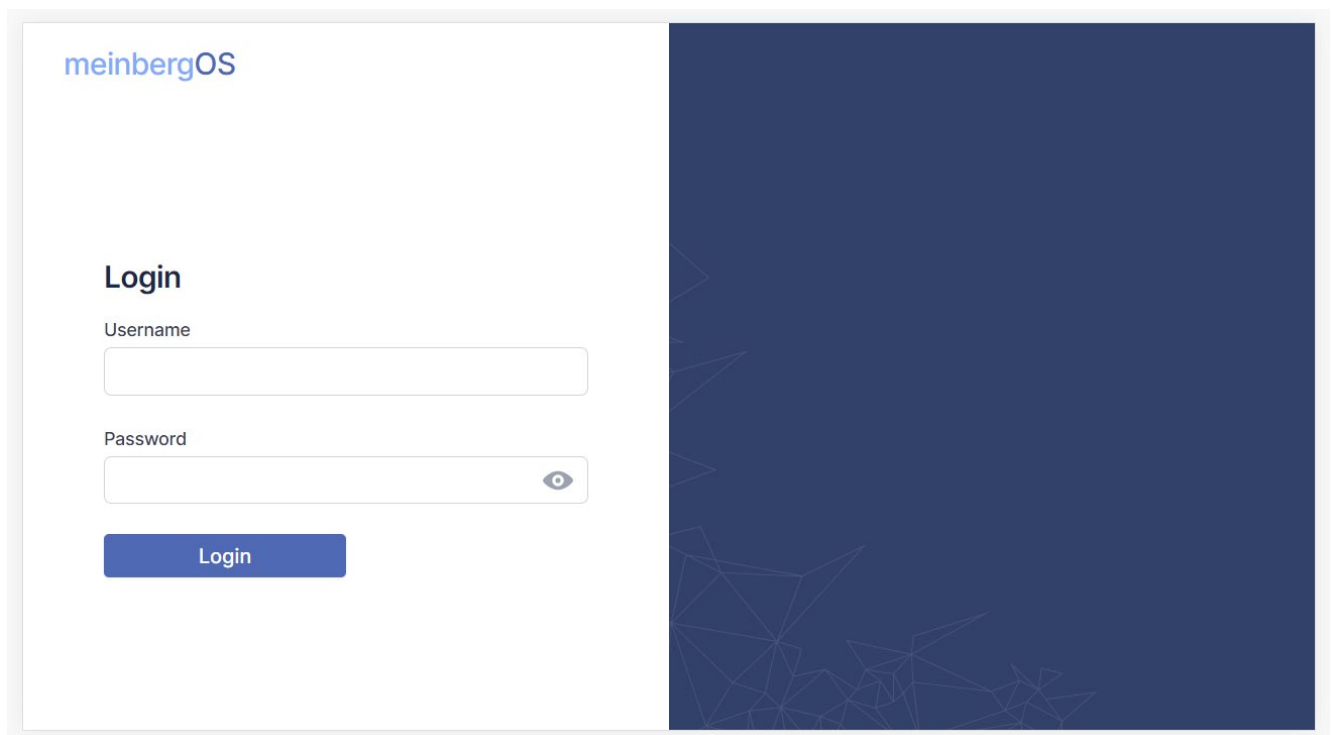
Open a web browser of your choice and open the address *https://192.168.19.79*. This should bring up the login page. Enter "*admin*" as the username and "*timeserver*" as the password.

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.

8.1.3 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 is delivered on the USB stick included in the scope of delivery and does not need to be installed or copied on the PC. The Meinberg Device Manager can be started directly from the USB data carrier. The computer must be connected to the network in which the microSync system is connected.
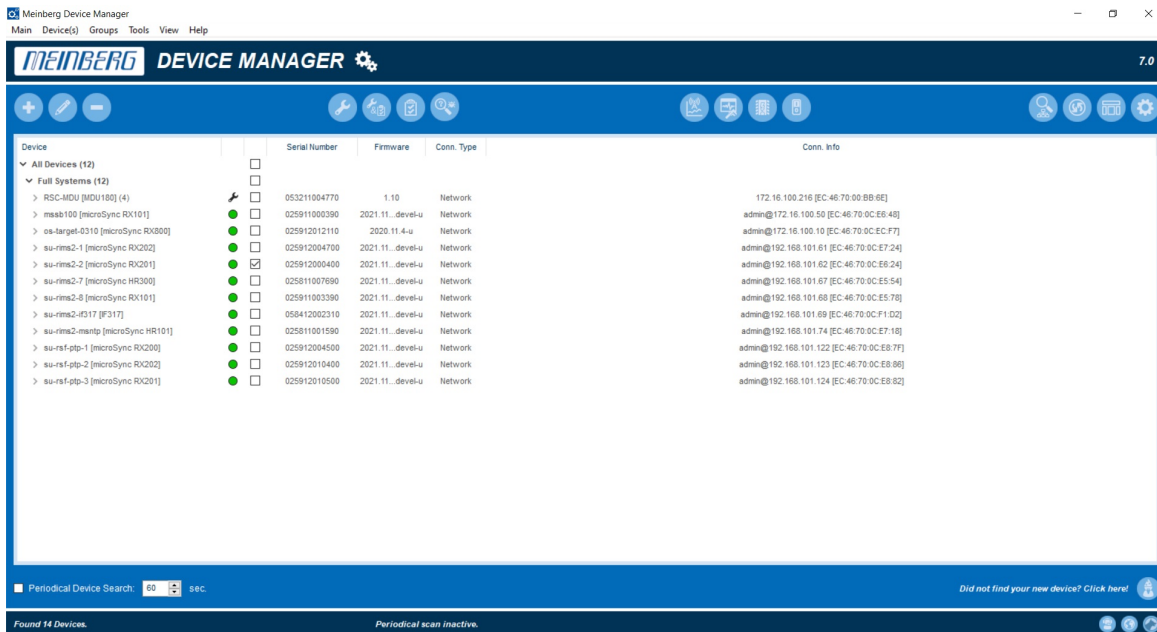
The software is downloadable free of charge from our homepage:
https://www.meinbergglobal.com/english/sw/mbg-devman.htm

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.

The device requires authentification.
Please enter username and password to login.

Username: admin
Password: •••••••••

☑ Save Credentials
☑ Silent Login

OK   Cancel

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.

8.2 Initial Start of Operation

8.2.1 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.
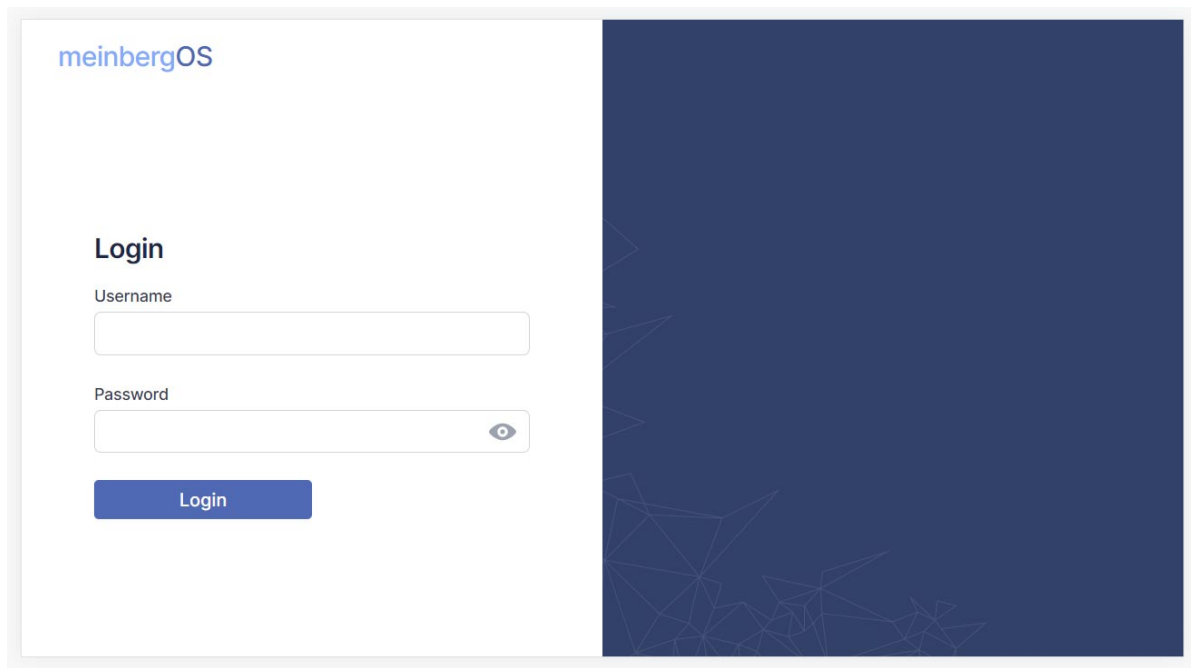
Figure 8.1: Login Page of meinbergOS Web Interface

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 8.1).

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

8.2.2 Start of Operation with Meinberg Device Manager Software

First install the Meinberg Device Manager software supplied on the USB stick. After the setup, start the program. If you do not want to perform a setup on your computer, you can start the portable version of the Meinberg Device Manager software directly on the USB stick: *USB Drive/Software/MbgDevMan/mbgdevman_portable/mbgdevman.exe*.

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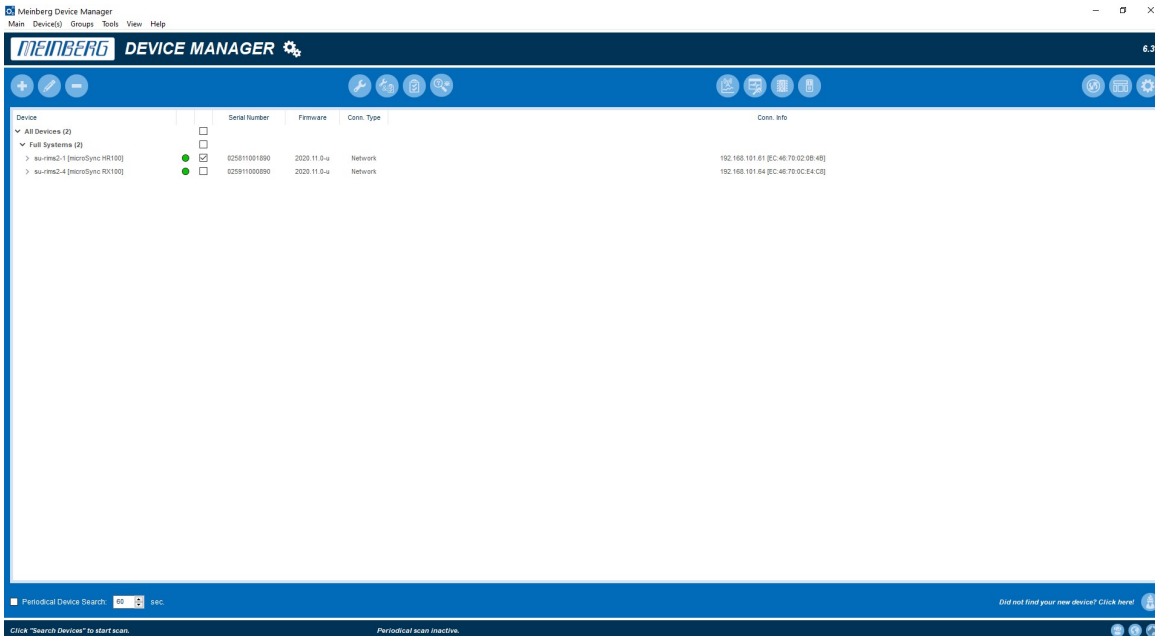
By clicking on the Search Devices button, all available microSync systems that have a serial or a network connection are recognized by the Meinberg Device Manager and will be listed then.

- 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 User-name & 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 Man-ager 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 Man-ager does not ask for a user name and password every time you log in.

Custom Alias
Assign a custom alias for better identification of indi-vidual systems/modules in Device Manager.

Custom Group
Assign the module/assembly to a previously created group.

9 Technical Appendix

9.1 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 (GNS181)

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 (GPS180)

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 (GNS181-UC)

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

9.2 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 SQ	+- 220 μsec	+- 4.7 sec
OCXO MQ	+- 65 μsec	+- 1.6 sec
OCXO HQ	+- 22 μsec	+- 788 msec
OCXO DHQ	+- 4.5 μsec	+- 158 msec

9.3 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

9.4 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

10 Technical Appendix: GNSS Antennas + Accessories

10.1 Information on the 40dB Multi GNSS Antenna

GPS L1 / GLONASS L1 / GALILEO E1 / BeiDou B1 Frequency Band

GPS, GLONASS, Galileo and BeiDou satellites do not hold a geostationary orbit, but circle the Earth once roughly every 12 hours. Satellites can only be received as long as there is nothing obstructing the line of sight between the antenna and the satellite. Detailed installation requirements can be found in the chapter **Installation Multi GNSS Antenna**.

This active L1 antenna incorporates a high-performance antenna and low-noise amplifier in a weatherproof housing. The connected GPS/GLONASS receiver supplies the antenna with a 5.0 V DC voltage via the antenna cable.

A standard coaxial cable with 50 Ohm impedance can be used to connect the antenna to the receiver. The length of the cable between the antenna and receiver should not exceed 70 meters (H155, Low-Loss). A mounting kit is provided with the product as shipped.

Please refer to the data sheet "**40 dB GPS Multi GNSS Timing Antenna with Integrated Lightning Protection**" (pctel_gpsl1gl.pdf), which can also be downloaded at:

http://www.meinbergglobal.com/download/docs/other/pctel_gpsl1gl.pdf

10.2 Technical Specifications: Antenna Cable

The table below shows which coaxial cable types and lengths are supported by Meinberg for each of the receiver types. If you need to purchase a replacement cable at any time, please refer to this table to ensure that you select cable with suitable cutoff frequency and attenuation properties.

Cable Type	Cable Diameter (mm/in)	Attenuation at 100 MHz (db)/100 m/328 ft	Max. Cable Length (m/ft)	Used for Receiver Type
RG58/CU	5/0.2	17	300/984	GPS/GNS-UC/PZF
RG213	10.3/0.41	7	700/2297	GPS/GNS-UC
H155	5.4/0.21	9.1	70/230	GNM/GNS
H2010 Ultraflex	7.3/0,29	5.8	150/492	GNM/GNS

Please refer to the data sheet of the cable in question for further specifications.

10.3 Antenna Short Circuit

Information:

This information only applies to LANTIME devices with a front display.

If the antenna line is short-circuited, the following message will be shown on the display:

```
Antenna   Short-Circuit
   Disconnect Power!!!
```

If this message appears, the clock must be switched off and the cause of the problem must be eliminated before the clock can be switched back on. The supply voltage for the antenna/converter unit is around 5 V DC with the antenna connected.

10.4 Technical Specifications: MBG S-PRO Surge Protection

Adapter plug with replaceable gas discharge tube for coaxial signal connections.

Connector Type: Type-N connector female/female. The MBG S-PRO set includes a surge protector (Phoenix CN-UB-280DC-BB), a pre-assembled coaxial cable, and a mounting bracket.

The coaxial cable surge protector must be installed on the antenna line. The shielding is grounded using a conductor that is short as possible. The CN-UB-280DC-BB is equipped with two Type-N female connectors and has no dedicated input/output polarity and no preferred installation orientation.

Phoenix CN-UB-280DC-BB

Features:

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

|		
Installation Method:	Connector Type-Specific Adapter Plug	
Direction of Action:	Line Shield/Earth Ground	
Maximum Continuous Operating Voltage:	UC (Wire-Ground) 195 V AC	280 V DC
Rated Current:	I$_N$	5 A (25 °C)
Effective Operating Current:	IC at UC	$\leq 1\ \mu A$
Rated Discharge Current:	In (8/20) μs (Core-Earth) In (8/20) μs (Core-Shield)	20 kA 20 kA
Total Surge Current:	(8/20) μs (10/350) μs	20 kA 2.5 kA

Max. Discharge Current:	Imax (8/20)μs Maximum (Core–Shield)	20 kA
Rated Pulse Current:	Ian (10/1000)μs (Core–Shield)	100 A
Impulse Discharge Current:	(10/350) μs, Peak Value Iimp	2.5 kA
Output Voltage Limit:	At 1 kV/μs (Core–Earth) spike At 1 kV/μs (Core–Earth) spike	$\leq$ 900 V $\leq$ 900 V
Response Time:	tA (Core–Earth) tA (Core–GND)	$\leq$ 100 ns $\leq$ 100 ns
Input Attenuation:	aE, asym.	Typically 0.1 dB ($\leq$ 1.2 GHz) Typically 0.2 dB ($\leq$ 2.2 GHz)
Cut-Off Frequency:	fg (3 dB), asym. (Shield) in 50 Ω System > 3 GHz	
Standing Wave Ratio:	VSWR in a 50 Ω System	Typically 1.1 ($\leq$ 2 GHz)
Permissible HF Power:	Pmax at VSWR = xx (50 Ω System)	700 W (VSWR = 1.1) 200 W (VSWR = ∞)
Capacitance:	(Core–Earth) Asymmetric (Shield)	Typically 1.5 pF Typically 1.5 pF
Surge Current Resistance:	(Core–Earth)	C1 – 1 kV/500 A C2 – 10 kV/5 kA C3 – 100 A D1 – 2.5 kA
Ambient Temperature:	(During Operation)	-40 °C ... 80 °C
Supported Altitude:	$\leq$ 2000 m (above sea level)	
IP Rating:	IP55	
Housing Material:	Nickel–Plated Brass Colored Nickel	
Dimensions:	Height 25 mm, Width 25 mm, Depth 67 mm	
Connection Type:		Type-N Connector 50 Ω
	IN	Type-N Connector, Female
	OUT	Type-N Connector, Female
Standards/Regulations:	IEC 61643-21 2000 + A1:2008 EN 61643-21 2001 + A1:2009	

The original product page of the supplier (see link) of the CN-UB-280DC-BB surge protector is the source of the specifications above. Please refer to the manufacturer's product page at the following link for detailed specifications as well as a variety of product-specific documents:
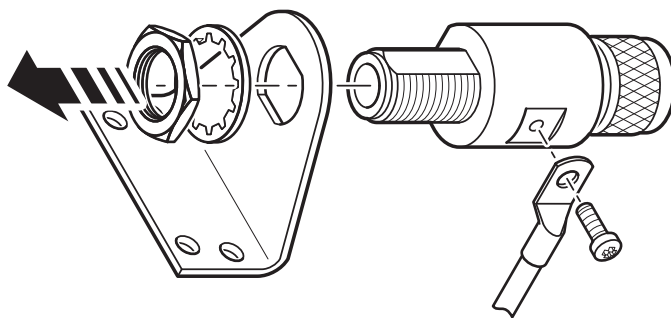
10.4.1 MBG S-PRO: Physical Dimensions
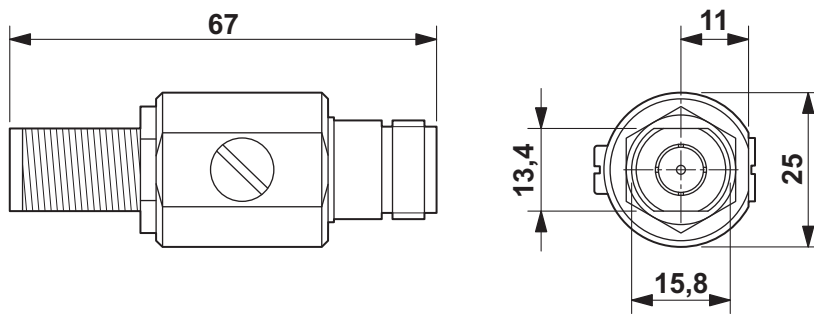
10.4.2 Installation and Grounding

10.5 Technical Specifications: RV-76G GPS/GLONASS Antenna for Mobile Applications

General Information

The antenna system RV-76G is the integration of a high performance GPS/GLONASS patch antenna and a state-of-the-art low-noise amplifier into a very low-profile, extremely compact and fully waterproof antenna signal enclosure. When connected to a GPS/GLONASS receiver with +2.5 to 5 V DC antenna power, it provides excellent signal amplification and out-of-band rejection for that receiver.

The flat design and the robustness of the enclosure make the RV-76G one of the most popular antennas in the vehicle navigation and marine market.

Specifications

Physical Characterisics

Construction:	Polycarbonate radome with detachable cable/connector for easy mounting, rubber O-ring between top radome and screw base for waterproofing.
Dimensions:	60 mm diameter x 38 mm height
Weight:	125 g (excluding cable and connector)
Color:	Standard ivory white
Mounting:	Bulkhead mount with 0.8-inch threaded wing nut

Antenna Element

Center Frequency:	1575.42 MHz ± 10 MHz & 1602 MHz ± 8 MHz
Polarization:	R.H.C.P. (Right Hand Circular Polarization)
Gain at Zenith:	+1.5 dBic typ.
Axial Ratio:	3 dB max. *mounted on the 70 mm x 70 mm square ground plane*

Low Noise Amplifier

Gain:	27 dB @ 3 V typ.
Band Width:	43 MHz min. @ 511≤-10 dB
Noise Figure:	1.5 typ.
Supply Voltage:	+2.5 ~5 V DC
Current Draw:	3 V DC: 10.6 mA typ. / 5.0 V DC: 21 mA typ.
Impedance:	50 Ohm

Cable & Connector

RF Cable:	5 m RG174/U (Standard)
Tensile Strength:	6 kg (13 lbs) @ 5 sec. with molded plastics on connector for strain relief

Overall Performance (Antenna Element, LNA & Cable)

Center Frequency: 1575.42 MHz $\pm$ 10 MHz & 1602 MHz $\pm$ 8 MHz

Gain: At 90°, 27 $\pm$ 3dB (Cable Loss)
Note: When mounted on the 70 mm x 70 mm square base plate

Environmental Conditions

Operating Temperature: ~40°C   +85°C

Storage Temperature: ~40°C   +90°C

Relative Humidity: 95% non-condensing

Source: Datasheet gps-glonass_antenna_rv-76g_catalog_v1.pdf (Sanav)
https://www.meinberg.de/download/docs/other/rv-76g_en.pdf

11 RoHS and WEEE

Compliance 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". We ensure that 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.

WEEE status of the product

This product is handled as a B2B (Business to Business) category product. To ensure that the product is disposed of in a WEEE-compliant fashion, it must be returned to the manufacturer. Any transportation expenses for returning this product (at end-of-life) must be covered by the end user, while Meinberg will bear the costs for the waste disposal itself.

12 Declaration of Conformity

Declaration of Conformity
Doc ID: microSync HR100/DC–August 11, 2022

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

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

Produktbezeichnung   **microSync HR100/DC**
Product Designation

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   ETSI EN 303 413 V1.1.1 (2017-06)
RED Directive

2014/53/EU
───
EMV – Richtlinie   ETSI EN 301 489-1 V2.2.3 (2019-11)
EMC Directive   ETSI EN 301 489-19 V2.1.1 (2019-04)
                          DIN EN 61000-6-2:2019
2014/30/EU   DIN EN 61000-6-3:2007 + A1:2011
                          DIN EN 55032:2015
                          DIN EN 55024:2010 + A1:2015
───
Niederspannungsrichtlinie   DIN EN 62368-1:2014 + A11:2017
Low Voltage Directive

2014/35/EU
───
RoHS – Richtlinie   DIN EN IEC 63000:2018
RoHS Directive

2011/65/EU + 2015/863/EU
───

Bad Pyrmont, August 11, 2022

Stephan Meinberg
Production Manager