

# Industrial communication

## Industrie 4.0/IOT

Edition 2016



# Connectivity for IOT and Industrie 4.0





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## Your partner for system solutions

HUBER+SUHNER is a leading international manufacturer and supplier of components and systems for electrical and optical connectivity. HUBER+SUHNER unites technical expertise in radio frequency technology, fiber optics and low frequency under one roof, and offers a high-quality product range for the communication, transport and industrial markets.

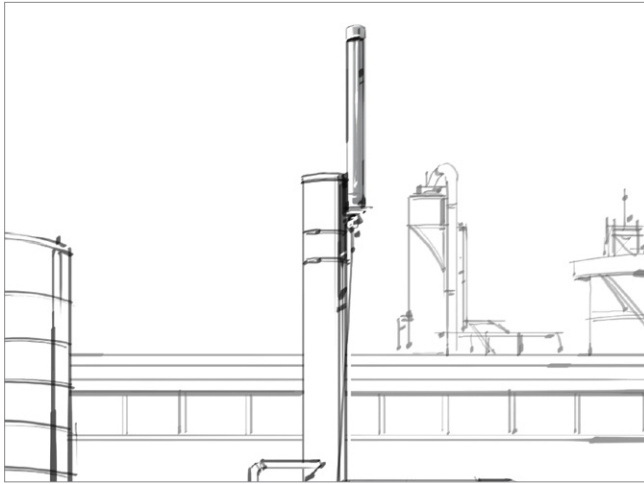


## Wireless infrastructure

Networking all devices and machines down to the smallest thing (concept of "Industrie 4.0" and "IOT" (Internet of things)) places high demands on infrastructure. Reliability and performance in particular are important requirements which must be satisfied.

As a result of their complex design, industrial buildings place special demands on radio links. Consideration needs to be given not only to angled rooms and deep basements, but also large objects such as industrial cranes and machines.

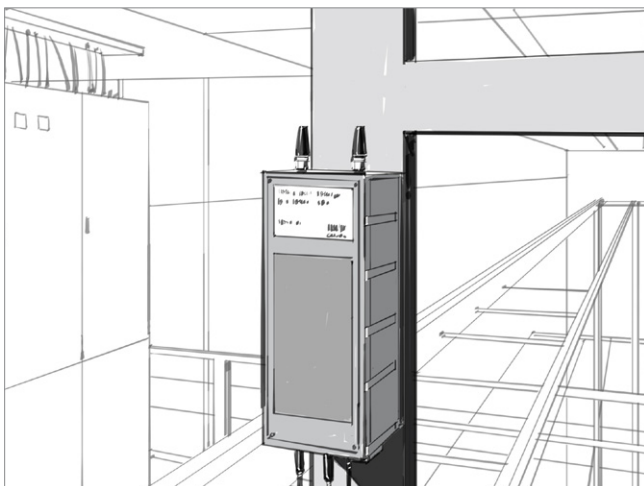
HUBER+SUHNER supplies a wide portfolio of antennas for this purpose which, in addition to excellent electrical properties, also meet all standard requirements for water proofing and dust tightness, shock and vibration properties, and mechanical protection. In addition to antennas, HUBER+SUHNER offers a wide range of RF cables and connectors for connections to access points and routers, as well as fiber optic products and industrial databus cables for connection to backbone networks.



## Wall/mast installation

Buildings or locations with difficult reception conditions can be connected to a wireless or cellular network using rod antennas or directional antennas. The products are installed on a wall or a mast using a suitable bracket. This may also be used, for example, to illuminate a high-bay warehouse.

These antennas typically have a gain of 2 to 6 dBi and feature protection from corrosion and high resistance to dust and water. Antennas with higher gain can also be used for special applications.



## Access points

In perfect conditions, the direct installation of an antenna on the access point is often the simplest way of connecting to a wireless network. For access points, Wi-Fi networks or wireless sensors are used to increase the flexibility of production systems.

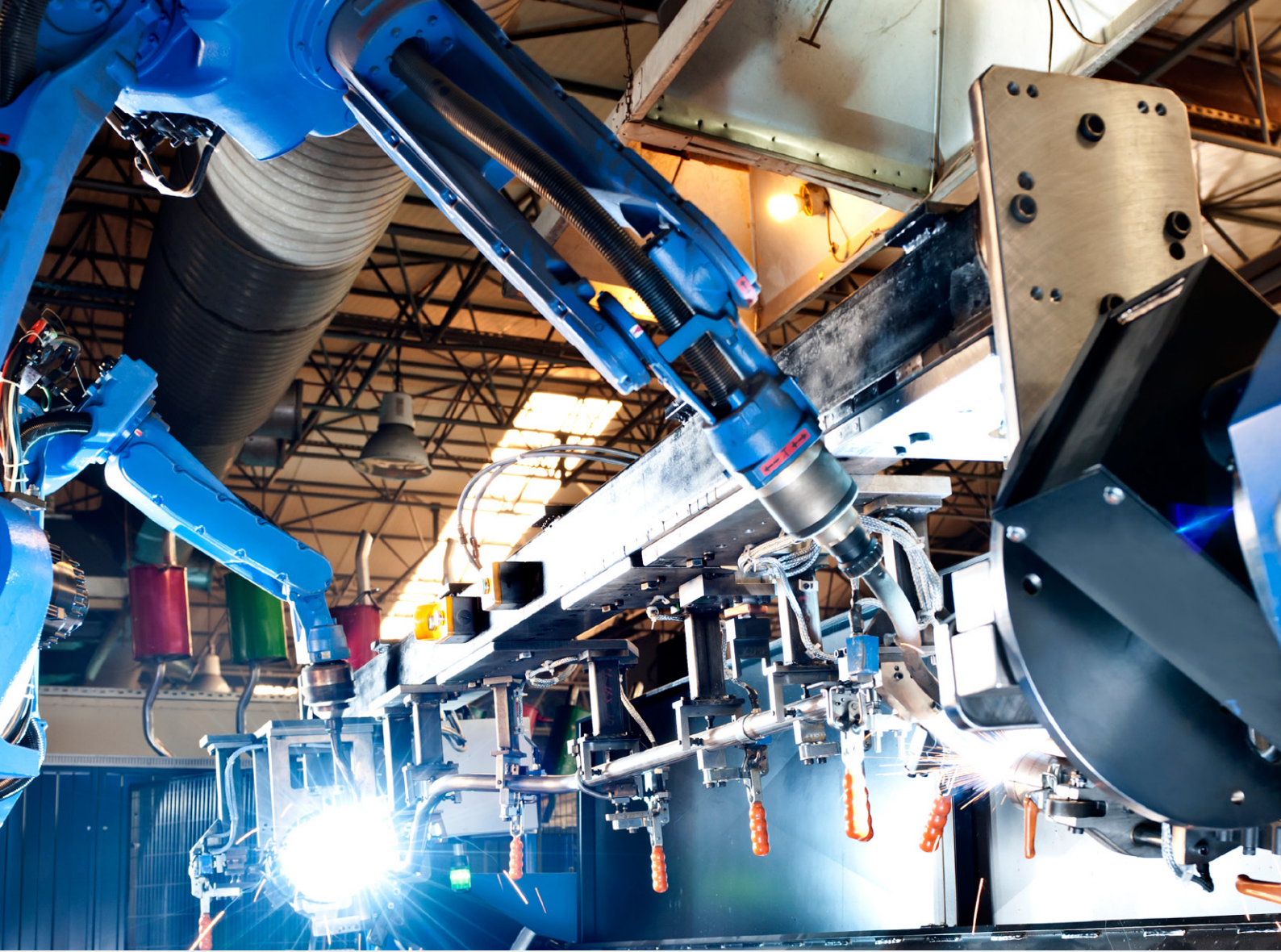
HUBER+SUHNER products feature compact designs and high resistance to dust and moisture combined with simple handling.



## Distribution boxes

The connection of distribution boxes to a wireless network in industrial environments and public spaces must be vandal-proof. To reduce expensive maintenance at these locations to a minimum, all the components must be designed for a long service life. This particularly applies to the exposed antennas.

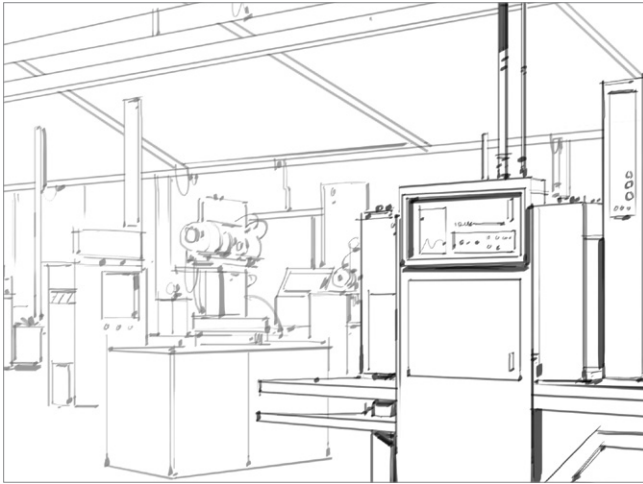
Vandal-proof antennas have a low-profile design. Depending on the model, the metal antenna base plate can be installed quickly, easily and safely using a single hole.



## Automation – smart factory

The vision of a production environment in which production systems and logistics systems can largely organise themselves without human intervention is becoming reality. The technical basis for this is provided by systems that communicate with each other and with central servers. The "IOT" and "Industrie 4.0" have become buzzwords. These terms mean that a product brings its production information with it in machine-readable form so that the production system and the various production steps can be controlled and the current status transmitted to the control room by Wi-Fi, Bluetooth, fiber optics, data bus or similar connection solutions.

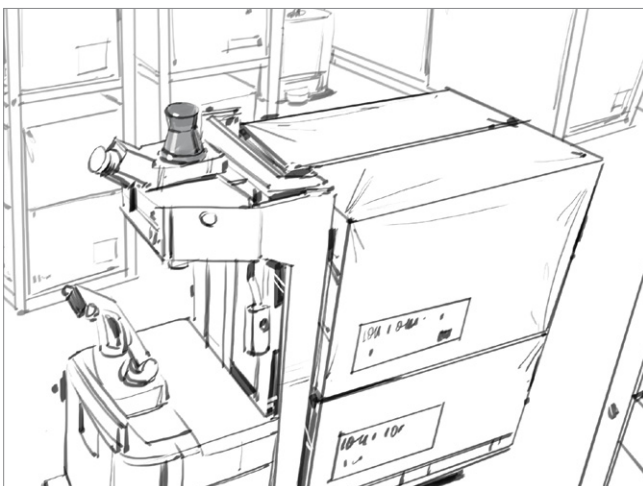
As this trend becomes progressively more implemented, interference-free data transmission becomes even more important. HUBER+SUHNER's wireless and cable solutions satisfy these high demands. Whether robust antennas or coaxial, fiber optic or data cables, these products are an important link between the various sensors, control units, etc. and provide a connection to the control system.



## Machinery

The automated exchange of information between devices such as machines and robots or with a central control room is increasing taking place using cable-based networks, Wi-Fi or mobile communication networks. The restricted space in and around production facilities requires compact, robust solutions which, in specific cases, must also be resistant to temperature and oil.

The robust antennas and wide portfolio of radio frequency, fiber optic and databus cables and connectors provide secured data connections suited to the individual situation.



## Vehicles

Automated production requires self-driving transport units which arrive at the right place at the right time with the right product. In addition to controlling the vehicles, it is also very important to provide information about the status of the work-piece.

Industrial cables from HUBER+SUHNER draw on extensive experience in connecting moving components. The vehicle antennas also benefit from a great deal of expertise in railway antennas.



## Devices

The remote monitoring, control and maintenance of machinery, plant and systems allows procedures to be rationalised, productivity increased and downtimes avoided. To leverage these large potential savings and thus gain an advantage in the market, all components must function reliably over a long period of time.

Sensor cables (fiber optic, radio frequency and low frequency) and antennas from HUBER+SUHNER for autonomous and mobile units satisfy all the demands for reliable data transmission.

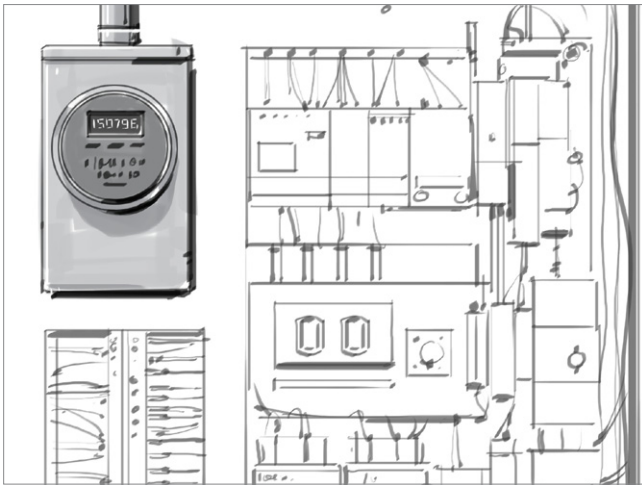


## Energy – smart meters/smart sub-stations

The efficient distribution of energy is a critical factor for ensuring the success of the energy revolution. The more precisely the flows of energy can be measured, the easier it is to minimise energy losses using forecast-based distribution controls. Perfect control requires prompt, precise information from throughout the network. Since these units are located in a wide range of environments (mining in mountainous regions or in a desert; consumers in cities or in rural environments), they also place a wide range of requirements on the connection properties

This is where the core skills of HUBER+SUHNER come into play: whether antenna connections for Wi-Fi, LTE and UMTS or backbone connections using fiber optic solutions. HUBER+SUHNER can supply both individual components and also a modular "plug & play" approach for cost-efficient installation, operation and maintenance.

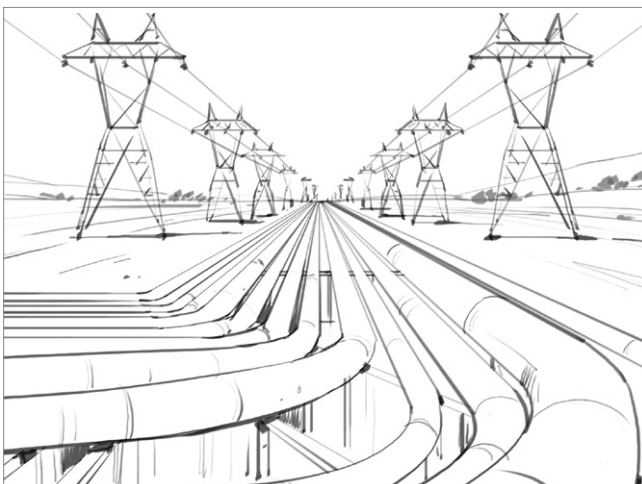




## Smart meters

Intelligent measuring systems determine the entire flow of electricity, water, gas, etc. This data is processed by the smart meter and fed into the network via the communication connection. Communication with the network can also occur in the opposite direction by supplying control pulses to the meter depending on the information available.

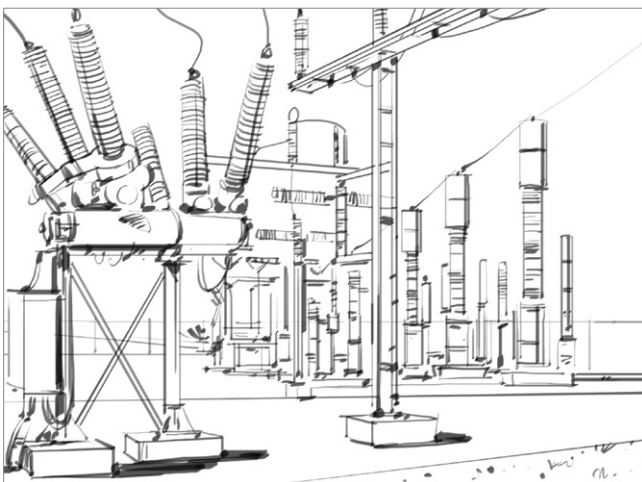
The communication may take place using a fiber optic connection or antennas in combination with local installations depending on the geographical location and the distance to be covered.



## Energy transmission

Optimum energy distribution requires a balance between consumption and supply. The more precise the information about consumption, the more efficiently the energy can be transmitted in the system. High energy consumption means that the continuous transmission of data between sub-stations and to the control center plays an essential role.

Due to the long distances involved, fiber optic connections are suitable for this task, as well as antennas for communicating using mobile communication networks.



## Energy distribution

The requirements for large-scale distribution are also particularly applicable to final distribution. Smart meters supply precise consumption data to the sub-station which allows the energy to be distributed on the basis of current trends.

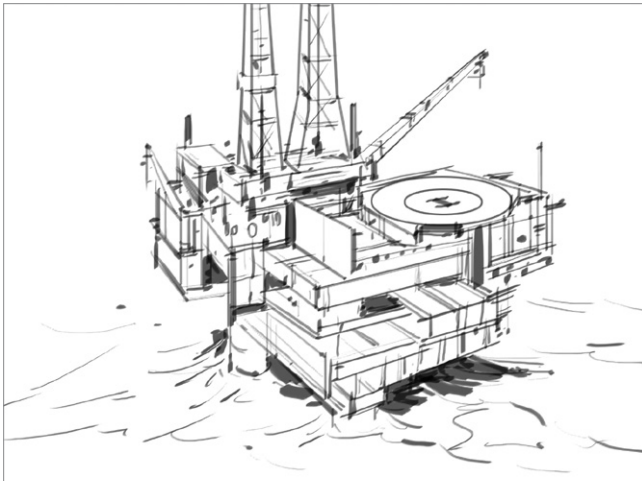
Once again, the data is transmitted securely using fiber optic networks, Wi-Fi networks or mobile communication networks.



## Harsh environment

The developments of "Industrie 4.0" are not simply restricted to easily accessible production facilities. In fact, the continuous flow of information from and to sites in remote, inhospitable areas holds even more significance. Whether offshore facilities, demolition zones, heavy industry zones, freighters or cruise ships, information about the current condition of individual components is extremely important.

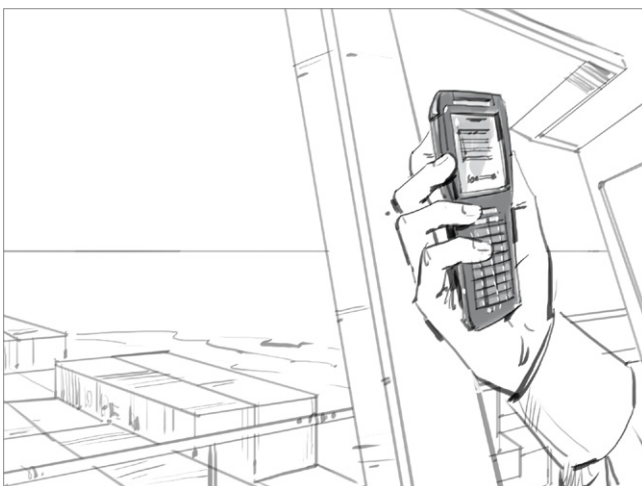
In addition to the standard requirements for the quality and reliability of the communication components, extreme ambient conditions such as high temperature fluctuations, oil and chemicals, salt water, mechanical stresses, and so on place extremely high demands on the material and technology. HUBER+SUHNER offers a wide range of robust antennas and industry-tested cables for data transmission using radio frequency and fiber optics.



## Smart oil/gas fields

Due to their exposed locations, offshore facilities are very cost-intensive. Expensive inspection flights to platforms can be reduced significantly by continuously transmitting the delivery rate, temperature and mechanical condition via communication networks. In addition to robust, intelligent sensors and measuring instruments, the basis for safe remote monitoring is provided by communication cables and antennas which can withstand these tough environmental conditions.

HUBER+SUHNER radio frequency, fiber optic and copper cables and connectors are renowned for their high quality and durability.



## Smart cruise ships Smart container ships

Today cruise ships are floating towns which provide passengers with the same facilities as on land. In other words, Internet and mobile phone connections are expected as standard. In addition to this, information about the position and condition of machinery, containers and products is not only important on land but also at sea.

HUBER+SUHNER communication connections for cruise ships and freighters meet the highest safety standards for flame and fire protection and also feature DNV/GL marine approvals.



## Antennas

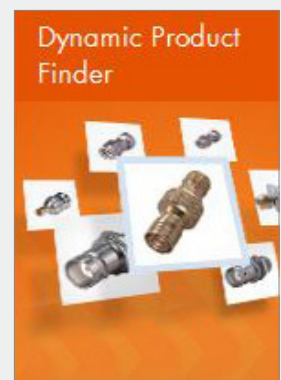
The HUBER+SUHNER antenna portfolio includes omni-directional antennas (SENCITY® Omni-S/M) for indoor and outdoor use which feature a robust design, cover frequency ranges from 790 to 6000 MHz, and achieve a gain of 2 to 7 dBi. Directional antennas in the SENCITY® Spot S/M/L families with a very wide range of installation options and different MIMO variants achieve a gain of 8 to 23 dBi in the 2, 4 and 5 GHz bands. Since antennas have to withstand special requirements in industrial environments, the antennas from HUBER+SUHNER feature extremely robust, watertight housings which can be configured as SISO or MIMO antennas.

### Main features

- Dustproof and watertight
- Corrosion protection
- Very good electrical properties
- Compact, robust housing
- Easy installation

### Options

- Low profile
- Vandal protection
- High gain
- Protected from high current
- Ex approval



[products.hubersuhner.com](https://products.hubersuhner.com)







# Omni-directional antennas

- High performance
- Robust antennas suitable for indoor and outdoor installations



## SENCITY® Omni-S

- Can be configured as MIMO

Antennas	Type	Service	Frequency	Gain	Dimensions Weight
	SOA-2456/360/1/0/V 1399.17.0224	Wi-Fi Cellular	1710 - 6000 MHz	2 dBi	Ø 22 × 57 mm 0.05 kg
	SWA-1727/360/2/0/V 1399.17.0237	Cellular LTE 2600	1710 - 2690 MHz	2 dBi	Ø 22 × 120 mm 0.30 kg
	SWA-2459/360/7/20/V_2 1399.17.0108	Wi-Fi	2400 - 5935 MHz	6 dBi	Ø 86 × 50 mm 0.30 kg
	SWA-2459/360/6/20/ MIMO_1 1399.59.0005	Wi-Fi and LTE 4 × 4 MIMO	2300 - 2690 MHz 3400 - 3800 MHz 4900 - 5975 MHz	3 dBi 4 dBi 6 dBi	Ø 145 × 33 mm 0.32 kg

## SENCITY® Omni-M

- High performance, higher gain than Omni-S




Antennas	Type	Service	Frequency	Gain	Dimensions Weight
	SOA-2455/360/6/0/V 1355.17.0002	Wi-Fi Dual band	2300 - 2500 MHz 4800 - 6200 MHz	5 dBi 6 dBi	Ø 25 × 250 mm 0.15 kg
	SOA-2455/360/6/0/V 1355.17.0003	Wi-Fi Dual band	2300 - 2500 MHz 4800 - 6000 MHz	5 dBi 6 dBi	Ø 25 × 250 mm 0.30 kg

# Directional antennas

- Antennas for Wi-Fi, security or LTE
- MIMO versions
- A very wide range of fastening variants
- Robust antennas suitable for indoor and outdoor installations




## SENCITY® Spot-S

- Average gain 7 to 14 dBi, small and extra robust design

Antennas	Type	Service	Frequency	Gain	Dimensions Weight
	SPA-2456/75/9/0/DF_1 1399.17.0210	Wi-Fi Dual band Single-port	2400 - 2500 MHz 5150 - 5935 MHz	9 dBi 9 dBi	81 × 36 × 101 mm 0.110 kg
	SPA-5600/40/14/0/V_2 1356.17.0077	Wi-Fi	5150 - 5975 MHz	14 dBi	81 × 36 × 101 mm 0.110 kg
	SPA-5600/65/9/0/MIMO_1 1356.35.0003	3 × 3 Wi-Fi MIMO	1710 - 2690 MHz 5100 - 6000	2 dBi	81 × 36 × 101 mm 0.270 kg




## SENCITY® Spot-M

- High gain 15 to 19 dBi, variations with small cross-section for tunnel applications

Antennas	Type	Service	Frequency	Gain	Dimensions Weight
	SYA-2400/30/14/0/V 1324.17.0110	Wi-Fi	2400 - 2500 MHz	14 dBi	420 × 80 × 80 mm 0.850 kg
	SPA-5600/18/19/0/V 1356.17.0024	Wi-Fi	5150 - 5250 MHz 5250 - 5725 MHz 5725 - 5975 MHz	18 dBi 19 dBi 18 dBi	190 × 190 × 30 mm 0.700 kg
	SPA-5600/20/16/0/VH 1356.17.0087	Wi-Fi  Dual-slant	4900 - 5150 MHz 5150 - 5875 MHz Vert./Hor. pole	15 dBi 16 dBi	190 × 190 × 30 mm 0.700 kg

## SENCITY® Spot-L



- Very high gain 15 to 23 dBi

Antennas	Type	Service	Frequency	Gain	Dimensions Weight
	SPA-5400/9/22/0/V 1354.17.0001	Wi-Fi Wi-Fi SECURITY	5100 - 6000 MHz 4900 MHz 4900 MHz	23 dBi	305 × 305 × 15 mm 1.200 kg
	SPA-5600/45/18/0/MIMO 1356.17.0090	Wi-Fi  3 × 3 MIMO	4900 - 5150 MHz 5150 - 6000 MHz 6000 - 6100 MHz	17 dBi 18 dBi 16 dBi	305 × 305 × 15 mm 1.500 kg
	SPA-2400/20/17/0/V 1324.17.0112	Wi-Fi  LTE 2600	2300 - 2400 MHz 2400 - 2500 MHz 2500 - 2700 MHz	15.5 dBi 17 dBi 18 dBi	305 × 305 × 25 mm 1.200 kg

# Vehicle antennas

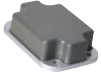

## SENCITY® Road

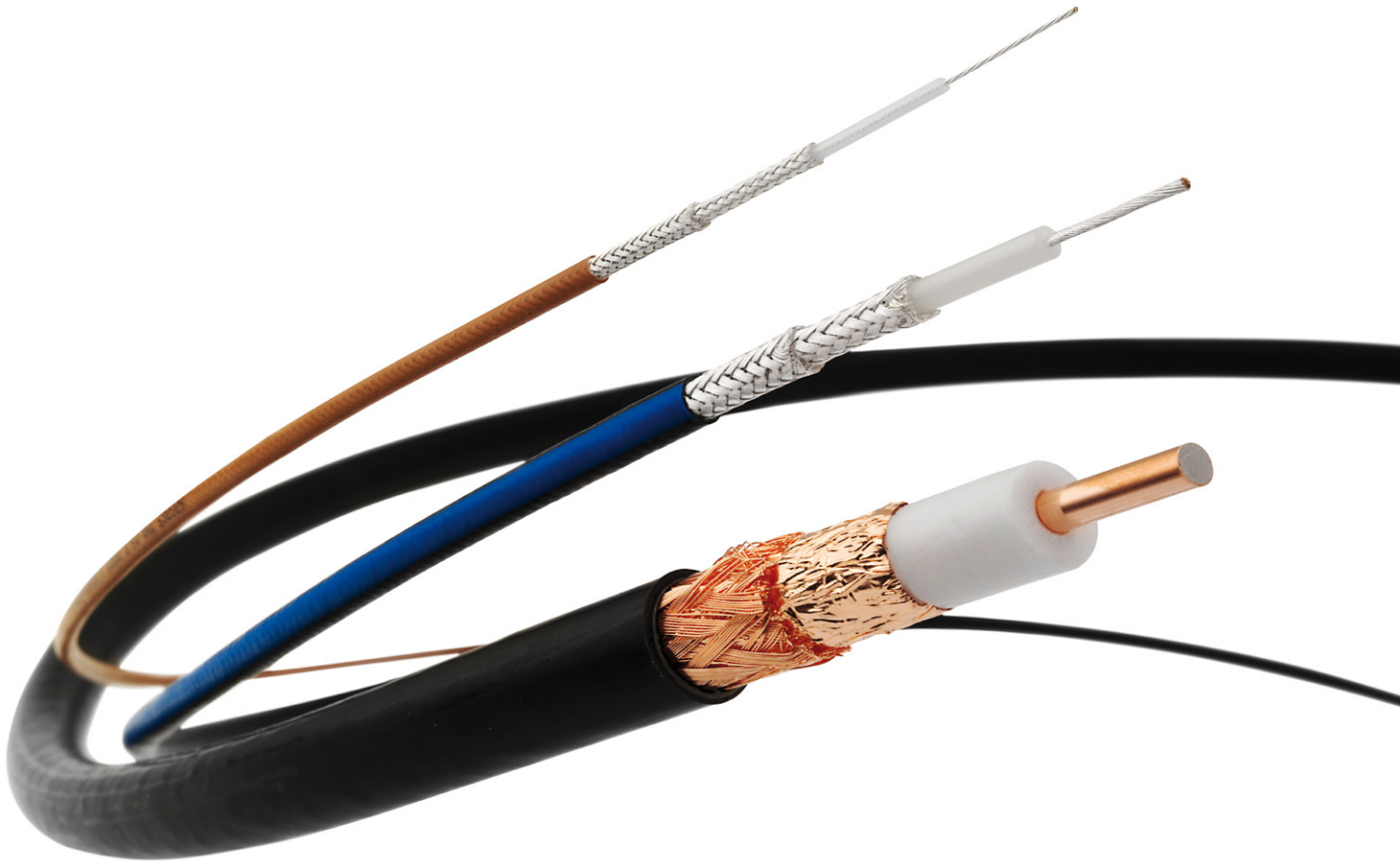
- Multi-service antennas
- Improved for use on vehicles
- Very robust, watertight housing

Antennas	Type	Service	Frequency	Gain	Dimensions Weight
	SWA-0727/360/4/10/MIMO 1399.99.0119	Mobile Mobile Mobile	690 - 960 MHz 1700 - 2200 MHz 2500 - 2700 MHz	4 dBi 6 dBi 6 dBi	83 × 88 × 208 mm  0.400 kg
	SWA-0860/360/5/10/DFRX30 1399.99.0039	Mobile Mobile Wi-Fi Wi-Fi GPS	690 - 960 MHz 1700 - 2200 MHz 2400 - 2500 MHz 5100 - 6000 MHz 1500 - 1700 MHz	5 dBi 4 dBi 6 dBi 7 dBi	83 × 82 × 208 mm  0.410 kg

## SENCITY® Rail

- Broadband antennas, optimised for roof installation
- High voltage protection
- Corrosion protection

Antennas	Type	Service	Frequency	Gain	Dimensions Weight
	SWA-0825/360/5/30/DFRX30 1399.99.0037	Mobile Mobile Wi-Fi GPS Mobile	690 - 960 MHz 1700 - 2200 MHz 2400 - 2500 MHz 1500 - 1700 MHz 2500 - 2700MHz	5 dBi 5 dBi 5 dBi 6 dBi 6 dBi	100 × 40 × 145 mm  0.530 kg
	SWA-0759/360/6/0/MIMO 1399.99.0130	Mobile Mobile Mobile Wi-Fi Wi-Fi WiMax	690 - 960 MHz 1700 - 2200 MHz 2500 - 2700 MHz 2400 - 2500 MHz 5100 - 6000 MHz 2300 - 2700 MHz	5 dBi 8 dBi 8 dBi 8 dBi 8 dBi 8 dBi	103 × 82 × 353 mm  1.500 kg



## RF cable

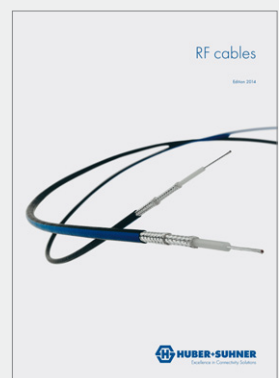
HUBER+SUHNER offers a wide range of coaxial cables, developed to meet the very highest standards. The balanced portfolio of flexible coaxial cables ensures a perfect connection for every application. The premium-quality cables have excellent electrical and mechanical properties and are used in various applications to meet the very highest demands.

### Performance line: High-temperature coaxial cable

- Large temperature range
- High performance
- RG standard

### Foam line: Flexible, low-attenuation cable

- Low attenuation
- Excellent shielding
- High flexibility
- Optionally halogen-free



[www.hubersuhner.com/RFcables](http://www.hubersuhner.com/RFcables)





## Performance line: High-temperature coaxial cable

The PTFE/FEP cables from the RG series are designed for applications at up to 200 °C and are characterised by low losses especially at high frequencies. The cables in the Enviroflex family do not contain fluorine plastics either in the dielectric or in the jacket and thus provide a robust and environmentally friendly option.



	RG	Enviroflex
Dielectric	PTFE	SPEX
Jacket material	FEP	RADOX®
Halogen-free	-	✓
Low smoke emission	✓	✓
Flame resistant	Not flammable	✓✓
Temperature range	✓✓✓	✓✓
Weather resistance	✓✓✓	✓✓

Outer diameter in mm	RG	G
2	RG_178_B/U K_01252_D	EF_178 EF_178_D
3	RG_316_/U K_02252_D	EF_316 EF_316_D
5	RG_400_/U	EF_400
5	RG_142_B/U	EF_142
10	RG_393_/U	EF_393

## Foam line: Flexible, low-attenuation cable

The three product series Spuma, S and SX provide lowest attenuation, high flexibility and optimal shielding. The S series with LSFH jacket material and the crosslinked SX series with RADOX® jacket also deliver extremely high flame protection.



	Spuma	Spuma-FR and S	SX
Dielectric	SPE*	SPE*	SPEX**
Jacket material	PE	LSFH	RADOX®
Halogen-free	✓	✓	✓
Low smoke emission	-	✓	✓
Flame resistant	-	✓✓	✓✓
Temperature range	✓	✓	✓✓
Weather resistance	✓✓	✓✓	✓✓

Outer diameter in mm	Spuma	Spuma-FR and S	SX
3	-	S_02162_B	-
4.5	Spuma_195	Spuma_195-FR-01	SX_03272_B-60
6	Spuma_240	Spuma_240-FR-01	SX_04172_B-60
10	Spuma_400	Spuma_400-FR-01	-
15	Spuma_600	Spuma_500-FR-01	-

\*SPE: foamed Polyethylene

\*\*SPEX: foamed Polyethylene cross-linked



## RF connectors and adapters

HUBER+SUHNER is a leading global supplier of radio frequency connectors, adapters and passive components. A very wide range of standard connectors, including SMP, SMA, BNC, TNC, N, is supplemented by solutions for specific applications. Based on our deep knowledge of radio frequency connectors in a wide range of applications, we can develop and produce bespoke solutions in consultation with the customer.




















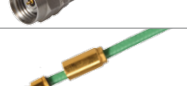

The product portfolio is constantly being optimised and updated with new, innovative solutions. HUBER+SUHNER has created market standards with its board-to-board solutions such as MMBX and MBX, and connectors with quick-lock connector mechanisms such as QMA and QN.

The application engineers at HUBER+SUHNER also provide support to customers all over the world in choosing the right connection solution for special applications. HUBER+SUHNER's success is based on the high quality of its products, support during the design-in process and in-depth expertise of radio frequency technology.



[www.hubersuhner.com/RFconnectors](http://www.hubersuhner.com/RFconnectors)

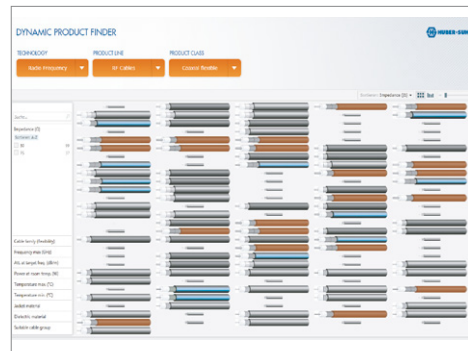


Series	Connector mechanism	Frequency range	
BNC	Bayonet	4 GHz	
C	Screw-on	4 GHz	
MBX	Slide-on	6 GHz	
MCX	Snap-on	6 GHz	
MMCX	Snap-on	6 GHz	
4.3-10	Screw-on/snap-on	6 GHz	
QN/XQN	Quick-lock	6 GHz	
7/16	Screw-on	7.5 GHz	
N	Screw-on	11 GHz	
TNC	Screw-on	11 GHz	
MMBX	Snap-on	15 GHz	
QMA/XQMA	Quick-lock	18 GHz	
BMA	Slide-on	18 GHz/26.5 GHz	
SMA	Screw-on	18 GHz/26.5 GHz	
PC 3.5 (3.5 mm)	Screw-on	26.5 GHz	
SK (2.92 mm)	Screw-on	40 GHz	
SSMA	Screw-on	40 GHz	
SMP	Snap-on	40 GHz	
PC 2.4 (2.4 mm)	Screw-on	50 GHz	
PC 1.85 (1.85 mm)	Screw-on	67 GHz	
SMPM/SMPM-T	Screw-on/snap-on	67 GHz	

# The direct route to perfect RF cable assembly

## 1. Select

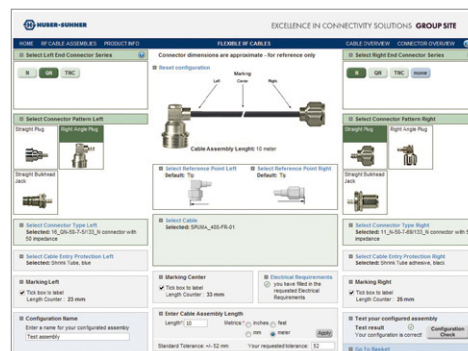
Select the appropriate cable using the "Product Finder".



<http://products.hubersuhner.com>

## 2. Configure

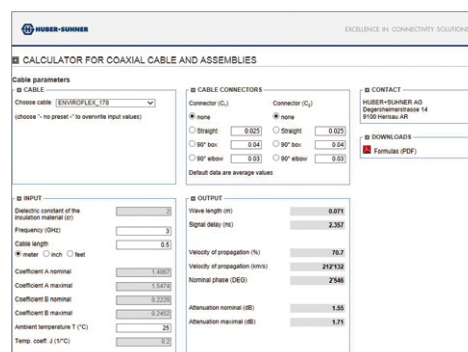
Define the matching assembly using the "RF assembly configurator".



<http://rfwebpcf.hubersuhner.com>

## 3. Calculate

Calculate the properties using the "RF assembly calculator".



<http://rfcablecalc.hubersuhner.com>

# Adapters

HUBER+SUHNER manufactures a wide range of adapters for joining a connector to a different interface. The range includes RF adapters for all conventional RF interfaces and configurations, as well as frequency and return loss specifications. Every RF coaxial adapter can be modified to suit specific applications.



## Standard adapter

### Features

- Wide range of different configurations
- Practical materials

### Benefits

- Majority of interfaces available
- Precision transitions
- Effective, reliable connectivity solutions



## Precision adapter

### Features

- Precision interface
- Excellent electrical properties
- High-quality base materials and coatings

### Benefits

- Perfect for precise laboratory measurements
- High reproducibility and precision



## Low PIM adapter

### Features

- Outstandingly low intermodulation performance
- Excellent electrical contacts
- Non-magnetic materials

### Benefits

- Extremely reliable
- Repeatable intermodulation measurements



## Hermetically sealed adapter

### Features

- Glass seal
- 100% tested
- Large temperature range

### Benefits

- Hermetically sealed bushings



## Bespoke adapters

Adapters can be designed to suit the application and specific requirements:

- Adapters with different interfaces
- Stainless steel, beryllium-copper, brass materials
- Gold, passivated, SUCOPRO®, SUCOPLATE® Coatings

Further details are available online in the RF connector catalogue or in the dynamic product finder at [www.hubersuhner.com](http://www.hubersuhner.com).



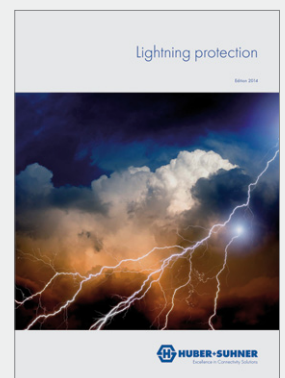
## Lightning protection

Four decades of experience in developing and manufacturing coaxial – and data line – HEMP and LEMP protectors are the foundation of our current EMP protector portfolio and have made HUBER+SUHNER a first stop for protection solutions in defense applications. HUBER+SUHNER offers protection components for land based, airborne and naval tactical communications as well as for navigation, radar and electronic warfare applications.

HUBER+SUHNER develops and produces protection components for communication solutions in demanding, exposed ambient conditions.

Our products are designed to meet the stringent requirements of the defense and security markets. An extensive high-voltage impulse laboratory is available to verify our designs in accordance with the valid lightning, surge and HEMP standards.

HUBER+SUHNER holds groundbreaking patents in the field of coaxial lightning and HEMP protection, such as the automatically suppressing surge arrester (Semper).



[www.hubersuhner.com/LP](http://www.hubersuhner.com/LP)



# Lightning protection – product overview



## Gas discharge tube protectors with exchangeable GDTs "Series 3401/3402" (standard versions)

For applications with RF and DC components on the antenna line the standard GDT lightning/EMP protectors feature DC continuity and large bandwidth. Most HUBER+SUHNER GDT protector designs are performing excellently in the NEMP application as well. For specific applications internally DC-blocked GDT protectors are available.



## Self-extinguishing GDT protectors (Semper)

The HUBER+SUHNER Semper design guarantees safe extinguishing of the GDT under high RF power or with additional DC components on the antenna line. By retrofitting standard GDTs with the Semper GDT existing installations can be upgraded. The Semper technology is a real improvement to the standard gas tube technology and increases reliability and lifetime of GDT protectors.



## True broadband GDT protectors "Series 3406"

SlimLine GDT protectors feature high return loss in the frequency band between DC and 6 GHz. This design is best suited for point to point and WLAN equipment.



## Hybrid GDT fine protection "Series 3403"

For very sensitive DC powered receivers such as those used in GPS installations, the hybrid GDT fine protectors with integrated transient voltage suppressor diodes guarantee lowest residual pulse energy. HUBER+SUHNER fine protectors do feature DC continuity.



## Quarter-wave shorting stub protectors "Series 3400"

HUBER+SUHNER quarter-wave shorting stub protectors perform best lightning parameters with excellent RF specifications within limited bandwidth. A ratio of 4:1 between lowest and highest frequency of the frequency band is achievable by still meeting high return loss. For specific applications internally DC-blocked quarter-wave shorting stub protectors are also available.



## Data line protectors Series 3414 (twisted-pair, Ethernet)

Our CAT 5 and CAT6 (Gigabit) data line protectors are "Power Over Ethernet" compatible and available as IP68 rated robust components for outdoor applications (i.e. back-haul microwave links) or in IP20 specified housings for indoor installations (i.e. data processing centers).



## Fiber optics solutions

Signals between sensors, actuators and the controller must be transmitted reliably. In this case, fiber optics is the technology of choice to ensure maximum availability. It offers the highest interference immunity, even under electromagnetic conditions, as well as absolute potential separation between all communication modules.

HUBER+SUHNER offers a broad range of high-quality fiber optic products and services specifically for use in industrial environments that meet the high requirements for industry and offshore facilities.

Extensive experience in the development and production of cables, connectors and pre-assembled cable systems has yielded optimal solutions that are perfectly tailored to each other.



[www.hubersuhner.com/fiberoptics](http://www.hubersuhner.com/fiberoptics)





# MASTERLINE Ultimate



## MASTERLINE Ultimate SC-A1

The MASTERLINE Ultimate A series system supports up to 3 media converters, fastened to 7 mm cable and MASTERLINE Classic (MLC) splitter. The system can be used to start a daisy chain with a Q-ODC-12 jack. These unique features make the MASTERLINE Ultimate SC system the best product in its class in terms of ease of installation, robustness and efficiency.



## MASTERLINE Ultimate SC-M1

The MASTERLINE Ultimate M series is a "plug & play" fiber optic cable system with connectors sealed at the factory for up to 3 media converters. They are connected by easily installed Q-ODC fiber optic jumpers. The system can be used to expand a daisy chain and is high flexible thanks to its unique Q-OCD-12 connectors.



## MASTERLINE Ultimate SC-Z1

The robust connector housing of the MASTERLINE Ultimate Z series with up to 4 Q-ODC jacks finishes a daisy chain. It can also be used as a compact independent housing for fitting to the Q-ODC-12 jumper after installation.



## MASTERLINE Ultimate SC-H1

The MASTERLINE Ultimate H series (hard-wired) supports up to 4 media converters. Fastened to 7 mm cable and MASTERLINE Classic (MLC) splitter. The robust and easily installed connector housing is suitable for areas with little space and mast installations and supports a point-to-point installation strategy for Industrie 4.0.



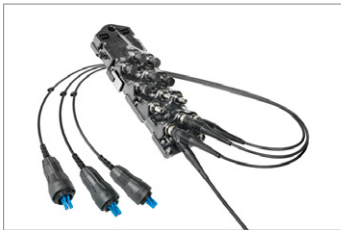
## MASTERLINE Ultimate SC WDM

The MASTERLINE Ultimate Small Cell product portfolio can be fitted with CWDM modules to allow the multiplexing of individual fibers and thus reduce the fibers required in a daisy chain.

# Fiber optic cable systems

A variety of cable systems can be configured to meet customer requirements. Pre-terminated cable systems offer the following advantages:

- Can be installed directly and quickly – immediately operational
- No splicing or connector assembly required on site
- Cost savings thanks to simple and time-saving installation
- Little expertise required



## MASTERLINE Ultimate

### Features

- Pre-terminated "plug & play" solution
- Robust connector head with 6 or 12 Q-ODC jacks
- Rodent protection and UV-resistant
- Simple, time-saving installation

### Applications

- For connecting control cabinets in and between buildings
- For connecting distribution boxes
- For connecting access points on masts or in buildings



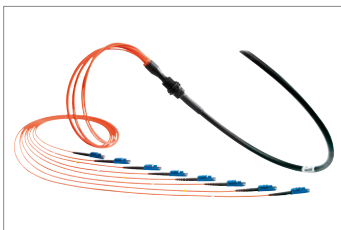
## MASTERLINE Extreme

### Features

- Featuring robust ODC industrial connectors
- Safe installation – blind mating
- Water- and dust-tight for use in tough environmental conditions
- Hybrid version with power conductor available

### Applications

- For connecting control cabinets in and between buildings
- For connecting distribution boxes
- For connecting access points on masts



## MASTERLINE Classic

### Features

- Strong cable support
- Wide operating temperature range
- Dust- and water-tight pull-in hose for protecting fan-out cables
- With standard connectors

### Applications

- For connecting control cabinets in and between buildings
- For connecting distribution boxes and cabinets
- For cabling communication networks



## Mobile cable systems

### Features

- Easy storage of cable assemblies
- Assemblies with multi-pole connectors
- MASTERLINE Mobile with standard connectors and removable protective sheaths
- Both cable ends accessible

### Applications

- Temporary connections

# Fiber optic assemblies

HUBER+SUHNER can configure robust assemblies to meet customer requirements from our wide range of connectors and patch cables.



## ODC assemblies

### Features

- Featuring robust ODC industrial connectors
- Protected end faces
- Safe installation – blind mating
- Dustproof and watertight
- For harsh environmental conditions

### Applications

- For connecting access points in buildings or outdoors
- For connecting control cabinets



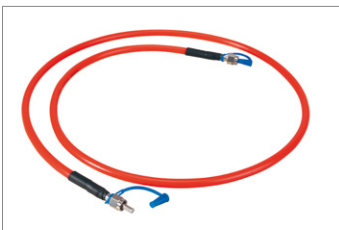
## Q-ODC-12 link cable assemblies

### Features

- Standard Q-ODC-12 (m/f) connectors
- Various lengths
- Rodent protection, UV resistant, robust
- Compatible with all Q-ODC-12 interfaces

### Applications

- MLUSC connection cable
- Connection cable from the control room to the control cabinets with modular expansion



## Robust cable assemblies

### Features

- With all typical fiber types
- Standard connectors incl. SFF
- For harsh environmental conditions

### Applications

- For connecting access points in buildings
- For connecting control cabinets



## Patch cables

### Features

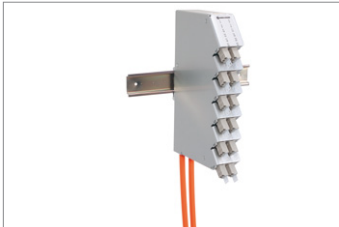
- Simplex and duplex
- Standard connectors incl. SFF
- Connector types with automatic protective caps

### Applications

- For connecting fiber fan-out modules and access points in distribution boxes
- For patches in distribution enclosures

# Fiber optic fiber management systems

Practical and compact modules support the professional fanning out of fibers to connection and fan-out points.



## MDR module

### Features

- Space saving
- Mounted on DIN rail (35 mm)
- Splice/patch and patch variants
- Angled couplings for optimal patch cable connections

### Applications

- Fiber fan-out in control cabinets and distribution boxes



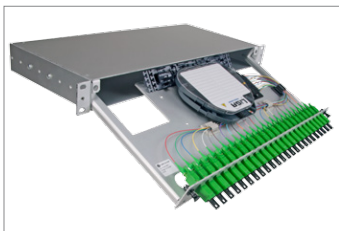
## Wall-mounted housings

### Features

- Various sizes (Optibox)
- For splicing and/or patching
- Multiple cable inputs and outputs
- High level of dust- and water-tightness
- Smart fiber management

### Applications

- For connecting cable segments
- Branch point to access points
- For use in buildings and outdoors



## Cable terminations

### Features

- Housings for splicing and patching
- For 19" cabinets
- Easy installation
- Casing also available for housing fan-out cables in cable systems

### Applications

- Fiber fan-out in control cabinets, distribution boxes and distribution cabinets



## Distribution boxes

### Features

- High fiber density
- Optimum access to fibers and connectors
- Modular assembly for future expansion

### Applications

- For connecting and branching cable segments
- For connecting access points
- For use in buildings and outdoors



## Distribution enclosures

### Features

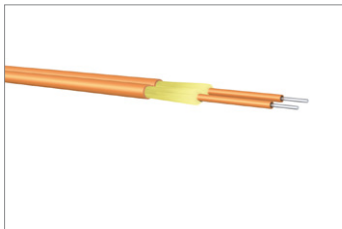
- Optimum access to fibers and connectors
- Splice and patch-only modules and splice/patch modules
- Modular assembly for gradual expansion
- Professional fiber and cable supports
- Maximum fiber density
- 19" and ETS cabinets (NGR) in widths from 300 to 1200 mm

### Applications

- Fiber distribution in communication network nodes

# Fiber optic cables

HUBER+SUHNER manufactures a wide variety of halogen-free cables for countless applications. All cables are tested for the highest mechanical, thermal and chemical resistance in accordance with requirements.



## Cables for assemblies

### Features

- Simplex, duplex, breakout and riser cables
- For direct connector assembly
- LSFH types with excellent fire properties
- High mechanical and thermal resistance

### Applications

- For assemblies with ODC industrial connectors
- For robust cable assemblies
- For patch cables
- For multi-fiber connecting cables



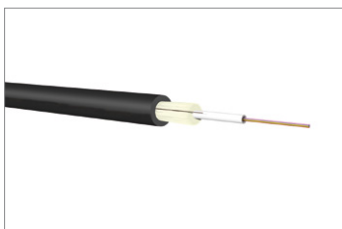
## Industrial breakout cables

### Features

- For direct connector assembly
- Types for stationary applications with best-in-class fire resistance
- Flexible cables for mobile applications
- Available as a pre-terminated, ready-to-connect cable system

### Applications

- For demanding industrial applications (industrial Ethernet)
- For connecting control cabinets
- For connecting access points in buildings



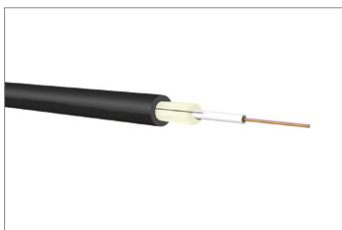
## Universal loose tube cables

### Features

- Glass and steel-armoured cable types
- Best-in-class fire resistance
- Effective rodent protection
- Cable system available ready for connection

### Applications

- For indoor and outdoor applications
- For connecting wall-mounted housings and distributors
- Installation in cable ducts and conduits



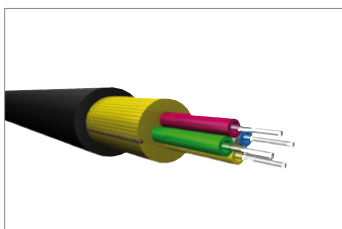
## RADOX® cables

### Features

- Metal-free cables with rodent protection for indoor and outdoor use
- Highly flexible and dimensionally stable
- Halogen-free, resistant to oil and fluids

### Applications

- Meets the requirement of SHF2
- Flame, fire, oil and mud resistance to NEK 606
- Suitable for emergency outdoor connections



## Mobile field cables

### Features

- 2 to 12 fibers
- For tough ambient conditions in mobile or stationary applications
- High flexibility, high tensile and compression strength
- Large temperature range
- Optional: Robust Minicord breakout cables with two fibers
- Optional: Cables with double sheaths and 12 fibers



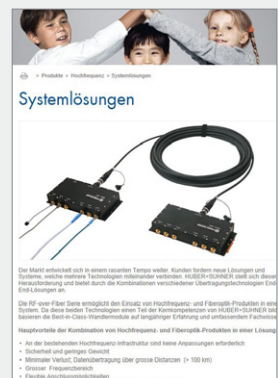
## RF-over-Fiber

The market is evolving at a significant pace. With customers requiring that new solutions and systems combine various technologies, HUBER+SUHNER has positioned itself to be able to provide our customers with end-to-end-solutions.

The RF-over-Fiber series enables the use of radio frequency and fiber optics in a single system. With these two technologies forming a part of HUBER+SUHNER's core technology offering, we are using our vast experience and expertise to deliver best-in-class conversion modules.

Key benefits of combining radio frequency and fiber optics in a single solution:

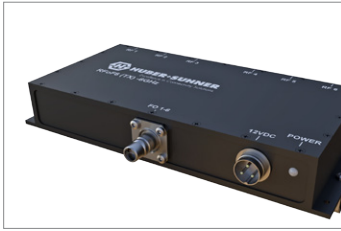
- No changes required to existing RF infrastructure
- Secure and light-weight
- Covers greater distances (> 100 km) with less loss
- Wide frequency ranges available
- Flexible connectivity options
- Reduced total cost of ownership and future-proof



[www.hubersuhner.com/RFoF](http://www.hubersuhner.com/RFoF)

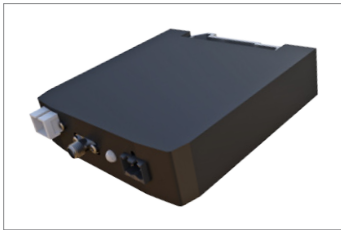


# System components



## RF-over-Fiber (RFoF)

The standard RF-over-Fiber (RFoF) modules are available in 6 and 12 ports. The 12 port module comes in a 1HE 19" chassis. All standard modules are designed for single mode connectivity. The standard products within the RF-over-Fiber product range offers broad frequency ranges that look to cover a number of applications in the market.



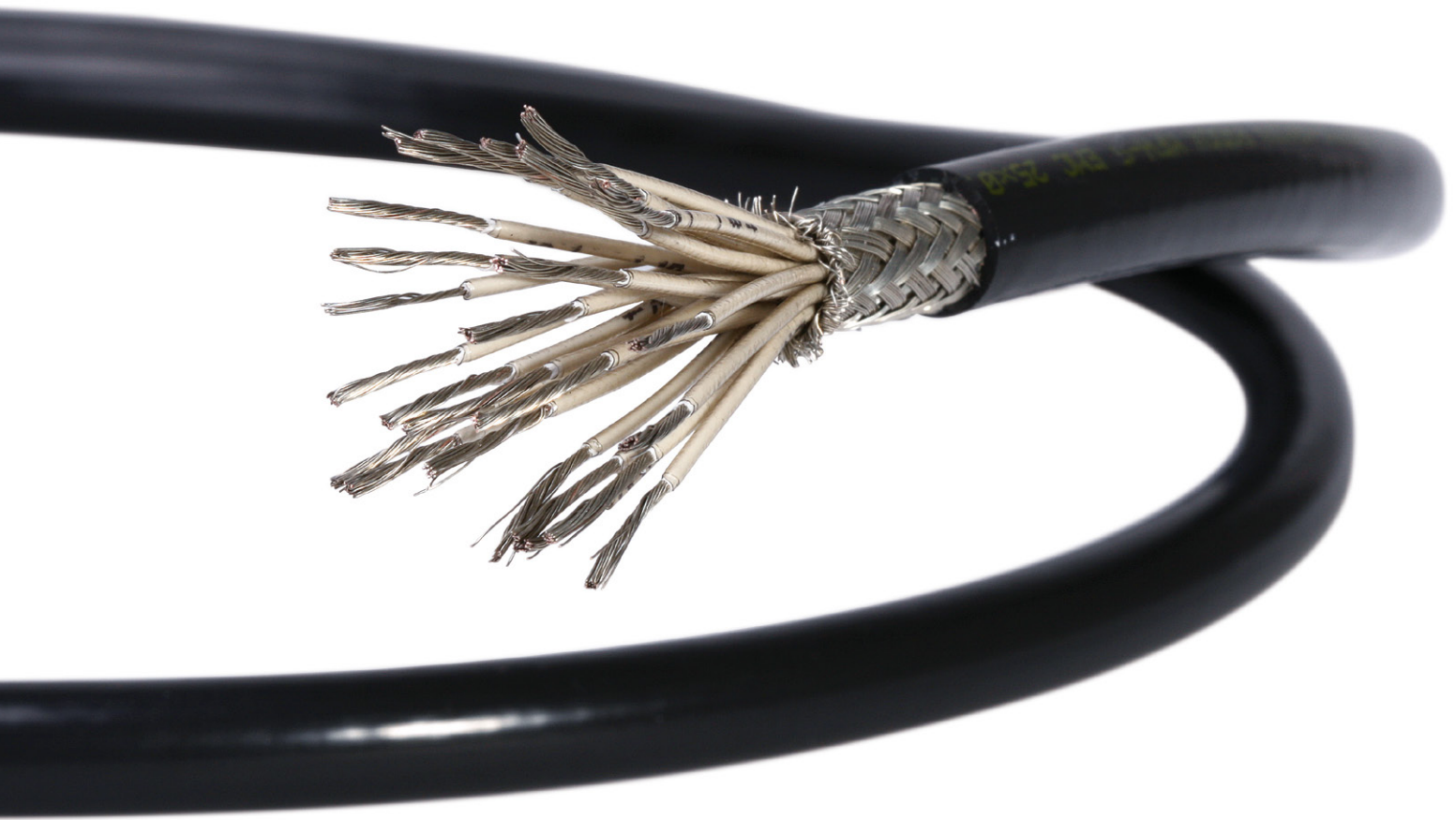
## GPS-over-Fiber (GPSoF)

The standard GPS-over-Fiber (GPSoF) modules are available as a single port transmitter with a choice of single or 4 port receiver modules and make use of the L1 band. Other bands (such as L2) are available upon request. With a frequency range of more than 1.5 GHz, GPS-over-Fiber products are very well suited to a number of antenna remoting, signal distribution and other high-tech applications in challenging environments such as mines, subways, special-purpose vehicles and offshoring infrastructures.



## LAN-over-Fiber (LANoF)

The standard LAN-over-Fiber (LANoF) modules are available in 6 and 12 ports. The 12 port module comes in a 2HE 19" chassis. The standard products are designed for multimode connectivity. The LAN-over-Fiber product range employs 1000 Base-SX, making all modules appropriate for Gigabit networks.



## RADOX<sup>®</sup> databus cables

HUBER+SUHNER databus cables have a RADOX<sup>®</sup> jacket and satisfy the strict demands of industrial applications such as high temperature resistance, excellent fire properties, reduced wall thicknesses and ease of use. HUBER+SUHNER offers a broad product portfolio of RADOX<sup>®</sup> databus cables which, in addition to reliable data transmission, feature:

- Thin insulation wall thickness
- Narrow bending radii
- High flexibility
- High transmission reliability
- Long service life
- No halogen



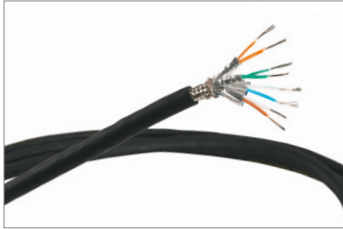
[www.hubersuhner.com/LFCables](http://www.hubersuhner.com/LFCables)



RADOX<sup>®</sup> ist eine eingetragene Marke von HUBER+SUHNER.



# Product portfolio



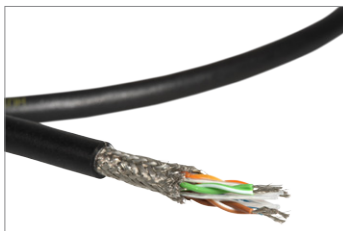
## RADOX® Milcat 7

### Features

- High speed data transmission 600 Mhz at 100 Ohm
- Resistance to acid, alkali, mud and weathering
- Can be fitted with M12 connectors

### Applications

- Fixed and mobile installations
- Gigabit Ethernet for tough industrial environments



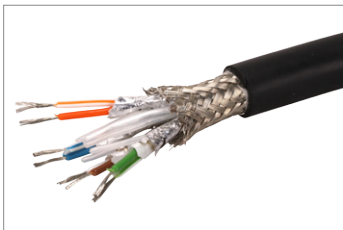
## RADOX® Milcat 5e

### Features

- Cat. 5e performance
- Temperature resistant to  $-40\text{ }^{\circ}\text{C}$
- Very good wear resistance
- Hard wearing
- Flame-resistant

### Applications

- Military communication
- Extended possible uses: UV-resistance renders suitable for outdoor use
- Tough industrial environments



## RADOX® Marine Cat 5e

### Features

- Cat. 5e performance
- DNV tested
- Extremely robust design
- Wear, pressure and vibration-resistant
- Flame, oil and mud-resistant to NEK606

### Applications

- Data transmission to ships' diesel engines
- Industrial environments where robust design and resistance are required



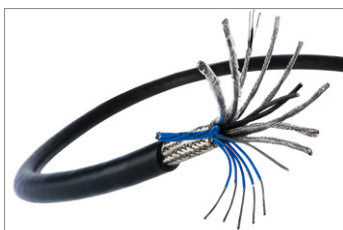
## RADOX® Databus 120 Ω

### Features

- CAN technology
- GL tested
- Largely resistant to acids, oil and other chemical media

### Applications

- Databus communication in ships
- Can be installed in dry and wet areas
- Can be used in tough industrial environments



## RADOX® MFH-S B Multipair

### Features

- Interference-resistant signal and data transmission
- DNV and ABS tested
- Temperature range from  $-50$  to  $+145\text{ }^{\circ}\text{C}$
- Flame, oil and mud resistant to NEK606
- Flame resistant to IEC60332-1-2 and IEC606332-3-22

### Applications

- Indoor and outdoor installations
- Fixed and moving installations
- Ship building, offshore or other industrial applications with particularly high requirements

# Product portfolio



## Category 6A jack

For the transmission of digital and analogue voice, video and data signals. Suitable for all category 6<sub>A</sub> or class EA channels in accordance with ISO/IEC 11801, EN 50173-1 and TIA/EIA 568-C.2.

### Features

- Housing made of zinc-alloy, fully shielded
- Mounting clip: Keystone
- With wiring colour code T568-A and B
- Contact spring with phosphor bronze alloy, plated with gold
- Tool-less installation



## Category 6A multi jack blocks

Cassette module for the transmission of digital and analogue voice and data signals. Especially suited for category 6<sub>A</sub> or class EA applications in accordance with ISO/IEC 11801, TIA/EIA 568-C.2

### Features

- 1 cassette module presents 6 RJ-45 ports at front and 6 terminal blocks at rear
- Compatible with cassette patch panel
- Housing made of die-casting
- Contact spring with phosphor bronze alloy, plated with gold
- IDC made of phosphor bronze alloy



## Cat. 6A field-installable plug connector

For the transmission of digital and analogue voice, video and data signals. Suitable for all category 6<sub>A</sub> or class EA channels in accordance with ISO/IEC 11801, EN 50173-1 and TIA/EIA 568-C.2.

### Features

- Housing made of zinc-alloy, fully shielded
- Mounting clip: Keystone
- With wiring colour code T568-A and B
- Contact spring with phosphor bronze alloy, plated with gold
- IDC made of phosphor bronze alloy
- Tool-less installation



## 1 U panel for 4 or 8 copper cassettes

### Features

- Capacity for 4 (8) copper cassettes, 24 (48) connections
- 1U of rack space
- Tool-less assembly and module fitting
- Ideal for pre-terminated installations
- Supplied unloaded with earthing kit



## Equipment rack

### Features

Rack configured in standard offset frame layout (option "R"), assembly includes:

- Offset frame assembly with PDU mtg brackets
- 2 × pairs of fully adjustable 19" mounting rails fitted centrally with U labels at front
- Earth kit/baffle kit

- For alternate (same cost) frame options please contact customer services
- Enhanced cable entry top panel fitted front and rear with remaining aperture filled with plain panels
- 2 × pairs side panels EC606332-3-22



HUBER+SUHNER AG  
Degersheimerstrasse 14  
9100 Herisau  
Switzerland  
Tel. +41 71 353 4111  
hubersuhner.com

HUBER+SUHNER is certified in accordance with EN 9100, ISO 9001, ISO 14001, ISO/TS 16949 and IRIS.

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