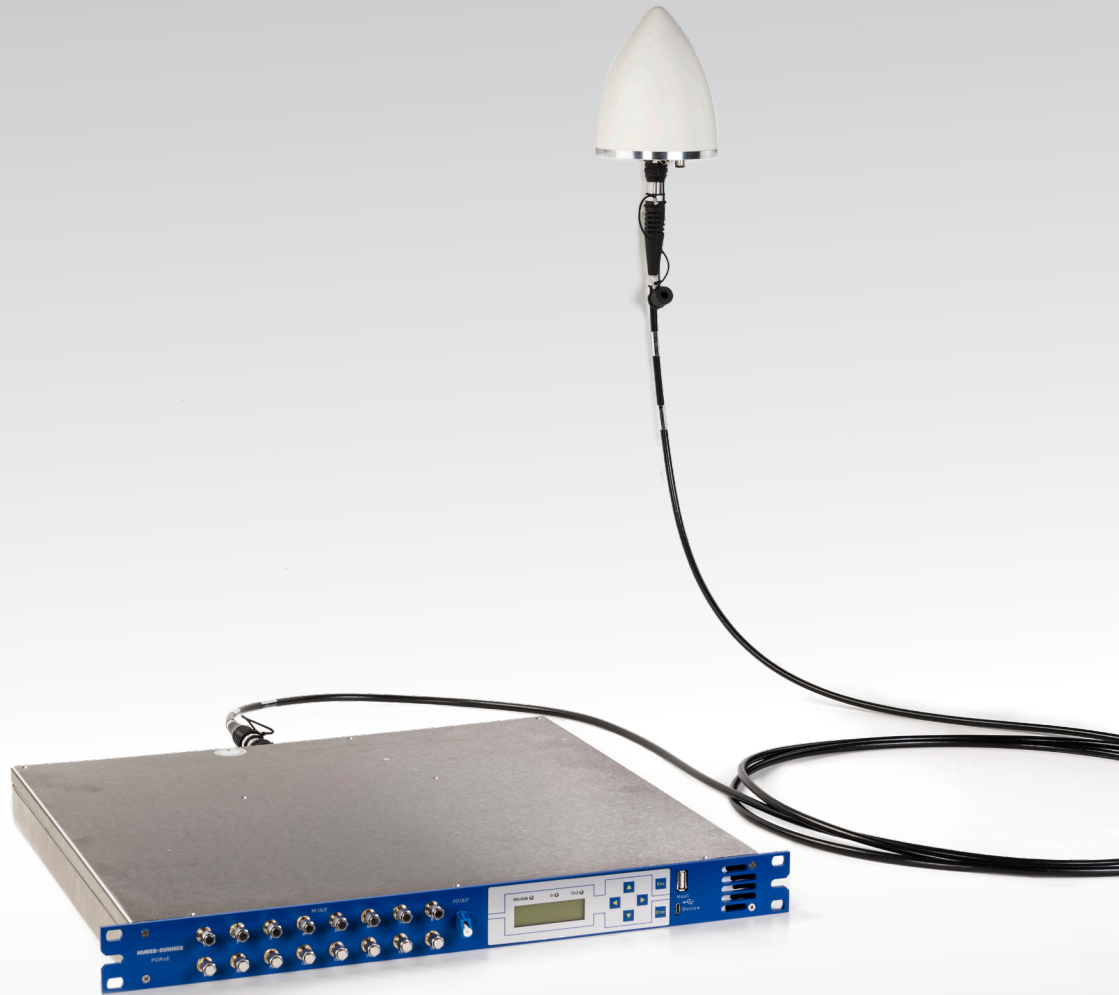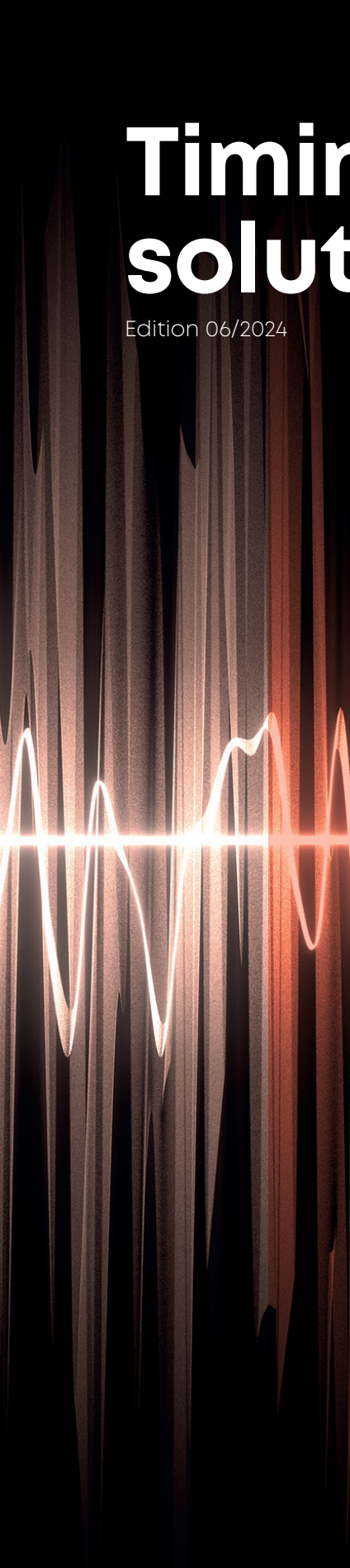# Timing synchronisation solution via GNSS

Edition 06/2024

HUBER+SUHNER

Make timing expansion possible

With increasing data transmission speeds and volumes, precise time synchronisation and reduced jitter times are becoming increasingly important. Positioning signals from satellites are based on atomic clocks, in which their precision serves as the basis for all international time data. Many applications such as power transmission, telecommunication network operations, financial transactions time stamping, air traffic management systems, satellite platforms and TV broadcasting use Global Navigation Satellite System (GNSS) for timekeeping and synchronisation purposes.

Our unique GNSS and power-over-fiber systems receive, transmit and augment GNSS signals. This technology offers high scalability and flexibility in deployment, that improves the total cost of ownership without compromising robust and secure time distribution. With our solution, you are ready for the timing and sychronisation challenges of the future.

The GNSS infrastruture challenge

GNSS are essential for many applications, such as navigation, positioning, timing and geodesy. However, GNSS infrastructure faces several challenges, such as signal interference, jamming, spoofing, cyberattacks and space debris. These threats can compromise the accuracy, reliability and security of GNSS services. To address these challenges, GNSS infrastructure needs to be resilient, robust and adaptable.

Disadvantages of existing coaxial GNSS infrastructure

Lack of scalability - a large number of users or devices are not supported or degrade signal quality
Short transmission range - repeaters or amplifiers are required for longer distances
**Necessary power supply** - a power supply is needed in close proximity to the GNSS antenna
Additional lightning protection system - to protect against overload/failure due to overvoltage
Limited service life - signal integrity and reliability are impaired over time due to deteriorating cable performance
Antenna positioning - due to the existing infrastructure, optimum GNSS reception is not guaranteed in many cases
Susceptibility to interference - manipulation through spoofing attacks

Conventional GNSS antenna installation
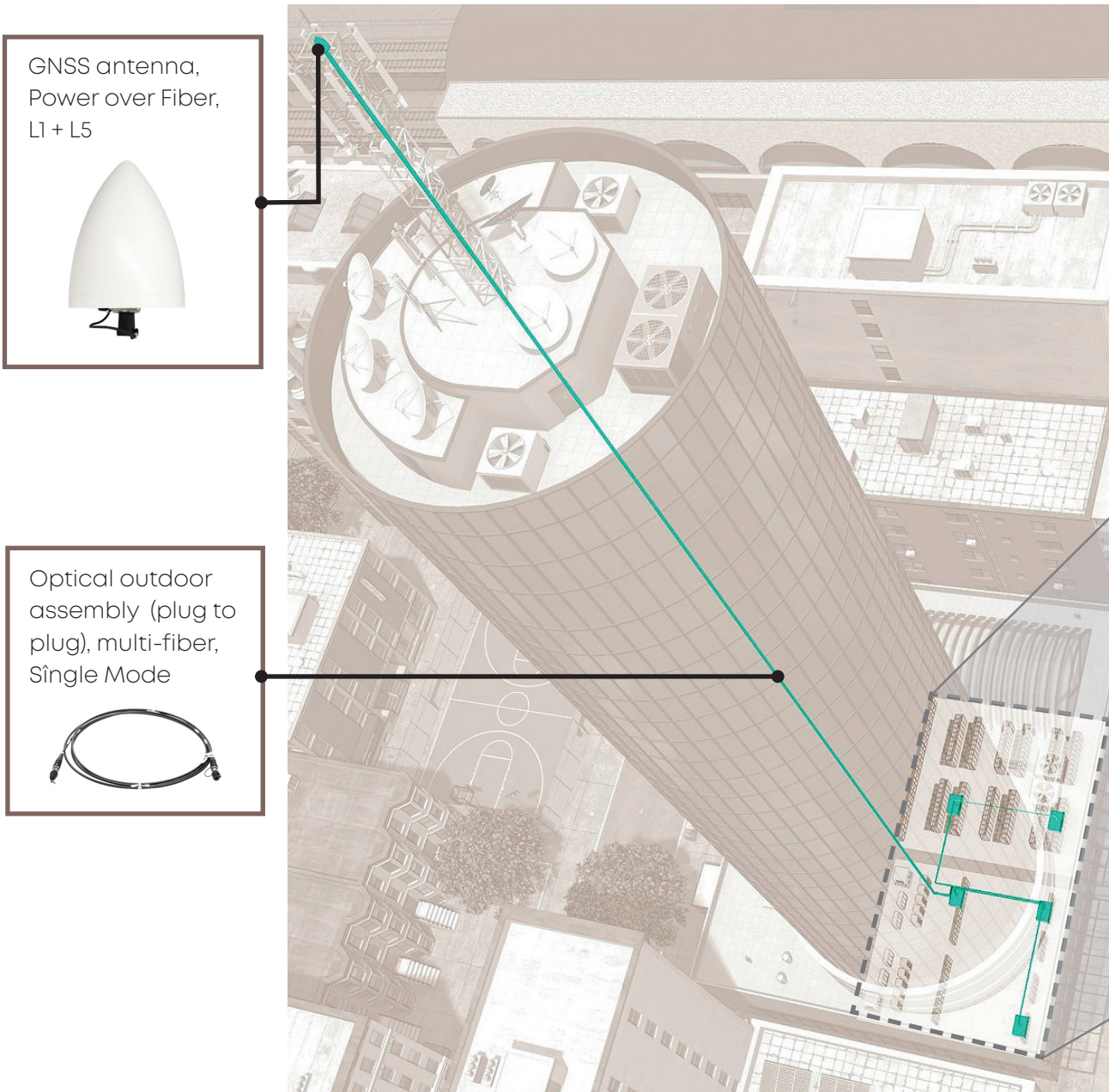

GNSS antenna

Lightning protector
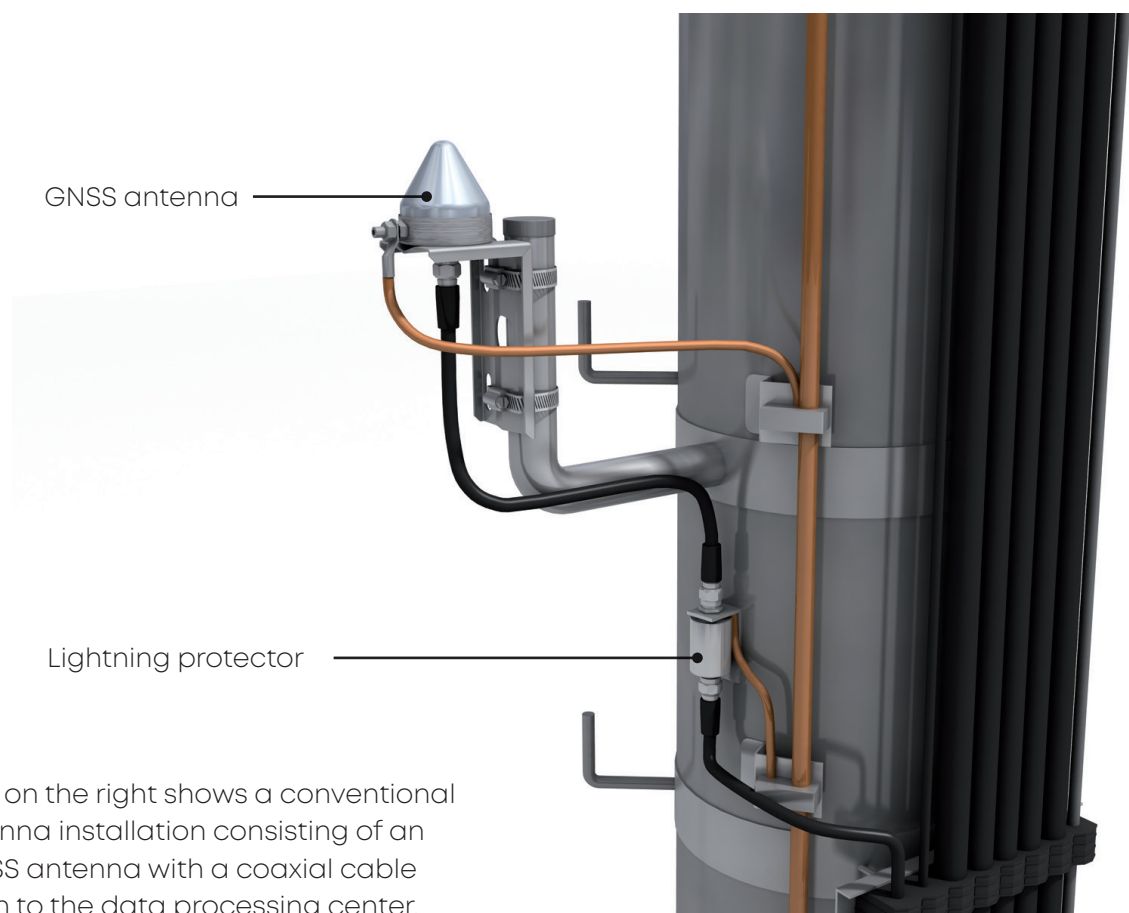
The image on the right shows a conventional GNSS antenna installation consisting of an active GNSS antenna with a coaxial cable connection to the data processing center.

One solution for all time scenarios

The demands for precise time synchronisation are constantly increasing in the course of global networking. Time-accurate data transmission and processing in data centers as well as their cyber security pose major challenges for network operators.

A central office and a data center are both facilities that host different types of equipment for telecommunications and computing purposes; However, they have different functions and requirements. A central office connects the customer's phone to the public network, while a data center stores and processes data for various applications. Both facilities need to have timing synchronisation, which means that their devices have a common reference for time measurement.

GNSS antenna, Power over Fiber, L1 + L5

Optical outdoor assembly (plug to plug), multi-fiber, Sîngle Mode

For this special challenge, we have developed a flexible and efficient solution for GNSS signal distribution and time synchronisation in close cooperation with our customers. A special feature: The fibre optic-based power-over-fibre technology requires no additional power supply, as the required energy is transmitted through the fibre optic cable and converted to supply the antenna. This avoids voltage peaks or fluctuations and minimises the risk of spoofing and/or jamming attacks, ensuring reliable power and signal transmission.

Flexibe and scalable

Our all-in-one solution also simplifies the installation process and reduces the need for multiple GNSS antennas.

Reliable and secure

Our latest receiver features dual power redundancy and various monitoring functions for resilient time distribution. Unlike RF cabling, optical transmission does not degrade over time, resulting in consistent performance and quality.

Base unit Power over Fiber
19" unit (1U), 16 RF OUT,
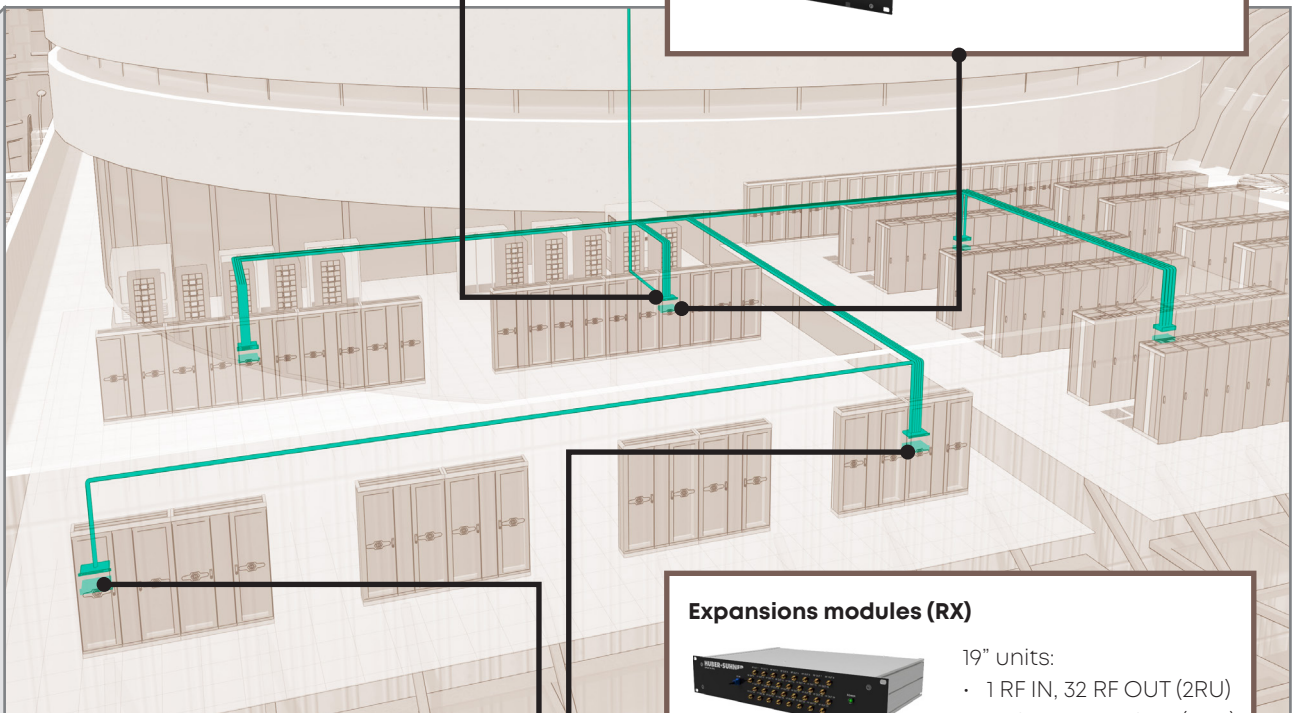1 FO OUT

Optcal splitter units for long distance distribution

19" Optical splitter (1U)
1 FO IN, 2 FO OUT,
16 RF OUT

19" Optical splitter (1U)
1 FO IN, 8 FO OUT

Expansions modules (RX)

19" units:
- 1 RF IN, 32 RF OUT (2RU)
- 1 FO IN, 32 RF OUT (2RU)

DIN rail units
- 1 FO IN, 1 RF OUT
- 1 FO IN, 4 RF OUT

GNSS over Fiber — the accurate time for your business processes

Timely and accurate data capture is essential for many companies, banks and trading firms. A software-based enterprise application for precise, time-based coordination and automation of business processes with immediate analysis of business data is required. Whether it be providing trading data, or querying and logging stock-market purchases, or component failure in networks or maintaining company databases — these are just a few of the challenges that globally active companies have to overcome across all time zones.

In many situations, success depends on precise time synchronisation. All nodes in the database cluster must be kept consistent to ensure the secure transfer of data between data centers, and from the cloud to the edge.

A Network Time Protocol (NTP) server is a common method for time synchronisation in company applications. It sends time signals to all devices in a network, which then set their clocks accordingly. For applications that require very precise time information, such as financial trading systems and industrial control systems, a Precision Time Protocol (PTP) server can be used. PTP sychronises the time of all devices in a network with sub-microsecond accuracy.

Benefits of GNSS in enterprise applications

- Most accurate time reference for PTP and NTP
- Clocks can be sychronised with high accuracy and stability over long distances
- Worldwide coverage for applications with the most accurate time reference that require synchronisation across different time zones
- Precise time calculation (time zones) for every location on earth
- Synchronisation via fiber is less prone to errors compared to other time references

GNSS Antenna,
coaxial, L1 + L2

Transmitter module (TX),
IP66 Box or DIN rail
AC or DC, outdoor
or indoor
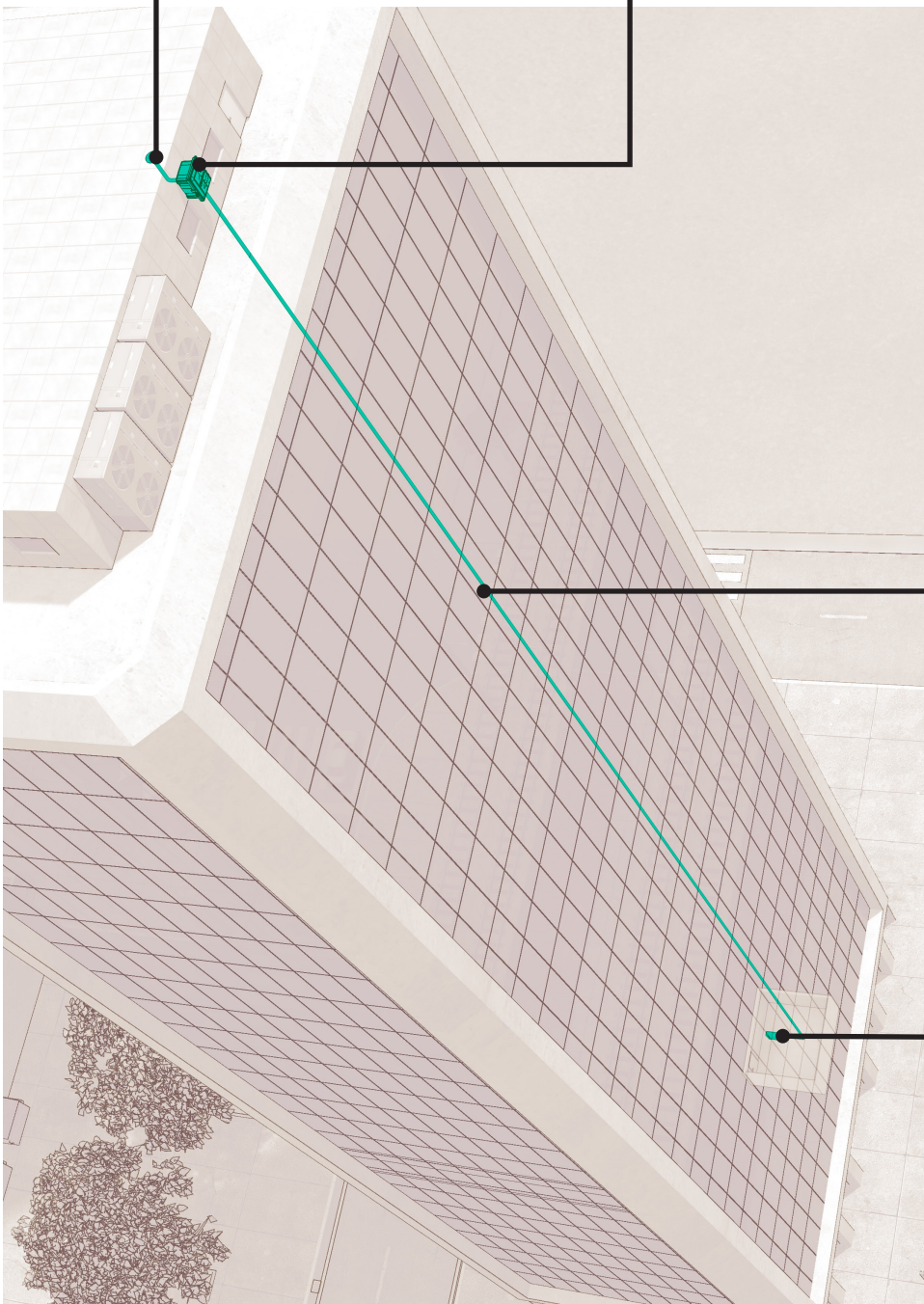
Optical outdoor
assembly, single fiber,
Single Mode

**Available expansions
modules (RX):**

19" units with up to 32
RF ports

DIN rail units with
maximum 4 RF ports

Detailed module list
on page 5.

Next generation GNSS & Power over fiber product

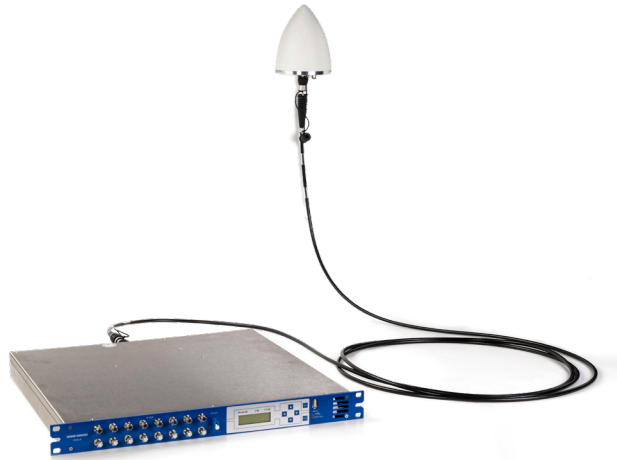The GNSS & Power-over-Fiber portfolio from HUBER+SUHNER is the world's first true copper-free time distribution link for data center and telecommunications customers in search of scalable timing infrastructure solutions. Learn how our game-changing solution can provide you the lowest Total Cost of Ownership (TCO).

Features:

- Allows for greater distances between the RF source and the receiver system
- Immune to RFI, EMI and EMP
- GNSS-over-fiber offers unlimited felxibility and scalability in signal distribution
- Monitoring functions via Web GUI

- Enables power redundance due to two integrated power supplies
- Remote control and monitoring via SNMP (RESTCONF YANG available soon)
- Supporting infrastructure installation due to direct GNSS signal evaluation

Benefits

Cost savings for installation (TCO)

- No need for power distribution on the roof
- Fewer roof penetrations
- Easier installation without lightning protection
- No construction approval for power required
- One GNSS antenna for unlimited end devices with timing reference

Easy and flexible time signal expansion

- Distribute unlimited timing signals over fiber
- Use existing optical DC infrastructure to save costs
- Scale up as your needs grow

Enhance safe and secure timing signal reference distribution

- Redundant timing reference in a different location to protect against jamming attacks
- Dual power supply to reduce the risk of power failure
- Optical transmission to avoid remote detection and physical access of data signals
- Integrated monitor surveillance into your network for enhanced security

Portfolio overview

GNSS-over-Fiber portfolio

Transmitter (TX) Modules (E/O Conversion)

Item-No	Product description	# of RF inputs	# FO outputs	Form factor
85135572	D-GNSSoF1-1T-L12	1 SMA	1 LC/UPC	Din Rail mount
85145805	GPSoF1 (TX) [LC/PC] IP66 AC	1 SMA	1 LC/UPC	Outdoor enclosure
85145804	GPSoF1 (TX) [LC/PC] IP66 DC	1 SMA	1 LC/UPC	Outdoor enclosure

Expansion modules (RX) Modules

Item-No	Product description	# FO / RF inputs	# FO outputs	# RF outputs	Form factor
85135573	D-GNSSoF1-1R-L12	1 LC/UPC	-	1 SMA	Din Rail mount
85140587	GPSoF4 - 1.5GHz (RX) [LC/PC]	1 LC/UPC	-	4 SMA	Din Rail mount
85145447	GPSoF16-2 (RX)	1 LC/UPC	2 LC/UPC	16 SMA	19" 1 RU
85140926	GPSoF32 (RX)	1 LC/UPC		32 SMA	19" 2 RU
85154296	GPSoF - OSM (1x8)	1 LC/UPC	8 LC/UPC	-	19" 1 RU
85128404	GPSoF Amp Expansion Splitter Module 32	1 SMA	-	32 SMA	19" 2 RU

Antenna

Item-No	Product description	Frequency range	Power supply
85160014	GNSS ANT L1+L2 3.3 V	L1+L2	3.3 V

GNSS & Power-over-Fiber portfolio

Antenna

Item-No	Product description	FO interface	Form factor
85227355	O-GNSSPoF0-1-L15	Q-ODC 12	Antenna

Base unit modules (RX) Modules

Item-No	Product description	# FO inputs	# FO outputs	# RF output	Form factor	description
85128283	Direct GPSoF - MAC8-1 (RX)	Q-ODC 12	1 LC / UPC	8 SMA	19" 1 RU	
85238861	P-GNSSPoF16-RxE AC	Q-ODC 12	1 LC / UPC	16 SMA	19" 1 RU	2x AC power supply included
85213405	P-GNSSPoF16-RxE DC	Q-ODC 12	1 LC / UPC	16 SMA	19" 1 RU	2x DC power supply included

Accessories

Item no.	Product description	Parameter	Description
85213406	Power Supply AC	100 to 240 V [AC]	1x power supply for P-GNSSPoF16-RxE AC 85208370
85213407	Power Supply DC	36 to 60 V [DC]	1x power supply for P-GNSSPoF16xE DC 85213405
84108853	Cleaning tool LC		Click handheld cleaning tool for LC connector
85172238	Cleaning tool Q-ODC 12		Click handheld cleaning tool for Q-ODC 12 connector
85152769	Direct GPSoF DC/DC Converter	Power input: 2x -48V [DC] / Power output: 2x 12V [DC]	DC/DC converter 19" 1 RU for Expansion modules and MAC 8
85154592	GPSoF IP66 Mastmount Kit		Mast mount adapter for GPSoF1 (TX) [LC/PC] IP66 85145805 85145804

Cables overview

Our products are designed for use in harsh environments where data transmission is critical. Even under difficult conditions, they can be installed quickly and easily as well as offer a high level of protection against mechanical stress, temperature fluctuations, shocks and a long service life for the plug connections. Thanks to low insertion loss, they offer reliable data transmission. Furthermore, our products comply with the highest flammability standards, such as Plenum for the North American region or CPR C and UL OFNR for the rest of the world.
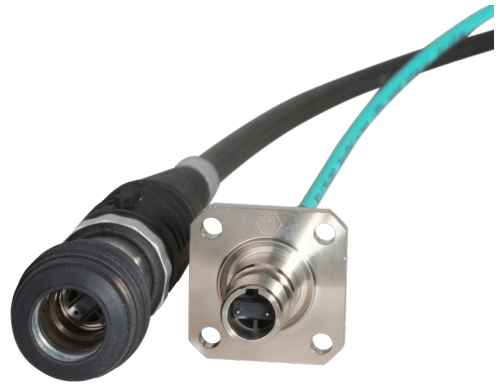
**Fiber optic Q-ODC 12 plug to plug assembly
(Flammability rating: UL OFNR, CPR C)**

Item-No	Product description	Length (ft)	Length (m)
85209503	MA12_QOI4_QOI4_A270X_15.2_BB	50	15.25
85209504	MA12_QOI4_QOI4_A270X_30.5_BB	100	30.5
85209505	MA12_QOI4_QOI4_A270X_45.7_BB	150	45.75
85209506	MA12_QOI4_QOI4_A270X_61.0_BB	200	61
85209507	MA12_QOI4_QOI4_A270X_76.2_BB	250	76.25
85209508	MA12_QOI4_QOI4_A270X_91.4_BB	300	91.5
85209509	MA12_QOI4_QOI4_A270X_0107_BB	350	106.75
85209510	MA12_QOI4_QOI4_A270X_0122_BB	400	122
85209511	MA12_QOI4_QOI4_A270X_137.2_BB	450	137.25
85209512	MA12_QOI4_QOI4_A270X_152.4_BB	500	152.5
85209513	MA12_QOI4_QOI4_A270X_0183_BB	600	183
85209514	MA12_QOI4_QOI4_A270X_213.4_BB	700	213.5
85209516	MA12_QOI4_QOI4_A270X_0244_BB	800	244
85209518	MA12_QOI4_QOI4_A270X_274.3_BB	900	274.5
85212489	MA12_QOI4_QOI4_A270X_0305_BB	1000	305

Note: different lengths available upon request.

Fiber optic Q-ODC 12 assembly (Plenum)

Item-No	Product description	Length (ft)	Length (m)
85142037	MA12_QOI4_QOI4_A270X_15.2_BB	50	15.25
85142038	MA12_QOI4_QOI4_A270X_30.5_BB	100	30.5
85142039	MA12_QOI4_QOI4_A270X_45.7_BB	150	45.75
85142040	MA12_QOI4_QOI4_A270X_61.0_BB	200	61
85142041	MA12_QOI4_QOI4_A270X_76.2_BB	250	76.25
85142042	MA12_QOI4_QOI4_A270X_91.4_BB	300	91.5
85142043	MA12_QOI4_QOI4_A270X_0107_BB	350	106.75
85142044	MA12_QOI4_QOI4_A270X_0122_BB	400	122
85142045	MA12_QOI4_QOI4_A270X_137.2_BB	450	137.25
85189554	MA12_QOI4_QOI4_A270X_152.4_BB	500	152.5
85189555	MA12_QOI4_QOI4_A270X_0183_BB	600	183
85189556	MA12_QOI4_QOI4_A270X_213.4_BB	700	213.5
85189557	MA12_QOI4_QOI4_A270X_0244_BB	800	244
85189558	MA12_QOI4_QOI4_A270X_274.3_BB	900	274.5
85189559	MA12_QOI4_QOI4_A270X_0305_BB	1000	305

RF cable assemblies

Item No.	Cable type	Connector type	IL (dB) L1 for 1 m / 1 ft
NA	SPUMA_240-FR-01	SMA (male, straight)	0.340 / 0.104
NA	SPUMA_400-FR-01	SMA (male, straight)	0.168 / 0.051

Note: Other cable lengths are available upon request. Technical parameters of the RF assemblies can be calculated at the following link: http://rfcablecalc.hubersuhner.com/

Connecting – today and beyond

About HUBER+SUHNER

We are a leading global supplier of components and systems solutions. With our broad range of products and deep know-how, we serve the industry, communications and transportation markets with applications from the three technologies of radio frequency, fiber optics and low frequency. And as a global company with a presence in over 80 countries, we stay close to our customers. Always.

Waiver
Fact and figures herein are for information only and do not represent any warranty of any kind.