



RF-over-Fiber for Aerospace Applications

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RF-over-Fiber (RFoF) is a technology for transmission of analogue radio frequency signals by light using conversion modules at either end of the link and fiber optics in between. HUBER+SUHNER is one of very few firms in the world that has the expertise and experience to fuse radio frequency and fiber optics into a single solution.

Key Features and Benefits

Exceeds coaxial link performance

RFoF permits for vastly longer distances: 100 km without amplification. Much lighter weight due to use of fiber optics and the option to multiplex tens of channels into a single fiber.

Superior reliability

Intrinsically immune to EMI & RFI, EMP and notoriously difficult to intercept ("tap").

Unparalleled electrical performance

The combination of low NF, gain flatness and SFDR makes this product family unique in the market.

Breadth of product family

Frequencies from 20 MHz to 40 GHz available, specialized units for wide bandwidth, low phase noise, high linearity, GNSS-over-fiber, and power-over-fiber-fed GNSSoF.

Rugged design

Our compact and durable converter modules come in various embodiments, e.g. chassis-, panel and DIN mountable units or as customized form factors. We guarantee functionality across extreme operating environments including high shock and vibration resistance.

Connectivity solutions

Regularly we combine our products into connectivity network architectures tuned to precisely meet the specificities of our customers.

The Aerospace sector is increasingly relying on RFoF when long distances and EMI-prone environments must be bridged with RF signals – a scenario that deems conventional coaxial links unsuitable. As the applied frequencies are increasing to accommodate greater data loads, the limitations of coaxial links become even more accentuated making RFoF an indispensable technology for contemporary and future-proof connectivity.



Air Traffic Control

ATC voice communications operate in the VHF band at 118 - 137 MHz in 25 kHz or 8 kHz steps. Send and receive antennas can be co-located but careful implementation is need to avoid mutual interference. The receive signals require sensitivities to -107 dBm at 10 dB S/N. This is an ideal case for high-gain, low noise RFoF solutions linking the antenna.

Multilateration Systems

Multilateration (MLAT) systems triangulate the position of aircraft in the air or on the ground using a network of receiving antennas on and around the airport. These units listen for “replies,” typically to interrogation signals transmitted from a local SSR (secondary surveillance radar). Interrogation at 1030 MHz is responded at 1090 MHz, and signal transmission from the antennas to the tower is conveniently realized by RFoF.

Remoted Radars

Contemporary airports integrate data from multiple radar sources, e.g., primary & secondary airport surveillance radars, as well as air-route surveillance radars, all operating in L- and S-band. Centralized signal processing implies RF signals need to be conveyed over large distances. A case for RFoF.



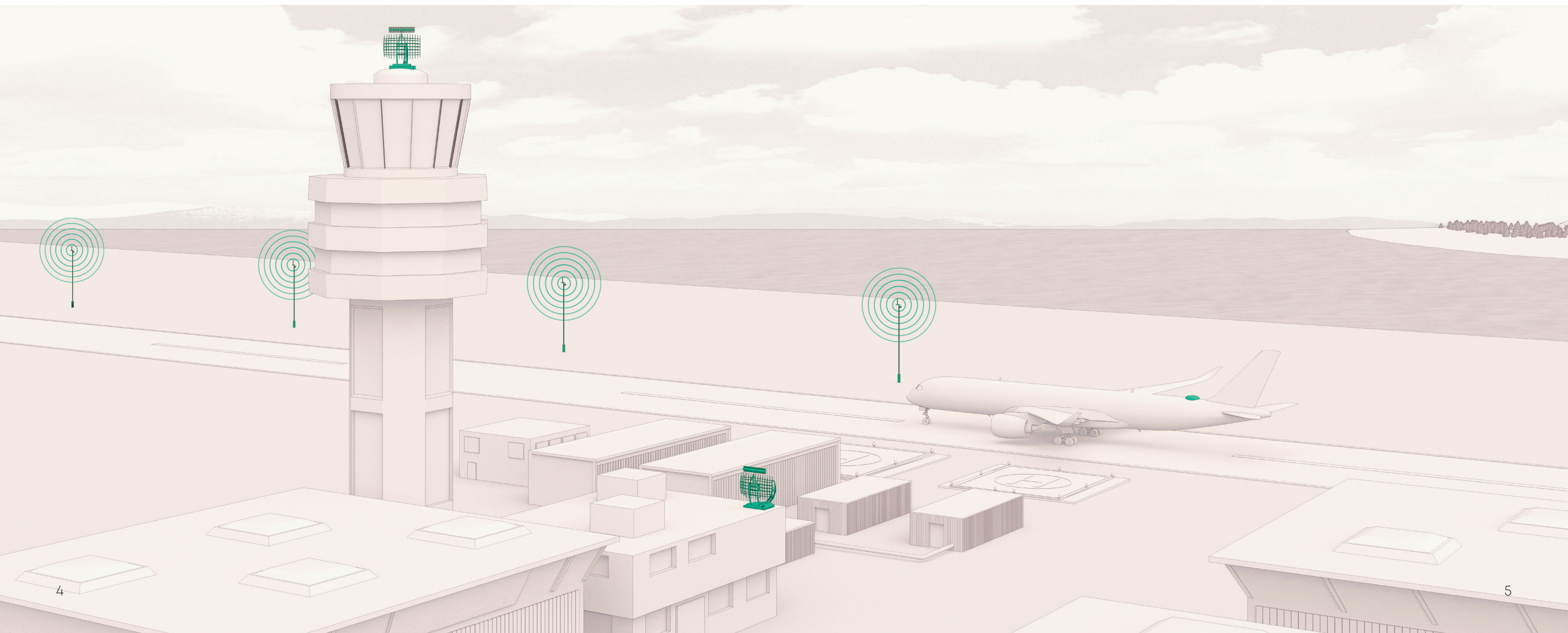
RF-over-Fiber transmitter, standard

- 20 MHz...6 GHz Tx and Rx
- Sensitivity at -104 dBm with 10 dB S/N in 25 kHz channels
- 1310nm, DIN rail, for single channel transmission



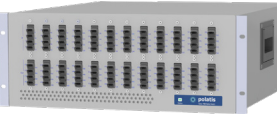
RF-over-Fiber receiver, low-phase module

- 100 MHz & 160 MHz low phase noise module
- Synchronization of LOs in TX and RX systems



Ground Stations

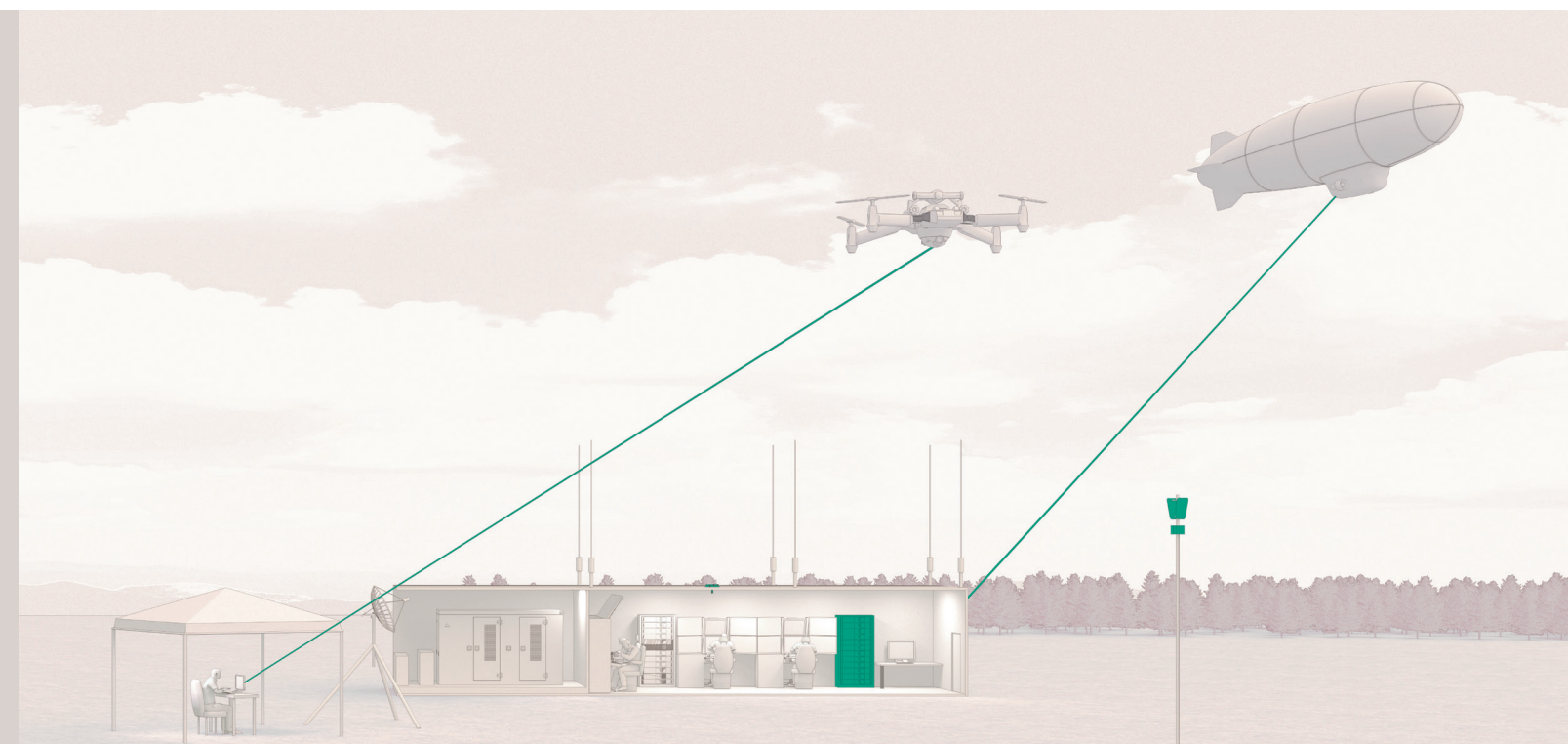
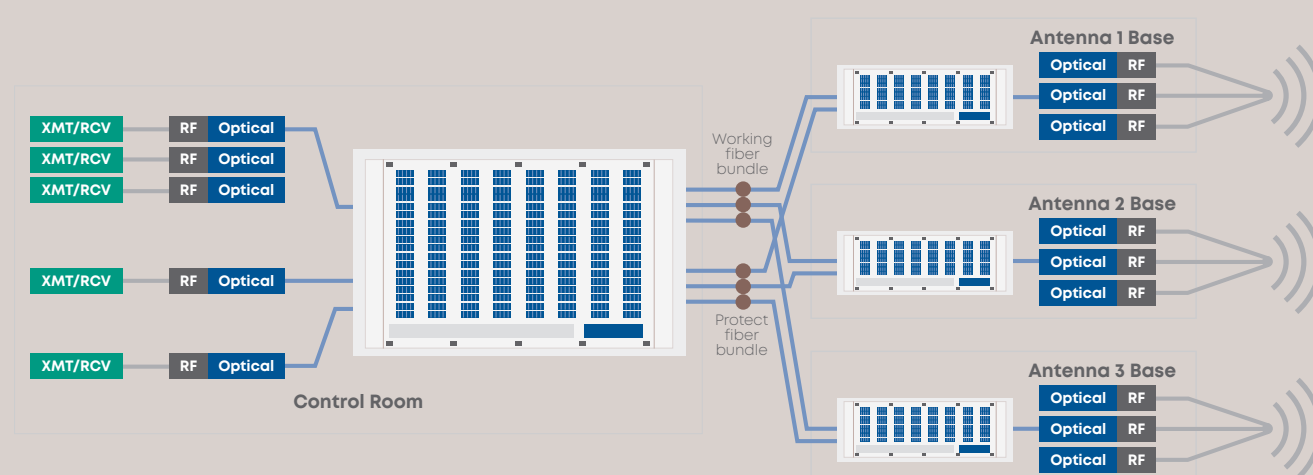
Satcom ground stations benefit from an all fiber-based approach: control rooms can be safely located further away from antennas, provisioning can be done remotely, satellite dishes can be shared by different organizations, and data can be easily re-routed around failure. Using our 40 GHz modules even allows omission of K_u down-conversion at the dish. Using our complementary and proprietary all-optical switches, WDM technology and fiber management solutions, HUBER+SÜHNER covers the full ground station ecosystem.

	RF-over-Fiber transmitter, 40 GHz 0.1...40 GHz broadband system with broad temperature range (-20°...65°C)
	All-optical switches Available in 4×4 to 384×384 matrix sizes

Tethered Payloads

Tethered Drones revolutionize aerospace and defense operations by distributing RF signals over fiber optics. This enhances signal bandwidth, integrity, and security while optimizing size, weight, and power (SWaP). Applications include UAS, ground, surface, subsurface systems, towed systems, and aerostats. Robust, lightweight hybrid cables and spool solutions ensure reliable performance in harsh environments, providing tactical advantages in electronic warfare (EW), intelligence, surveillance, and reconnaissance (ISR) operations.

	RF-over-Fiber transmitter and receiver, 40 GHz 0.1...40 GHz broadband system with wide temperature range (-20°...65°C)
	RF-over-Fiber transmitter and receiver, 6 GHz 20 MHz...6 GHz Tx and Rx, 1310nm, DIN Rail, for single channel transmission



Avionics Systems

Aircraft host a myriad of antennas for a variety of purposes. Each radio has its own antenna, and the antennas are strategically placed mainly because their range and coverage can be negatively affected if positioned incorrectly. RFoF helps to link remote antennas and satcom units at reduced weight, and interference-free compared to traditional coaxial connections. WDM-expanded RFoF links permit transmission of multiple avionics signals over the same fiber.

Cabin Connections

The communication infrastructure deployed in aircraft cabins involves an interconnection of the cabin systems, entertainment systems, and external communication systems spanning classical data streams in RF, CAN, Ethernet, and RS485. RFoF plays a central role in linking wireless access points and cabin systems in the front and back of the cabin, as well as Ethernet-fed cabin systems.



RF-over-Fiber transmitter, low-phase module

- Bi-directional transmission lines with additional synch channel



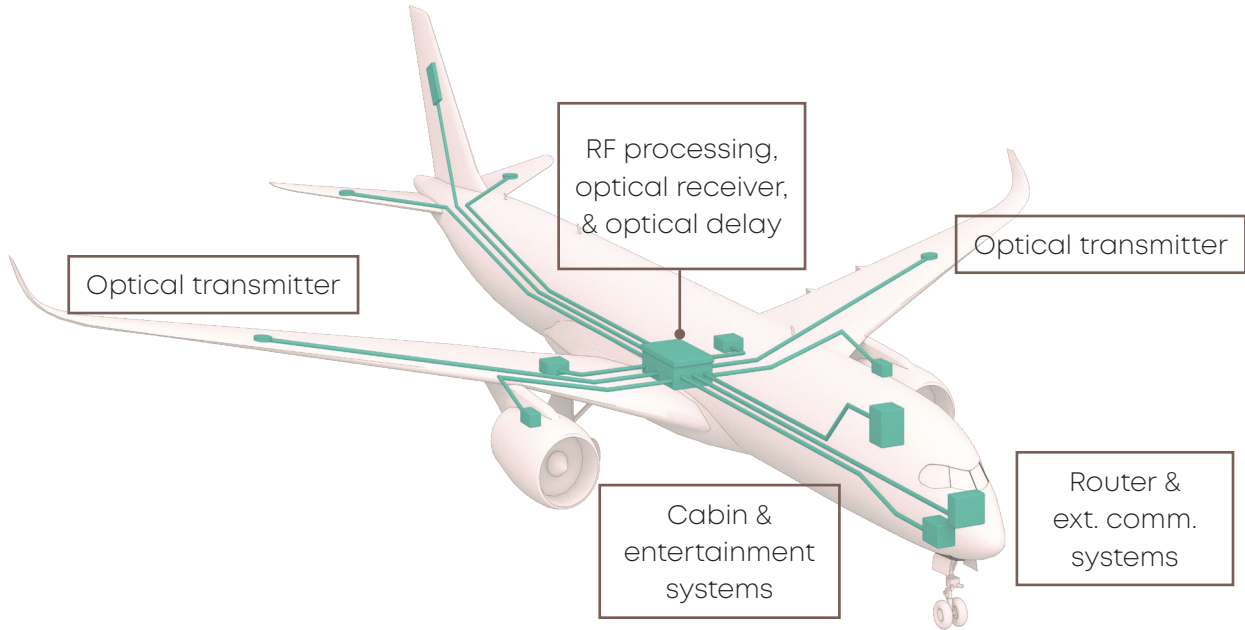
Transmitter, 6 GHz, DIN Rail, 1 RF IN, 1 FO Out

- 20 MHz..6 GHz Tx and Rx, 1310nm, DIN Rail, for single channel transmission



Ethernet switch

- Managed ethernet switch for on-board networks



GPS and Satcom Repeaters

MRO operations in hangars require access to GNSS and satcom signals for a variety of calibration and communication purposes. Signals are inhibited by the presence of building infrastructure and hence need to be repeated. The simplest solution is to link a galvanically separated roof-top antenna (omitting the need for lightning protection) to an indoor router. GNSS-over-fiber with a fiber-optically powered GNSS receiver is a unique solution offered only by HUBER+SUHNER.



GNSS-over-Fiber active optical splitter

- Active optical and RF splitter and expansion modules for signal distribution within the premises .



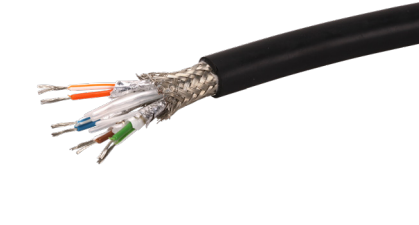
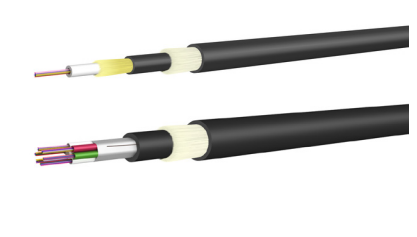
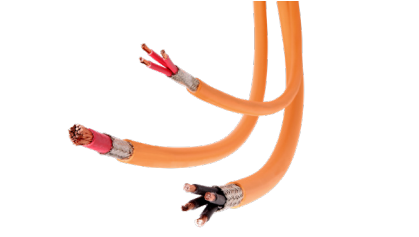
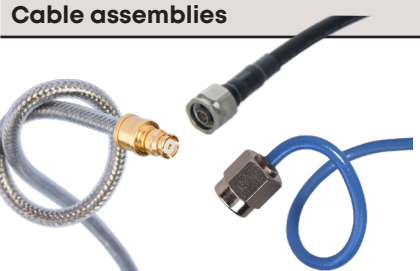
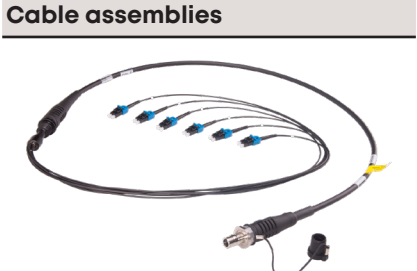
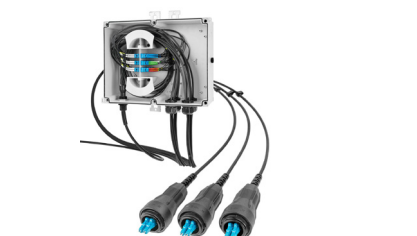
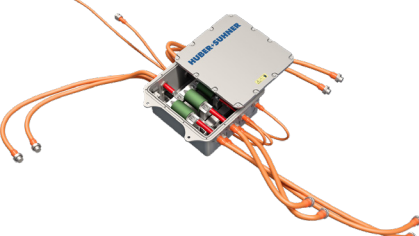
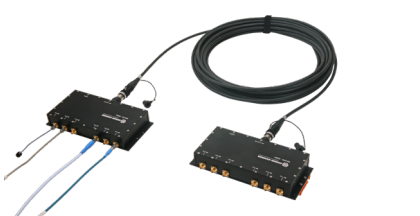
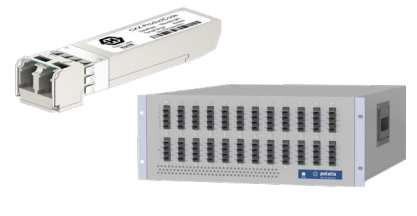
GNSS and Power-over-Fiber

- Fully Cu-free synchronization link including power-over-fiber-fed GNSS antenna (L1, L2)



Beyond RFoF: Broad Cross-Technological Portfolio

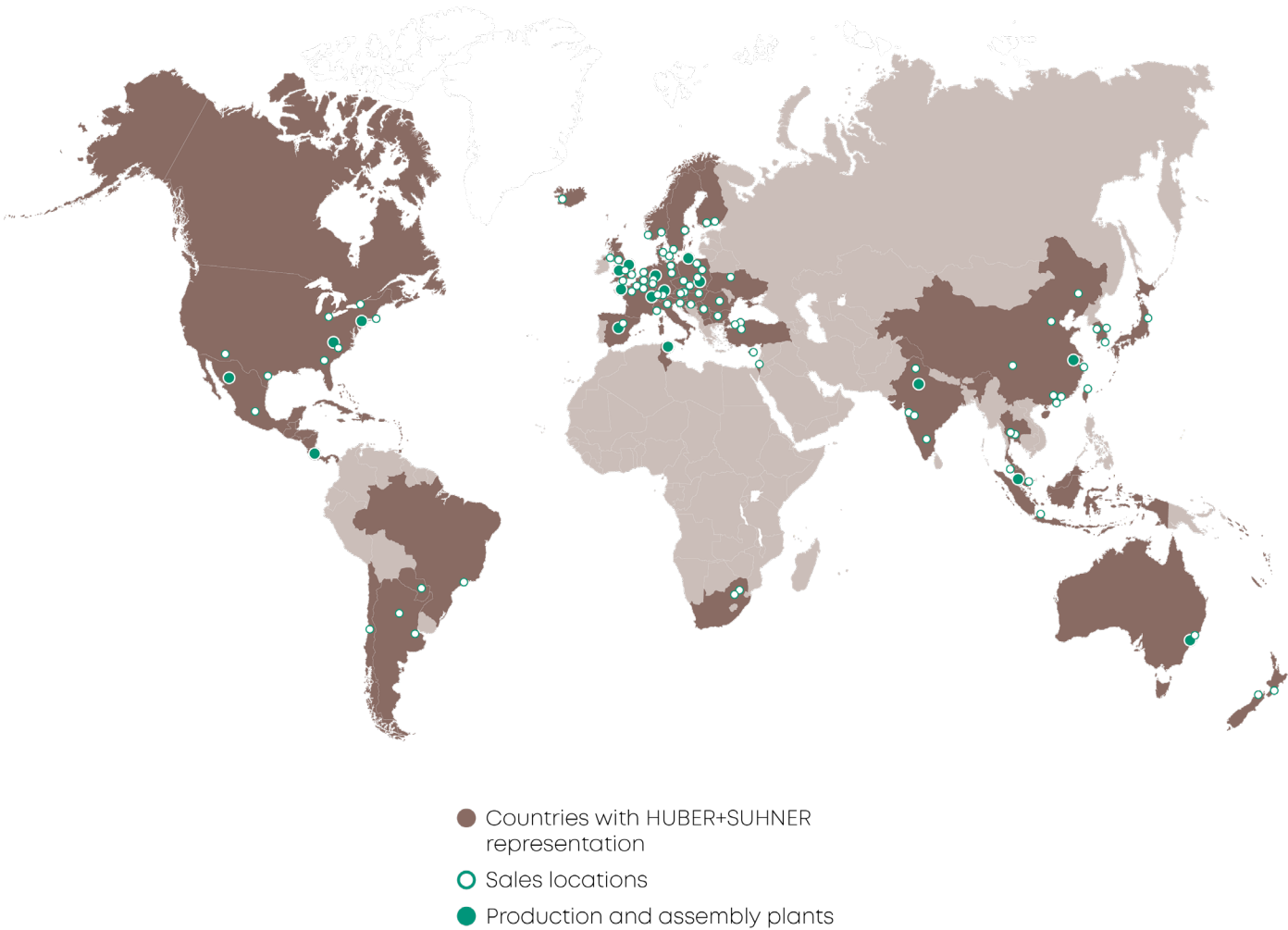
Deep vertical integration across RF, fiber optics and low-frequency components and systems.

Radio frequency	Fiber optics	Low frequency
Connectors	Connectors	Databus cables
		
Cables	Cables	High voltage cables
		
Cable assemblies	Cable assemblies	Cable harnesses
		
Antennas	Fiber distribution	Power & signal distribution
		
System solutions	Active equipment	Customized solutions
		

Heritage

With a proven track record in harsh environment applications, HUBER+SUHNER is a trusted partner, backed by extensive engineering and testing resources. We take pride in our extensive heritage providing rugged connectivity to the world's most recognized programs.

Headquartered in Herisau, Switzerland, we develop and produce products and solutions that excel in performance, quality, reliability and long service lives – even under the most demanding conditions. Through a global production network, combined with subsidiaries and representations in more than eighty countries, we are close to our customers worldwide.



HUBER+SUHNER AG
Degersheimerstrasse 14
CH-9100 Herisau
Switzerland
Phone +41 71 353 41 11
hubersuhner.com

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

Waiver

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