SYNCRO Fiber-Enhanced GNSS Connectivity

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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 synchronisation challenges of the future.

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The GNSS infrastructure 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

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.

Use case

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.

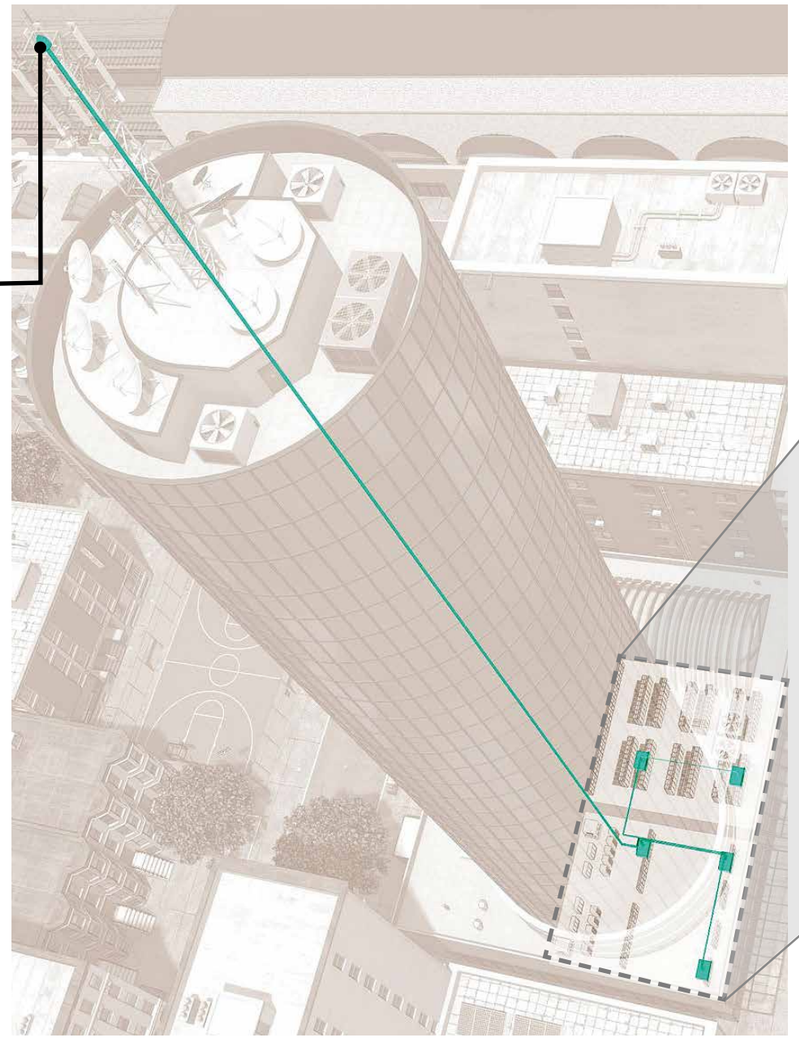
A central office and a data center are both facilities that host different types of equipment for telecommunications and computing purposes. However, they have different functions and requirements. A central office connects the customer's phone to the public network, while a data center stores and processes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

For this special challenge, we have developed the flexible and efficient solution family SYNCRO for GNSS signal distribution and time synchronisation in close cooperation with our customers. A special feature: The fiber optic-based power-over-fiber technology requires no additional power supply, as the required energy is transmitted through the fiber 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.

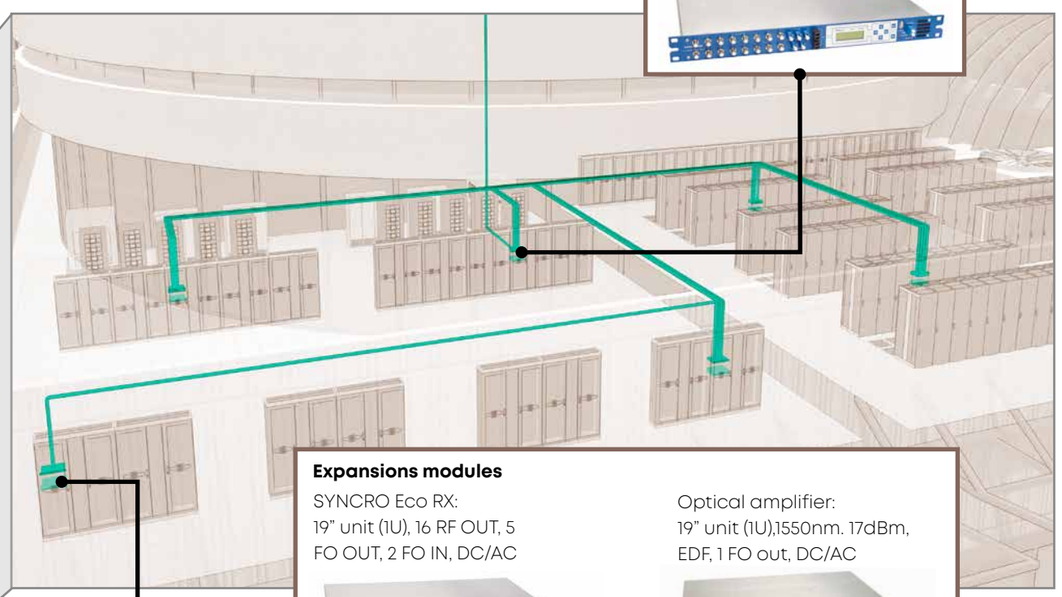
Flexibe and scalable
Our all-in-one solution also simplifies the installation process and reduces the need for multiple GNSS antennas.

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.

SYNCRO Max antenna, Power over Fiber L1, L5, Optical LC fan out



SYNCRO Max RX:
19" unit (1U), 16 RF OUT, FO OUT, 2 FO IN, 4 FO OUT power, DC/AC



Expansions modules

SYNCRO Eco RX:
19" unit (1U), 16 RF OUT, 5 FO OUT, 2 FO IN, DC/AC

Optical amplifier:
19" unit (1U),1550nm. 17dBm, EDF, 1 FO out, DC/AC

SYNCRO Mini RX:
L1, L2, L5 DIN Rail: 1 RF out, 1 FO in / 4 RF out, 1 FO in

Passive optical splitter:
19" unit (1U)1:16, LC UPC

Use case

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.

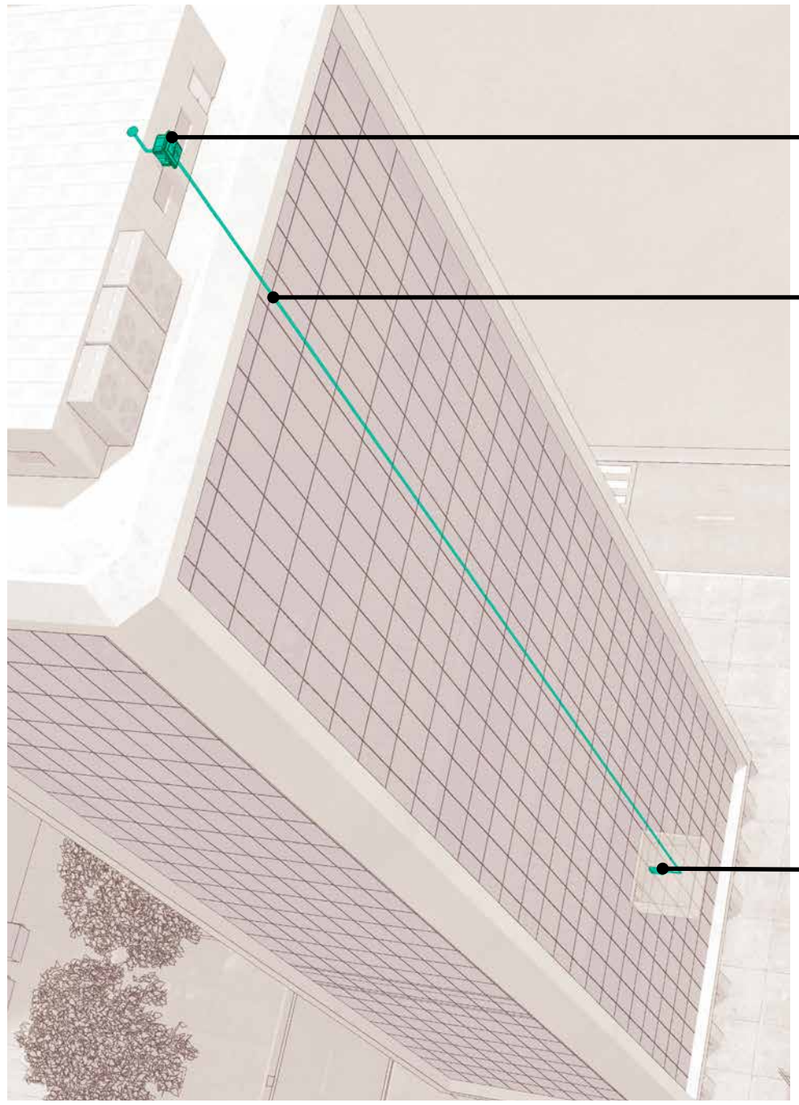
Benefits of GNSS in enterprise applications

- 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

Compact Single-Timing Solution
For non-critical infrastructures such as smaller data centers, edge locations, or secure in-house data systems, a single timing application can be installed. This solution is cost-effective, easy to install thanks to its plug-and-play design, and still offers full monitoring and signal extension functions.

SYNCRO Mini antenna:
Coaxial, L1 + L5

SYNCRO Mini TX:
Outdoor L1, L2, L5,
Flange, 1 RF IN,
1 FO OUT, AC / DC



Optical outdoor / indoor assembly, LC UPC to LC UPC, Single mode

Available expansions modules (RX):

SYNCRO Mini RX:
L1, L2, L5 DIN Rail: 1 RF out, 1 FO in / 4 RF out, 1 FO in

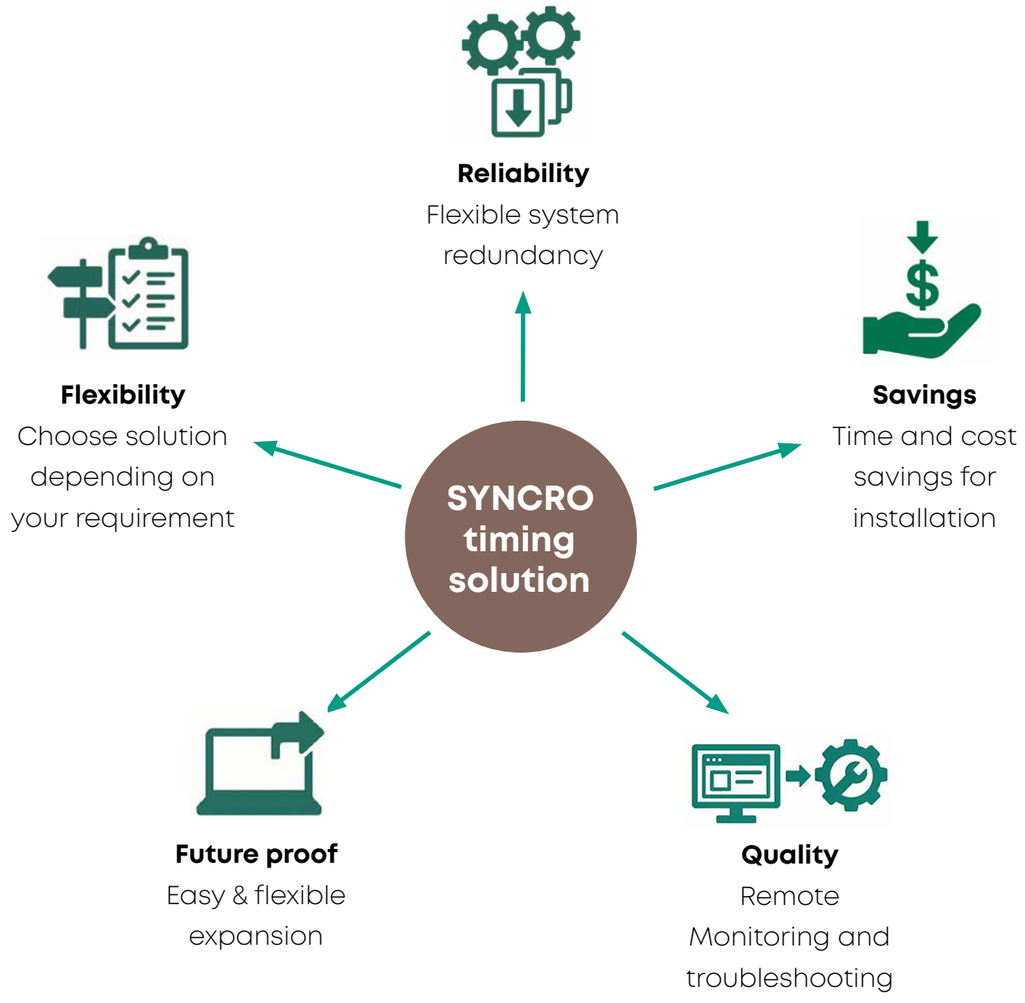
SYNCRO Eco RX:
16 RF OUT, 5 FO OUT, 2 FO IN, AC

Detailed module list on page 5.

SYNCRO - Next generation GNSS & Power over fiber family

The SYNCRO GNSS & Power-over-Fiber portfolio is the world's first true copper-free time distribution link with three different applications for data center and telecommunications customers in search of scalable timing infrastructure solutions. Our SYNCRO product family comprise of SYNCRO Max, SYNCRO Eco, SYNCRO Mini carefully curated to address the synchronisation need for different use case in various application offering a cost-effective and scalable alternative to traditional infrastructure. It enables secure, flexible, and accurate time distribution, without the complexity of coaxial cabling.

Keep your network ready for tomorrow's timing demands with simplified design and higher performance. Your advantages at a glance:

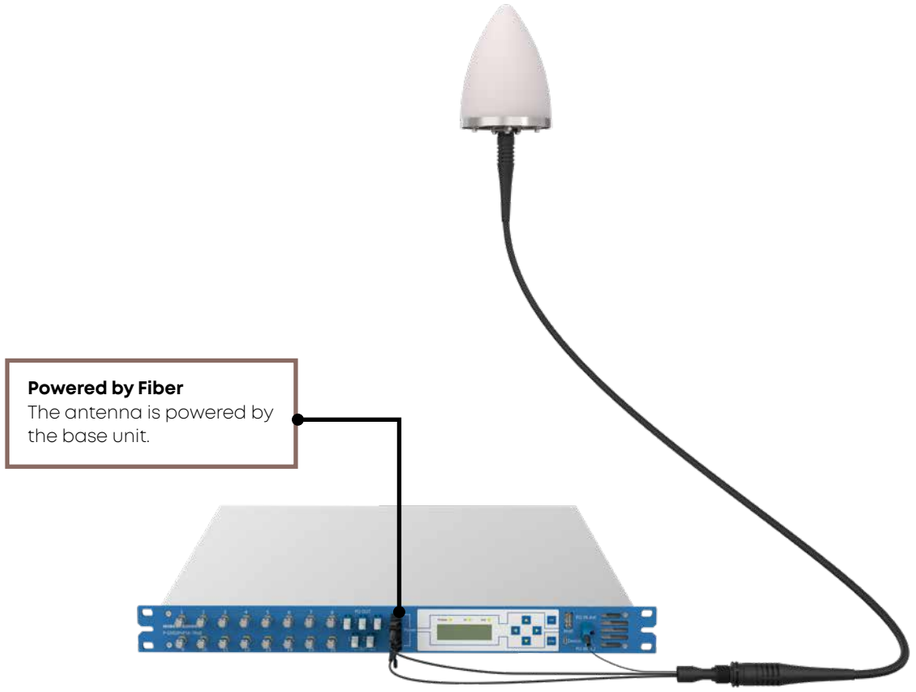


SYNCRO Mini for single antenna setup, cost-sensitive projects	SYNCRO Eco Redundancy required, monitoring needed	SYNCRO Max No rooftop power available, maximum reliability including monitoring and redundancy
Description Cost-effective GNSS connectivity for non-critical infrastructure with simplified 3-piece design.	**Description** Advance GNSS connectivity for critical infrastructure with focus on Remote monitoring, redundancy and TCO	**Description** Premium GNSS connectivity with integrated powering, redundant two-piece design, remote monitoring, highest performance.
Technology RFoF	**Technology** RFoF	**Technology** RFoF+PoF (Power-over-Fiber)
Powering Power is required at rooftop for Tx unit.	**Powering** Power is required at rooftop for Tx unit	**Powering** Antenna is powered via PoF from baseunit and offer fill flexibility to mount antenna at any location irrespective of local power
Remote monitoring No	**Remote monitoring** Yes Solution support WebGui, Restconf, SNMP, Netconf	**Remote monitoring** Yes Solution support WebGui, Restconf, SNMP, Netconf
Redundancy No	**Redundancy** Yes. Solution offer power redundancy of Antenna and system	**Redundancy** Yes Solution offer full system and power redundancy
Scalable Solution designed for high scalability, hence various cascading and expansion option are possible.	**Scalable** Solution designed for high scalability, hence various cascading and expansion option are possible.	**Scalable** Solution designed for high scalability, hence various cascading and expansion option are possible.
Lightening protection Required external lightening protection for Indoor Tx unit. For Outdoor Tx unit this will be integrated.	**Lightening protection** Required external lightening protection for Indoor Tx unit. For Outdoor Tx unit this will be integrated.	**Lightning protection** Integrated 100% copper free solution

Scalable
All solution designed for high scalability, hence various cascading and expansion option are possible.

Power supply and control via fiber optics

Unique worldwide – energy is supplied via fiber.
Usually, the power supply of the active GNSS antenna is provided by using a conventional power connection. Now the additional power supply becomes unnecessary, as the fiber optic connection of the antenna takes over this part and can transport the received data almost loss-free over longer distances in the same time.



Powered by Fiber
The antenna is powered by the base unit.

Benefits from Power over Fiber

- No additional power supply needed - the required energy is transmitted through the fiber optic cable and converted to power the antenna.
- Avoids power spikes or fluctuations and minimizes the risk of spoofing and/or interference attacks while ensuring reliable power and signal transmission.
- Large distances of several kilometers between the RF source and the receiver system are possible. Delay times are minimal. This enables separate antenna positions to ensure additional security and redundancy.
- No power cables, no lightning protection, no approval process. Roof installation is simplified and additional roof ducts are unnecessary.
- A single GNSS antenna can cover an unlimited number of end devices for time reference and can even be integrated and monitored within the in-house fiber optic infrastructure.
- Remote monitoring

Measuring time delay for critical infrastructures

Accurate time delay measurement is a critical factor in the performance of GNSS-over-Fiber systems. Any unknown delay between the GNSS antenna and the receiver directly affects synchronisation accuracy and can lead to timing errors. This results in negative consequences, particularly in critical applications such as mobile networks, data centers, power grids, and industrial automation, which is why accurate delay measurement is essential for reliable timing and system stability. Propagation delays can be reliably compensated only when the end-to-end delay is precisely known, ensuring deterministic and stable time distribution.

Our modules are time-delay measured during manufacturing, and time-delay-characterized assemblies are part of our standard portfolio to ensure accurate compensation and reliable synchronisation.

Possible application areas for GNSS where precise time data is required:

Telecommunications & mobile communications
- 5G Networks (ultra-low latency, TDD synchronisation) base stations, microcells, femtocells, distributed
- Antenna systems (DAS)
- Backhaul networks, fixed-line networks & synchronisation of network nodes

Data centers & cloud infrastructures
- Log files, synchronisation of databases & distributed systems
- Cluster consistency and transaction security (e.g., distributed database nodes)
- High-performance data centers, AI/HPC systems

Banking & finance industry
- Stock exchange trading, high-frequency trading
- Transaction timestamping in accordance with MiFID II regulations
- Banks, payment transactions, and trading systems

Broadcasting, media & broadcast
- ST-2110 / IP broadcasting
- Timecode, camera and audio production
- Satellite uplink/downlink timing

Transportation & traffic
- Satellite communication & Navigation
- Aviation / air traffic management (ATM)
- Autonomous transportation and traffic systems (e.g., UAVs, AGVs).

Industry 4.0, automation & manufacturing
- Automation systems, robotics, industrial communication networks
- Cyber-physical systems (CPS) & industrial control systems
- Time-critical measurement and testing equipment

Security & defense sector
- Military communications networks
- Critical infrastructure, cyber/security monitoring
- Surveillance & radar systems
- Mobile camp locations

Energy & utility networks
- Smart grid synchronisation
- Phasor measurementunits (PMUs) / synchrophasor networks
- Fault location using traveling wave methods

Equipment overview

GNSS over Fiber

GNSS coaxial Antenna

Product	Name	Order No.	Description
	O-GNSS-L15-02	85243244	SYNCRO Mini, GNSS antenna, coaxial, L1 + L5, 1 RF OUT. N female, mounting bracket included [1]

SYNCRO Mini Transmitter Modules (E/O Conversion)

Product	Name	Order No.	Description
	D-GNSSoF1-1T-L12	85135572	SYNCRO Mini Transmitter, L1, L2, DIN Rail, 1 RF IN / SMA female, 1 FO OUT / LC UPC, surge protector 84030303 / 3403.17.0060 recommended [2]
	C-GNSSoF1-1TS-L15-AC	85271756	SYNCRO Mini Transmitter, Outdoor, L1, L2, L5, 1 RF IN / N female, 1 FO OUT / LC UPC, AC, monitoring [3]
	C-GNSSoF1-1TS-L15-DC	85271757	SYNCRO Mini Transmitter, Outdoor, L1, L2, L5, 1 RF IN / N female, 1 FO OUT / LC UPC, DC, monitoring [4]

SYNCRO Mini Receiver Modules (O/E Conversion)

Product	Name	Order No.	Description
	D-GNSSoF1-1R-L12	85135573	SYNCRO Mini, Receiver, L1, L2, DIN Rail, 1 RF OUT / SMA female, 1 FO IN / LC UPC
	D-GNSSoF4-1R-L12	85140587	SYNCRO Mini, Receiver, L1, L2, DIN Rail, 4 RF OUT / SMA female, 1 FO IN / LC UPC
	C-GNSSoF1-1RS-L15-AC	85271758	SYNCRO Mini, Receiver, Outdoor, L1, L2, L5, 1 RF OUT / N female, 1 FO IN / LC UPC
	D-GNSSoF1-1RS-L15	85274235	SYNCRO Mini, Receiver, L1, L2, L5, DIN Rail, 1 RF OUT / SMA female, 1 FO IN / LC UPC

SYNCRO ECO Receiver Modules (O/E Conversion)

Product	Name	Order No.	Description
	P-GNSSoF16-7RxE-21	85244049	SYNCRO Eco Receiver, 16 RF OUT / SMA female, 2 FO OUT / LC UPC, 2 FO IN / LC UPC,, monitoring, redundant, AC
	P-GNSSoF16-7RxE-25	85271754	SYNCRO Eco Receiver, 16 RF OUT / SMA female, 2 FO OUT / LC UPC, 2 FO IN / LC UPC,, monitoring, redundant, DC

[1,2,3,4] RF assembly (cable SPUMA_240-FR-01 / SPUMA_400-FR-01) can be calculated and quoted with following link: http://rfcablecalc.hubersuhner.com

GNSS over Fiber & Power over Fiber

SYNCRO Max Antenna (E/O Conversion)

Product	Name	Order No.	Description
	O-GNSSPoF0-1RxE-L15-21	85271622	SYNCRO Max Antenna, PoF, L1, L5, Optical LC fan-out, Plenum, 122m, 400ft, 1550nm, monitoring
	O-GNSSPoF0-1RxE-L15-31	85271623	SYNCRO Max Antenna, PoF, L1, L5, Optical LC fan-out, CPRC / UL OFNR, 122m, 400ft, 1550nm, monitoring
	O-GNSSPoF0-1RxE-L15-23	85272833	SYNCRO Max Antenna, PoF, L1, L5, Optical LC fan-out, Plenum, 30.5m, 100ft, 1550nm, monitoring
	O-GNSSPoF0-1RxE-L15-33	85272815	SYNCRO Max Antenna, PoF, L1, L5, Optical LC fan-out, CPRC / UL OFNR, 30.5m, 100ft, 1550nm, monitoring

SYNCRO Max Receiver (O/E Conversion)

Product	Name	Order No.	Description
	P-GNSSPoF16-7RxE-11	85271626	SYNCRO Max Receiver, PoF, 16 RF OUT / SMA female, 2 FO OUT / LC UPC, 2 FO IN / LC UPC, 4 FO OUT power / LC UPC duplex black, monitoring, redundant, AC
	P-GNSSPoF16-7RxE-15	85271753	SYNCRO Max Receiver, PoF, 16 RF OUT / SMA female, 2 FO OUT / LC UPC, 2 FO IN / LC UPC, 4 FO OUT power / LC UPC duplex black monitoring, redundant, DC

SYNCRO optical active expansion

Product	Name	Order No.	Description
	OVxE1170	85271862	Optical amplifier, 1RU, 1550nm. 17dBm, EDF, 1 FO IN / LC UPC, 1 FO OUT / LC UPC
	FOVO16-PLC-H	85271884	Optical passive splitter, 1:16, LC UPC

Accessoires

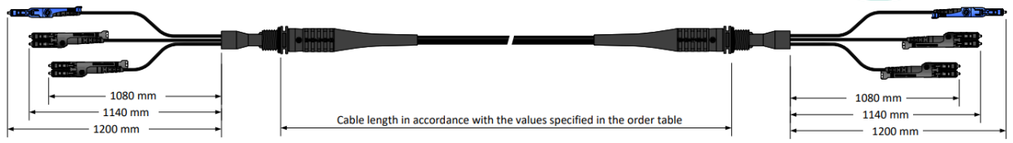
Product	Name	Order No.	Description
	Demarcation Box Patch FTTA-Z-00SM880003-000-00-000-S	85277743	Demarcation box, IP66, Patch version, 2x LC duplex black adapter (power), 1 x LC duplex blue adapter (signal)
	19''xE SV-1HE 230/100	85213406	Hot swappable, Power supply AC, compatible with SYNCRO MAX / ECO RX
	Power Supply DC	85213407	Hot swappable, Power supply DC, compatible with SYNCRO MAX / ECO RX
	Power supply 12 W	85272725	Power supply AC, SYNCRO Mini DIN Rail module
	D-Rail-Wall-Br	85285242	Wall mount bracket for all DIN RAIL modules
	3403.17.0060	84030303	Coaxial Surge Protector Device, N female to N female, bypass voltage 6 V, DC current 4 A

Equipment overview

Fanout assemblies (Demarcation box to base unit)

Time delay measured

Plenum-rated (UL OFNP)



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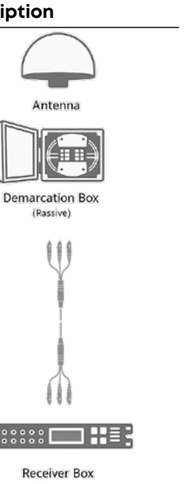
HH005_Z0015A_SG108ZG108ZZZZZSS	85278304	15,25	50	
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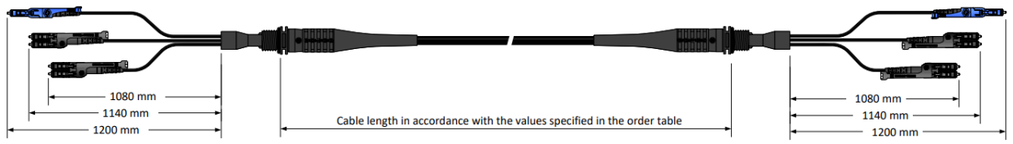
HH005_Z0046C_SG108ZG108ZZZZZSS	85278306	45,75	150	
HH005_Z0061C_SG108ZG108ZZZZZSS	85278307	61,00	200	
HH005_Z0076C_SG108ZG108ZZZZZSS	85278308	76,25	250	
HH005_Z0092L_SG108ZG108ZZZZZSS	85278309	91,50	300	
HH005_Z0107L_SG108ZG108ZZZZZSS	85278310	106,75	350	
HH005_Z0122L_SG108ZG108ZZZZZSS	85278311	122,00	400	
HH005_Z0137L_SG108ZG108ZZZZZSS	85278312	137,25	450	
HH005_Z0153L_SG108ZG108ZZZZZSS	85278313	152,50	500	
HH005_Z0183L_SG108ZG108ZZZZZSS	85278314	183,00	600	
HH005_Z0213L_SG108ZG108ZZZZZSS	85278315	213,50	700	
HH005_Z0244D_SG108ZG108ZZZZZSS	85278316	244,00	800	
HH005_Z0275D_SG108ZG108ZZZZZSS	85278317	274,50	900	
HH005_Z0305D_SG108ZG108ZZZZZSS	85277305	305,00	1000	

Riser-rated (UL OFNR) / CPR compliant (Class Cca-s1,d0,a1)



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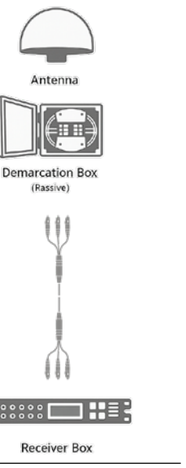
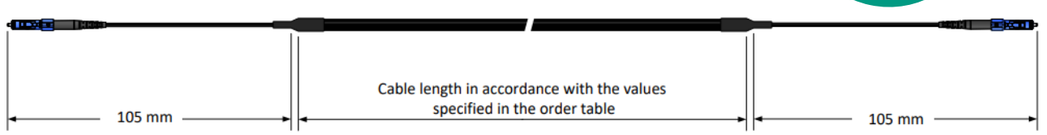
HH005_U0015A_SG108ZG108ZZZZZSS	85278318	15,25	50	
HH005_U0031A_SG108ZG108ZZZZZSS	85278319	30,50	100	
HH005_U0046C_SG108ZG108ZZZZZSS	85278320	45,75	150	
HH005_U0061C_SG108ZG108ZZZZZSS	85278321	61,00	200	
HH005_U0076C_SG108ZG108ZZZZZSS	85278322	76,25	250	
HH005_U0092L_SG108ZG108ZZZZZSS	85278323	91,50	300	
HH005_U0107L_SG108ZG108ZZZZZSS	85278324	106,75	350	
HH005_U0122L_SG108ZG108ZZZZZSS	85278325	122,00	400	
HH005_U0137L_SG108ZG108ZZZZZSS	85278326	137,25	450	
HH005_U0153L_SG108ZG108ZZZZZSS	85278327	152,50	500	
HH005_U0183L_SG108ZG108ZZZZZSS	85278328	183,00	600	
HH005_U0213L_SG108ZG108ZZZZZSS	85278329	213,50	700	
HH005_U0244D_SG108ZG108ZZZZZSS	85278330	244,00	800	
HH005_U0275D_SG108ZG108ZZZZZSS	85278331	274,50	900	
HH005_U0305D_SG108ZG108ZZZZZSS	85278332	305,00	1000	

LC UPC to LC UPC assemblies

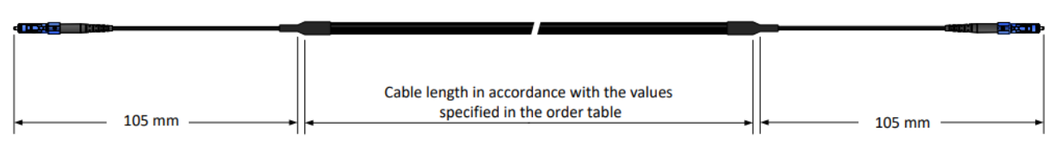
Time delay measured

Plenum-rated (UL OFNP)



Name	Order No.	Length [m]	Length [ft]	Description
MR01_LCUS_LCUS_A270P_15.2_SS	85279161	15,20	50	
MR01_LCUS_LCUS_A270P_30.5_SS	85279200	30,50	100	
MR01_LCUS_LCUS_A270P_45.7_SS	85279201	45,70	150	
MR01_LCUS_LCUS_A270P_0061_SS	85279203	61,00	200	
MR01_LCUS_LCUS_A270P_76.2_SS	85279204	76,20	250	
MR01_LCUS_LCUS_A270P_91.4_SS	85279206	91,40	300	
MR01_LCUS_LCUS_A270P_0107_SS	85279208	107,00	350	
MR01_LCUS_LCUS_A270P_0122_SS	85279211	122,00	400	
MR01_LCUS_LCUS_A270P_0137_SS	85279212	137,00	450	
MR01_LCUS_LCUS_A270P_0152_SS	85279213	152,00	500	
MR01_LCUS_LCUS_A270P_0183_SS	85279219	183,00	600	
MR01_LCUS_LCUS_A270P_0213_SS	85279220	213,00	700	
MR01_LCUS_LCUS_A270P_0244_SS	85279221	244,00	800	
MR01_LCUS_LCUS_A270P_0274_SS	85279222	274,00	900	
MR01_LCUS_LCUS_A270P_0305_SS	85279223	305,00	1000	

Riser-rated (UL OFNR) / CPR compliant (Class Cca-s1,d0,a1)



Name	Order No.	Length [m]	Length [ft]	Description
MR01_LCUS_LCUS_A270X_15.2_SS	85279168	15,20	50	
MR01_LCUS_LCUS_A270X_30.5_SS	85279284	30,50	100	
MR01_LCUS_LCUS_A270X_45.7_SS	85279285	45,70	150	
MR01_LCUS_LCUS_A270X_0061_SS	85279286	61,00	200	
MR01_LCUS_LCUS_A270X_76.2_SS	85279287	76,20	250	
MR01_LCUS_LCUS_A270X_91.4_SS	85279288	91,40	300	
MR01_LCUS_LCUS_A270X_0107_SS	85279289	107,00	350	
MR01_LCUS_LCUS_A270X_0122_SS	85279290	122,00	400	
MR01_LCUS_LCUS_A270X_0137_SS	85279291	137,00	450	
MR01_LCUS_LCUS_A270X_0152_SS	85279292	152,00	500	
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MR01_LCUS_LCUS_A270X_0244_SS	85279297	244,00	800	
MR01_LCUS_LCUS_A270X_0274_SS	85279298	274,00	900	
MR01_LCUS_LCUS_A270X_0305_SS	85279299	305,00	1000	

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.

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HUBER+SUHNER is certified according to ISO 9001, ISO 14001, OHSAS 18001, EN(AS) 9100, IATF 16949 and ISO/TS 22163 – IRIS.

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

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