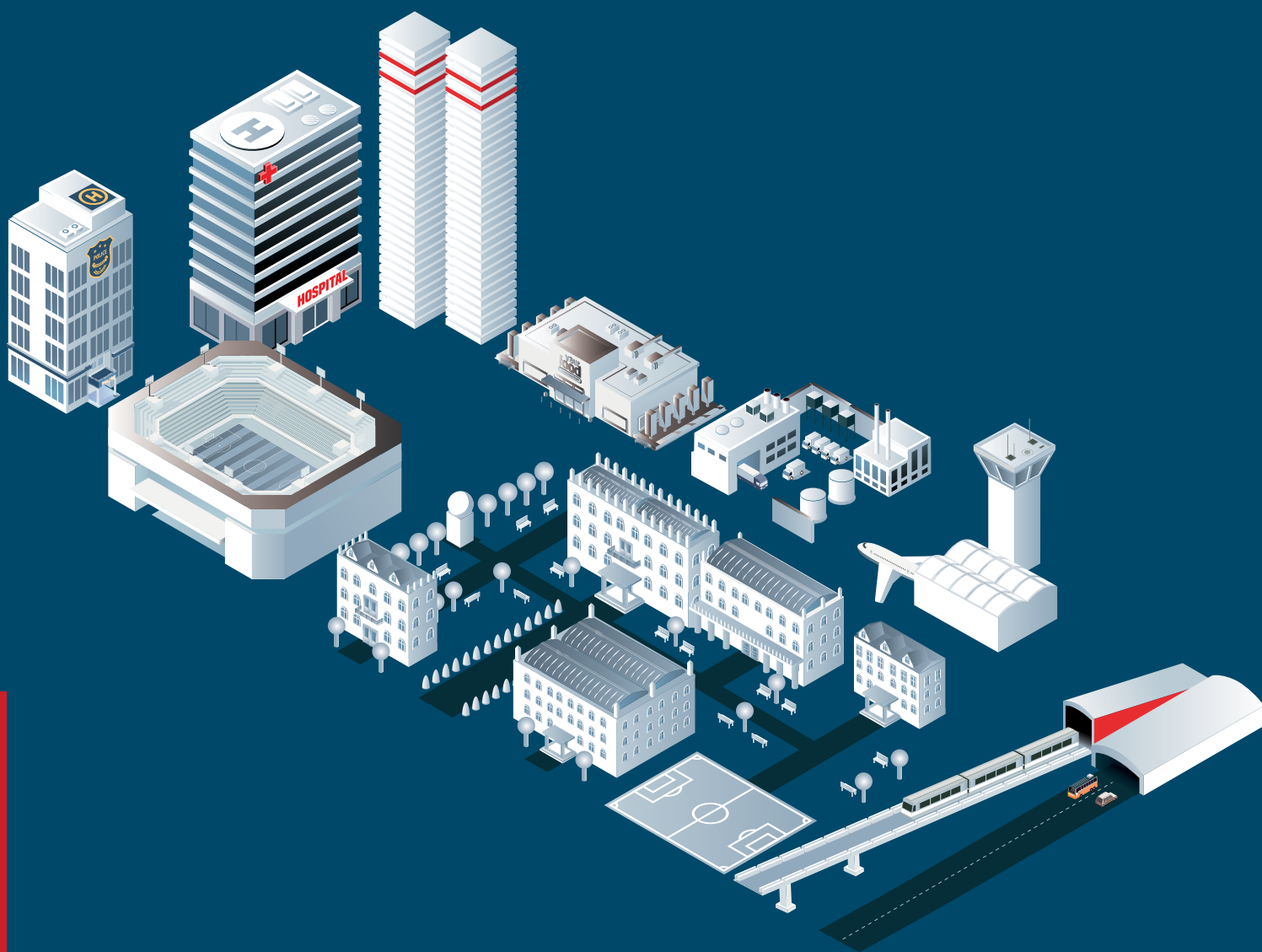




# RADIO FREQUENCY SYSTEMS

## Indoor Connectivity

Edition 1 / 01.2025



RF / Fiber / Hybrid  
**Solutions for Buildings and Tunnels**







## RADIO FREQUENCY SYSTEMS

### TABLE OF CONTENTS

#### INTRODUCTION: KEEPING PEOPLE CONNECTED

Complete Indoor Solutions	<a href="#">4</a>
Bespoke Indoor Configurations	<a href="#">5</a>

#### GREEN BY DESIGN

Sustainable Credentials	<a href="#">6</a>
-------------------------	-------------------

#### CELLFLEX® CABLES AND CONNECTORS

For Every DAS Application	<a href="#">7</a>
---------------------------	-------------------

#### HIGH-PERFORMANCE JUMPER CABLES

For Any Application, Any Size	<a href="#">9</a>
Understanding Jumper Names	<a href="#">10</a>

#### RADIAFLEX®

Best-in-Class Radiating Cables	<a href="#">11</a>
Selection Guide	<a href="#">12</a>
The Fastest MIMO Solutions Available	<a href="#">13</a>

#### SAFETY IS KEY

CPR-compliant cables for indoor applications	<a href="#">14</a>
--	--------------------

#### SOLUTIONS BY INDUSTRY

Warehouse	<a href="#">16</a>
Airport	<a href="#">17</a>
Stadium	<a href="#">18</a>
Rail Tunnel	<a href="#">19</a>

#### HYBRIFLEX®

Fiber Plug-And-Play Solution	<a href="#">20</a>
------------------------------	--------------------

#### PASSIVE DAS

High Performance End-to-End Solution	<a href="#">21</a>
Indoor Antennas up to 6 GHz	<a href="#">22</a>
Components up to 6 GHz	<a href="#">24</a>

#### PROOF BY EXAMPLE

Case Studies and References	<a href="#">26</a>
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## KEEP PEOPLE CONNECTED WITH **COMPLETE INDOOR SOLUTIONS**

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High-quality, uninterrupted connectivity indoors and underground is essential to protect lives, run businesses, and deliver the seamless connected experience people expect. It's also extremely challenging.



### **TAILORED SOLUTIONS FOR EVERY INDUSTRY**

RFS incorporates world-first inventions and innovations to keep people connected at all times, whether they're deep underground, at ground level, or many stories above ground.

Different environments require different configurations to maximize performance. Understanding which solutions will perform best in every scenario is vital, and the RFS team brings together decades of experience and expertise to advise customers on the best approach to achieve comprehensive indoor connectivity with industry-specific bundles of the best RF, optical fiber, and hybrid cable solutions for the job.

We have deployments across environments ranging from:

- Airports
- Campuses
- Data Centers
- Hotels
- Manufacturing
- Metro Tunnels
- Mines
- Rail Tunnels
- Stadiums
- Warehouses
- Wind Turbines
- And more

### **BUSINESS CRITICAL AND MISSION-CRITICAL**

Every industry requires bespoke solutions that overcome the specific connectivity challenges they face. Additionally, even within each business, there are multiple connectivity requirements that need to be served by multiple solutions:

#### **Business Critical**

Business Critical communication solutions cover the connectivity needed to maintain business as usual. RFS offers high-performance, high-capacity systems capable of supporting any business application that requires communication, from offering customer connectivity to advanced IoT use cases.

#### **Mission-Critical**

Mission-critical connectivity is often mandated as part of a business's regulatory requirements and is key to maintaining safety. RFS solutions meet the highest fire safety standards and are robust enough to continue to operate in any situation, supporting elements including CPR compliance and uninterruptible power sources a priority.



## KEEPING PEOPLE CONNECTED WITH **BESPOKE INDOOR CONFIGURATIONS**

### **RFS HAS YOU COVERED**

Delivering connectivity is never a one-solution task. Meeting every requirement needs a range of technologies. RFS, therefore, offers RF and fiber solutions in any combination to serve a broad range of indoor needs.

**RF** | RF cables deliver flexible wireless connectivity indoors with solutions for signal transportation and radiating cables that work as long antennas to deliver contoured coverage anywhere in-building and in-tunnel.

**Fiber** | No indoor system can run on wireless alone. Fiber connectivity is an essential component of modern communication. RFS offers flexible fiber configurations to meet a range of connectivity needs.

**Hybrid** | Hybrid cables combine multiple solutions into a single cable for the easy installation of high-performance and reliable systems to support business and mission-critical applications.

Where additional technologies are needed, RFS works with partners to help customers achieve their connectivity aims.



### **PROVEN IN HIGH-PROFILE DEPLOYMENTS**

*RFS RF and fiber solutions have been trusted to bring fast and reliable connectivity to some of the most iconic and challenging indoor environments for more than 40 years. Here are just a few of our projects:*

- CERN
- Eurotunnel
- Hong Kong Airport
- Munich Airport
- Seoul Incheon airport
- Louvre Abu Dhabi
- FIFA World Cup 2014, Brazil
- Mall of America
- Atlanta Stadium for Super Bowl
- Shanghai Tower

### **WE ARE YOUR FULL-SERVICE INDOOR CONNECTIVITY PARTNER**

RFS has the end-to-end indoor communications solutions and know-how to support deployments with:

- Any complexity level
- Any business model
- Any frequencies
- Any network technologies
- Any commercial or mission-critical communications services



*RFS solutions are deployed in some of the most iconic building structures and tunnels in the world.*

# GREEN BY DESIGN SUSTAINABLE CREDENTIALS

**It is more important than ever to both us and our customers that projects are designed with sustainability in mind.**

**The R&D teams at RFS are committed to ensuring our solutions support our customers' green ambitions, and this extends across our range of indoor solutions.**

**As an organization, we are making positive changes to continue to move towards our own net-zero targets and support customers. To achieve this, we have an environmental strategy based on four key principles:**

## 01 - GREEN BY DESIGN

- **Design for Environment (DfE):** This is part of the Product Lifecycle Process, with all products undergoing our RFS Product Carbon Footprint Life Cycle Assessment
- **Material Efficiency:** We manufacture using the minimum raw materials to reduce environmental impact without compromising quality. For example, our connectors are manufactured as a single piece, making one of the greener solutions on the market.
- **Power Efficiency:** Our engineering team has focused on ensuring low attenuation in our products. Not only does this give better performance, but leads to reduced power consumption.

## 02 - SMARTER LOGISTICS

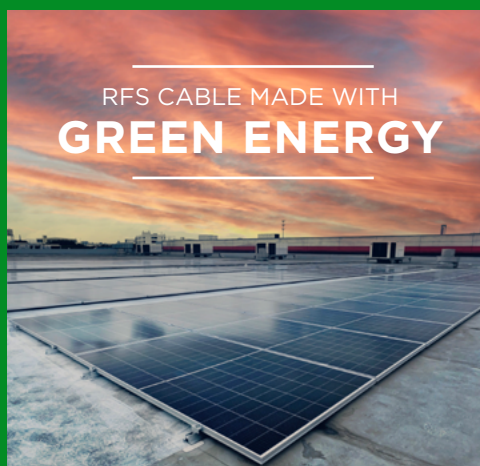
- **Global Network:** With key hubs in Europe, Asia, and an exclusive North American distributor, we maintain a short and efficient supply chain.
- **Sustainable Delivery:** For smaller orders via RFStore, we collaborate with local couriers to minimize environmental impact and avoid partial load deliveries.
- **Drum Recycling Program:** Our buy-back program encourages customers to return cable drums for recycling or reuse.

## 03 - BUILT TO LAST

- **Future-Proof Technologies:** Our systems are designed with future needs in mind.
- **Long Life:** Long-lasting equipment is key to reducing environmental impact. There is a reason our motto is 'Lifetime Connectivity'.

## 04 - SUSTAINABLE MANUFACTURING

- **Recycling Initiatives:**  
We recycle copper, aluminum, brass, scrap metal, and electronics left over from manufacturing to minimize waste.
- **Environmental Projects:**  
Across our sites, various initiatives, including using solar power and recycling rainwater for cooling, help reduce the carbon footprint of manufacturing.
- **Global Compliance:**  
All RFS facilities meet globally recognized environmental standards, including ISO14001 Environmental Management certification.



In 2023, RFS launched a major project to install solar panels on the roof of our Suzhou factory. Covering 16,000 square meters, the panels can generate 1.49MW of power. The project is expected to see an annual power generation 1.35 million kWh per year and save an estimated 1346 Tons of CO2 annually. In January 2024, the project was successfully connected to the state grid for power generation, meaning any excess energy can be utilized beyond our Suzhou factory, extending the positive environmental impact of RFS.





## CABLES AND CONNECTORS FOR EVERY DAS APPLICATION

RFS coaxial and radiating cables are designed to meet in-building communications requirements today and tomorrow. Our high-quality connectors maintain signal integrity end-to-end.

### CELLFLEX® LOW-LOSS COPPER AND ALUMINUM CABLES

The CELLFLEX and CELLFLEX Lite duo make up the largest corrugated transmission-line portfolio in the wireless infrastructure industry. The foam dielectric cables combine remarkable flexibility with high strength and superior electrical performance to ensure uninterrupted communications throughout buildings. This premium transmission line family is backed by a complete line of accessories, including the renowned OMNI FIT™ connector range.

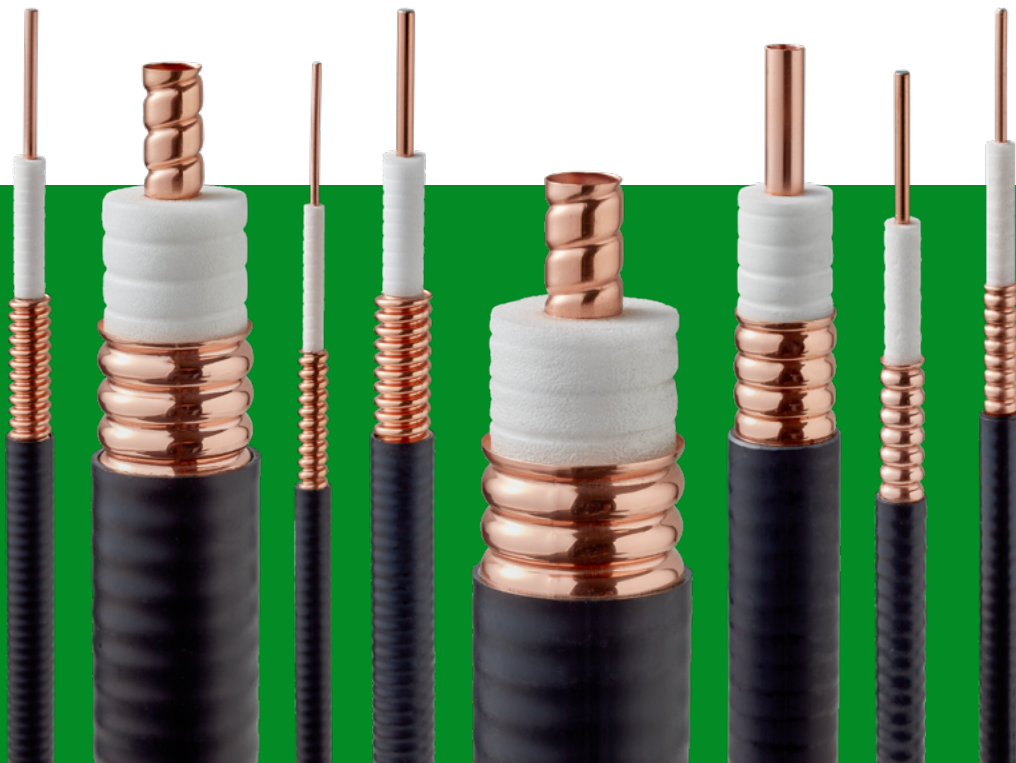
Twenty unique CELLFLEX types, ranging in size from 1/4" to 1-5/8", provide users with a perfect match for even the most complicated and demanding applications. Every cable comes with a guarantee of reliability, performance and cost-effectiveness.

### CELLFLEX Flame-Retardant Cables

SIZE	CABLE	CHARACTERISTIC
1/2"	SCF12-50 JFN	Superflexible
1/2"	LCF12-50 JFN	Low Loss
7/8"	LCF78-50 JFNA	Low Loss
1-1/4"	LCFS114-50 JFNA	Low Loss
1-5/8"	LCF158-50 JFNA	Low Loss



Check the last status of  
Declaration of Performance (DoP)  
on rfsworld.com: <https://bit.ly/rfs-cpr>



**Low  
attenuation**  
*enables extremely  
efficient signal  
transfers.*

## CABLES AND CONNECTORS FOR EVERY DAS APPLICATION

### OMNI FIT™ CONNECTOR FAMILIES

RFS connectors are designed for high performance, easy installation and full compatibility throughout the CELLFLEX family. The entire range of innovative OMNI FIT™ Premium and OMNI FIT™ Standard connectors work with both copper and aluminum cables. A perfect companion for the CELLFLEX® transmission line range, OMNI FIT™ connectors provide users with familiar connection options, premium electrical characteristics and reliable, long-life use.

### COMPLETE SHIELDING

The solid outer conductor on CELLFLEX coaxial cables creates a continuous RFI/EMI shield that minimizes system interference.

### OUTSTANDING INTERMODULATION PERFORMANCE

The solid inner and outer conductors virtually eliminate intermodulation.

### WIDE RANGE OF APPLICATIONS

CELLFLEX cables support frequency bands up to 6000 MHz to enable a wide range of in-building applications.

### LOW VSWR

Special low voltage standing wave ratio (VSWR) CELLFLEX variants help maintain system integrity.

### HIGH POWER RATING

Low attenuation, excellent heat transfer properties and temperature stabilized dielectric material ensure safe, long-term operation at high transmit power levels.



### TORQUE-KEY SET

The RFS Torque-Key Set is designed for improved installation of RFS E01-Connector series.

### FEATURES / BENEFITS

The new Torque-Key set has been designed to allow installers to accurately achieve the correct torque mentioned in the RFS installation guide. This is essential to ensuring the best electrical performance when using the RFS E01-Connectors

For easier and more precise installation that achieves maximum performance quality, we recommend our Universal Trimming Tools (TRIM-T05).



RFS Installation accessories - Torque wrenches

## INSTALLATION VIDEOS

- How to install premium connectors
- How to install standard connectors
- Installing HYBRIFLEX™ in the field
- How to install the Hybrid Connector System
- How to Protect and Install Low Inductance Cable Connections



[RFS Connector installation dedicated channel](#)



## GET HIGH-PERFORMANCE JUMPER CABLES FOR ANY APPLICATION, ANY SIZE

RFS is a global leader in RF jumper cables and offers a complete portfolio of jumper cables to meet any requirements.



**CELLFLEX Factory-Fit Jumpers** are ideal for indoor environments and other locations where jumper connectors do not require weatherproofing.

**CELLFLEX SecureFit Booted Jumpers** are ideal for outdoor environments and other locations where jumper connectors need to be protected from the elements.

*All of our CELLFLEX jumper cables support frequencies up to 6 GHz to simplify your network evolution and protect your investment.*

### CHOOSE FROM SUPER-FLEXIBLE AND LOW-LOSS JUMPER CABLES

CELLFLEX Factory-Fit Jumpers and CELLFLEX SecureFit Booted Jumpers are designed for seamless connection to our renowned CELLFLEX foam dielectric coaxial cables:



**CELLFLEX super-flexible jumper cables** combine outstanding bending characteristics and electrical performance to improve quality and efficiency in the most challenging deployment scenarios.

**CELLFLEX low-loss jumper cables** deliver extremely low attenuation that increases the efficiency of signal transfers in any RF system.

### INCREASE FIRE-RESISTANCE

All CELLFLEX jumpers can be delivered with a flame-retardant "JFN" jacket type that meets the stringent fire safety requirements in European standard EN 50575. These flame-retardant jumpers meet the legal and regulatory requirements for fire safety in the European Construction Product Regulation (CPR) 305/2017 and other major fire safety standards.

### CONNECTIONS IN THE FIELD JUST GOT EASIER


RFS' new coaxial adapter series provides a fast, easy and cost-effective solution for jumper connections. With a large selection of both straight and right angle adapters, there is a model for every network requirement. Passive intermodulation specifications for all RFS adapters is < -163 dBc.





## UNDERSTANDING JUMPER NAMES

RFS offers models with outdoor-rated jacket types, of varying lengths in meter increments.

Connector A	Connector B	Cable Type	Jacket Type	Cable Length	Performance Type
					
<b>7M &amp; 43M</b> CONNECTORS A & B		<b>S12</b> CABLE TYPE	<b>F</b> JACKET TYPE	<b>0100</b> CABLE LENGTH	<b>FFP</b> JUMPER PERFORMANCE
<b>7M</b>	7-16 Male	<b>L12</b>	<b>F</b>	<b>0100</b>	<b>FFP</b>
<b>7F</b>	7-16 Female	<b>S12</b>	<b>FB</b>	<b>0200</b>	
<b>7MR</b>	7-16 Male Right Angle		<b>Blank</b>	<b>0300</b>	
<b>43M</b>	4.3-10 Male			<b>0500</b>	
<b>43F</b>	4.3-10 Female			<b>1000</b>	
<b>43MR</b>	4.3-10 Male Right Angle			<b>1500</b>	
<b>NM</b>	N-Type Male				
<b>NF</b>	N-Type Female				
<b>NMR</b>	N-Type Male Right Angle				
<b>NXM</b>	NEX10 Male				

**NOTES:**

More Jumper configurations, e.g.: 1/4" or 3/8" size, weather proofing boot and various lengths are available

### NOTES:

More Jumper configurations, e.g.: 1/4" or 3/8" size, weather proofing boot and various lengths are available on request



## RADIAFLEX® RADIATING CABLES

RADIAFLEX is the industry's most advanced portfolio of 5G-ready radiating cables for wireless indoor communications. RADIAFLEX radiating cables:

- Support all services up to 7.2 GHz with high performance, making them ideal for multiband, multi-operator applications in the most challenging indoor and underground environments
- Can be combined to take advantage of 3.5 GHz spectrum and accelerate to 5G in buildings and tunnels

### SUPPORT ANY APPLICATION

RADIAFLEX radiating cables are available in several families with different bending radii, performance levels and outer conductor types to meet any application requirements:

- In-building and in-tunnel applications that require the highest possible radiating cable performance to support throughput-optimized 5G coverage solutions and the highly reliable systems needed for mission-critical wireless communications
- Heavy-duty in-building and mining applications
- In-vehicle applications
- Industrial applications and maritime
- Off-shore applications

#### RADIAFLEX Brochure

Discover The Original  
& Best Radiating Cable

<https://bit.ly/rfs-radiaflex-brochure>



### TAKE 5G INTO TUNNELS

Our newest, patented RADIAFLEX 5G radiating cables are the only radiating cables on the market that support spectrum up to 4.2 GHz. Due to the stopband-free design, the cables operate in all 3GPP standardized frequency bands up to 4.2 GHz. These future-ready cables simultaneously support commercial wireless applications and mission-critical services, making them ideal for the next generations of wireless applications in tunnels as well as spectrum rebanding and refarming projects.

### MAXIMIZE CAPACITY WITH MULTIBAND MIMO

Combining RFS' vertically polarized RAY and horizontally polarized RLK product families takes advantage of unique cross-polarization effects to optimize MIMO conditions in tunnels. With two "perfect match" radiating cables, you have new opportunities to create a MIMO solution that takes in-tunnel data rates to higher levels.

### INCREASE FIRE SAFETY

RADIAFLEX cables are low-smoke and halogen-free, meet all major international standards for flame and fire retardancy and have a CPR rating of B2ca with a d0 droplets rating.

#### RADIAFLEX

*cables deliver highly  
reliable wireless communications  
in some of the world's most iconic  
buildings and tunnels and in ~*

**50%**  
of the world's  
metros.



## RADIAFLEX Radiating Cable **SELECTION GUIDE**

	Mission Critical			4G/5G Commercial Radio							
	75-450 MHz	600-960 MHz	2400-2500 MHz	617-960 MHz	1700-1900 MHz	2200 MHz	2700 MHz	3800 MHz	4200 MHz	4900 MHz	6000 MHz
<b>4G/5G RADIAFLEX Radiating Cable Solution</b>											
RLKX114-50*	+	++	++	++	++	++	+++	+++			
RLKX114-50B	+	++	++	++	++	++	+++	+++	+++		
RAYX114-50*	+	++	++	++	++	++	+++	+++			
RLKAX12-50	+	+	++	+	+	++	++	++	++	++	++
RE60											+++
RLKU158-50*	+	++	+++	++	+++	+++	+++				
RAYA158-50*	+	++	+++	++	+++	+++	+++				
RLKU114-50*	+	++	+++	++	+++	+++	+++				
RAYA114-50*	++	++	+++	++	+++	+++	+++				
RLKU78-50	+	++	+++	++	+++	+++	+++				
RLKU12-50	+	++	+++	++	+++	+++	+++				
<b>Mission Critical Radio Applications</b>											
RLK158-50	+++	++		++							
RLK114-50	+++	++		++							
RLK78-50	+++	++		++							
RLK12-50	+++	++		++							
RLKW114-50	++	+++		+++	++						
RLKW78-50	++	+++		+++	++						
RLKW12-50	++	+++		+++	++						
<b>Railway Applications</b>											
RAYT158-50			+++								
RAYT114-50			+++								
RAY158-50	++	+++		+++							
RAY114-50	++	+++		+++							
RAY78-50	++	+++		+++							
<b>Diverse Applications</b>											
RCF12-50	+	+	+	+	+	+	+	+	+	+	+
RSF12-50	+	+	+	+	+	+	+	+	+	+	+
RLFU158-50	++	++	++	++	++	++					
RLFU114-50	++	++	++	++	++	++					
RLFU78-50	++	++	++	++	++	++					

\* MIMO cables

### RADIAFLEX Radiating Cables

SIZE	CABLE
1/2"	RADIAFLEX RLK types
7/8"	RADIAFLEX RLK, RLF, RAY types
1-1/4"	RADIAFLEX RLK, RLF, RAY types
1-5/8"	RADIAFLEX RLK, RLF, RAY types

RFS offers RADIAFLEX radiating cables with different constructions to comply with different levels of fire safety requirements:

JFNA: standard construction

JFLA: standard construction with flame barrier tape

CPR: standard construction with flame barrier tape and high performance jacket material

**BEST**

**CPR**

**CLASSES AVAILABLE**



#### Declaration of Performance (DoP)

Check the last status:

<https://bit.ly/rfs-cpr>





# THE FASTEST

## MIMO Solutions Available

Multiple input, multiple outputs (MIMO) is critical in indoor wireless deployments to allow higher capacity and improved reliability and performance.

- RFS is the only vendor that can enable MIMO end-to-end, and we have achieved two world firsts: The world's first pair of ultra broadband radiating cables for cross-polarized 2x2, 4x4 and higher MIMO applications.
- A new world record for download speeds in tunnels with a 4x4 MIMO solution for the Folio Line high-speed railway project that reached 560 Mbps.

### PROVEN IN HIGH-PROFILE DEPLOYMENTS

RFS solutions have been trusted to bring fast and reliable wireless communications to some of the most iconic and challenging indoor environments for more than 40 years. Here are just a few of our projects:

- Chengdu
- Hong Kong
- London
- Paris
- Singapore
- Sydney
- Toronto
- Wuhan
- Oslo

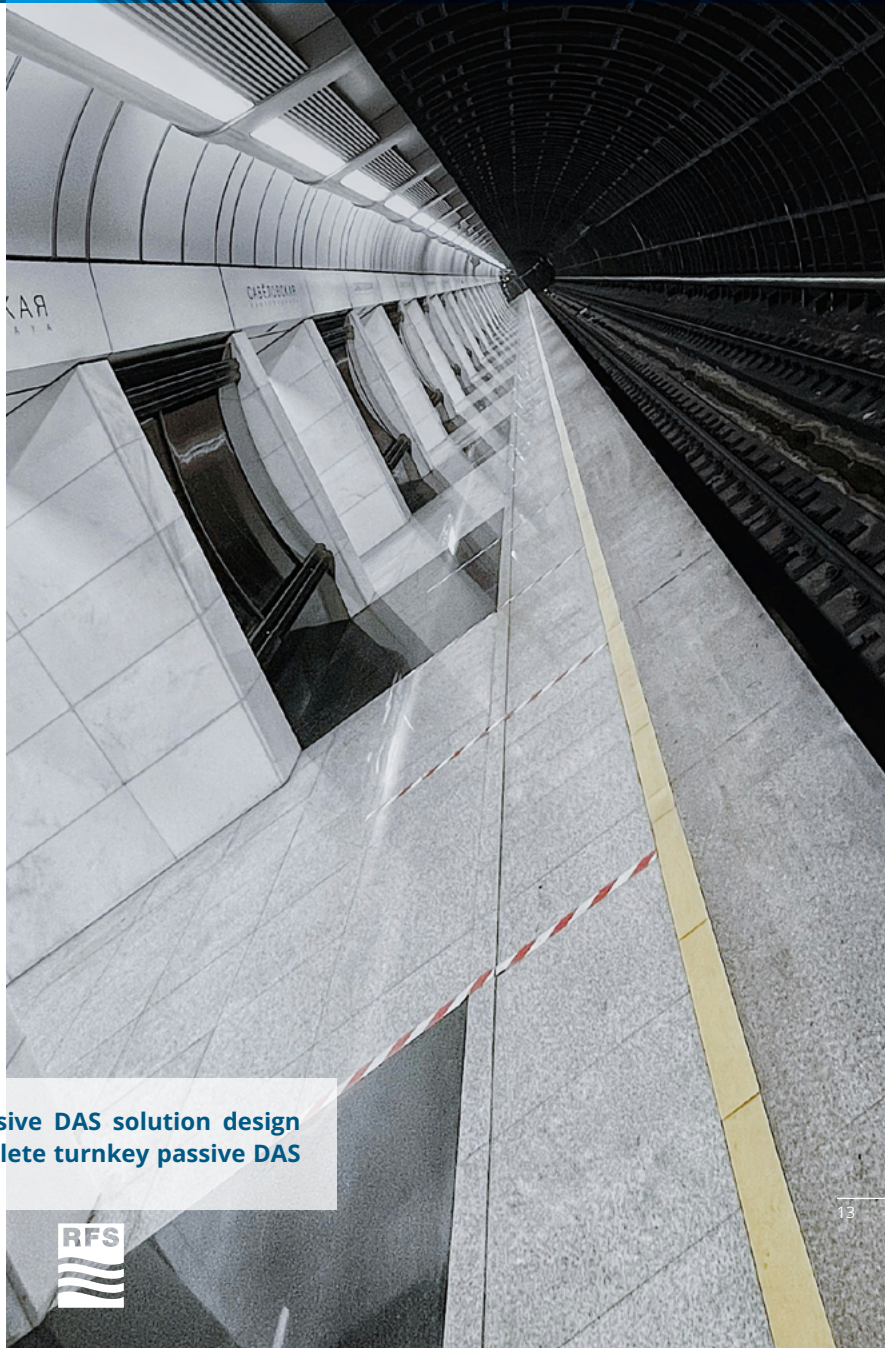


#### RFS In-Tunnel Successes around the world

*RFS Transforms Communications  
In Tunnels*

<https://bit.ly/RFS-in-tunnel-successes>

To further simplify deployments, we offer passive DAS solution design and deployment services, and can provide complete turnkey passive DAS solutions.





## ROBUST JACKET CONSTRUCTION ENABLES THE HIGHEST CPR CLASSIFICATIONS

RFS CPR-compliant coax and radiating cables feature a specially developed jacket that allows them to achieve best-in-class ratings for burning droplets (d0), low smoke emission (s1) and corrosivity (a1), the most important criteria for fire safety in cables that are installed indoors and underground.

All RFS cables are tested and certified by an external notified body according to EN 50575. In addition, RFS' manufacturing facility in Hannover, Germany, has been audited and meets the highest system 1+ requirements for type approvals, regular production audits, as well as regular sampling and testing of products by the notified body.

## FIND CPR-COMPLIANT CABLES FOR ANY APPLICATION

All RFS CPR-compliant cables are also designated as low-smoke, zero-halogen (LSZH) and meet International Electrotechnical Commission (IEC) standards for flame spread, smoke acidity and low smoke emission. They are compatible with existing RFS connectors, factory-assembled jumpers, grounding kits and clamps, as well as trimming and preparation tools.

## NEW RFS HANNOVER BURN CHAMBER




The in 2024 installed burn chamber extends RFS's testing capabilities and operates in accordance with the international standard EN50399 which refers to the important CPR (Construction Product Regulation) directive of the European Union. Combined with existing fire testing facilities, it gives RFS one of the most comprehensive in-house fire resistance testing capabilities of any organization in the cable space. This will allow RFS to continue offering solutions that meet fire safety standards worldwide.

## EUROPEAN CLASS CODE LABELING EXAMPLE

This table explains the CPR class codes using the rating for our **CELLFLEX** cables as an example: **B2ca s1 d0 a1**.

B2	ca	s1	d1	a1
Fire performance class	Application to cable	Smoke ratio	Droplets rating	Acidity rating

 Smoke opacity	 Droplets	 Acidity
s1	d0	a1
s2	d1	a2
s3	d2	a3

## CPR-COMPLIANT CABLES ARE IDEAL FOR INDOOR APPLICATIONS

### A BROAD PORTFOLIO OF CPR-COMPLIANT CABLES FOR INDOOR APPLICATIONS

Since July 1, 2017, all communications cables installed in buildings in the European Union (EU) must meet the fire performance requirements in European standard EN 50575 and include the CE marking to comply with EU Construction Products Regulation (CPR) No. 305/2011.

RFS was the first cable vendor to offer RF communications cables with the highest CPR classifications for fire safety. Today, we offer a wide range of CELLFLEX® coaxial cables and RADIAFLEX® radiating cables that comply with European CPR No. 305/2017. This directive requires that coax and radiating cables meet the fire performance standards in the EN 50575 standard and be classified according to the EN 13501-6 standard.

RFS cables are classified according to the CPR test standards and criteria listed below.

		CPR CLASSIFICATION			
		B2ca: +++	Cca: ++	Dca: +	Eca: -
Test Standard and Measurement					
IEC 60332-1-2	Flame spread	≤ 425 mm	≤ 425 mm	≤ 425 mm	≤ 425 mm
EN 50399	Flame spread	≤ 1.5 m	≤ 2.0 m	-	-
EN 50399	Total heat release	≤ 15 MJ	≤ 30 MJ	≤ 70 MJ	-
EN 50399	Peak heat release	≤ 30 kW	≤ 40 kW	≤ 400 kW	-
EN 50399	Fire grow rate	≤ 150 Ws-1	≤ 3000 Ws-1	≤ 1300 Ws-1	-
ADDITIONAL CLASSIFICATIONS					
EN 50399	Smoke emission	s1, s2, s3	s1, s2, s3	s1, s2, s3	-
EN 61034	Smoke density	s1a, s1b	s1a, s1b	s1a, s1b	-
EN 50399	Burning droplets	d0, d1, d2	d0, d1, d2	d0, d1, d2	-
EN 6754-2	Corrosivity	a1, a2, a3	a1, a2, a3	a1, a2, a3	-

The CPR burning droplets classification is particularly important because burning particles can ignite other cables or infrastructure. Only class d0 cables create no burning particles to deliver the highest levels of fire protection in buildings and tunnels.



## SAFETY IS KEY



## SOLUTIONS BY INDUSTRY

# TAILORED ANSWERS FOR EVERY SECTOR

Developing the technologies is only part of the puzzle for RFS. Every industry has different connectivity priorities. They may use the same technologies, but they need to be configured to meet the unique needs of each environment. We understand the various challenges of a wide range of industries and provide consultancy along with quality, long-life connectivity solutions to meet and exceed the needs of our customers.

## WAREHOUSE

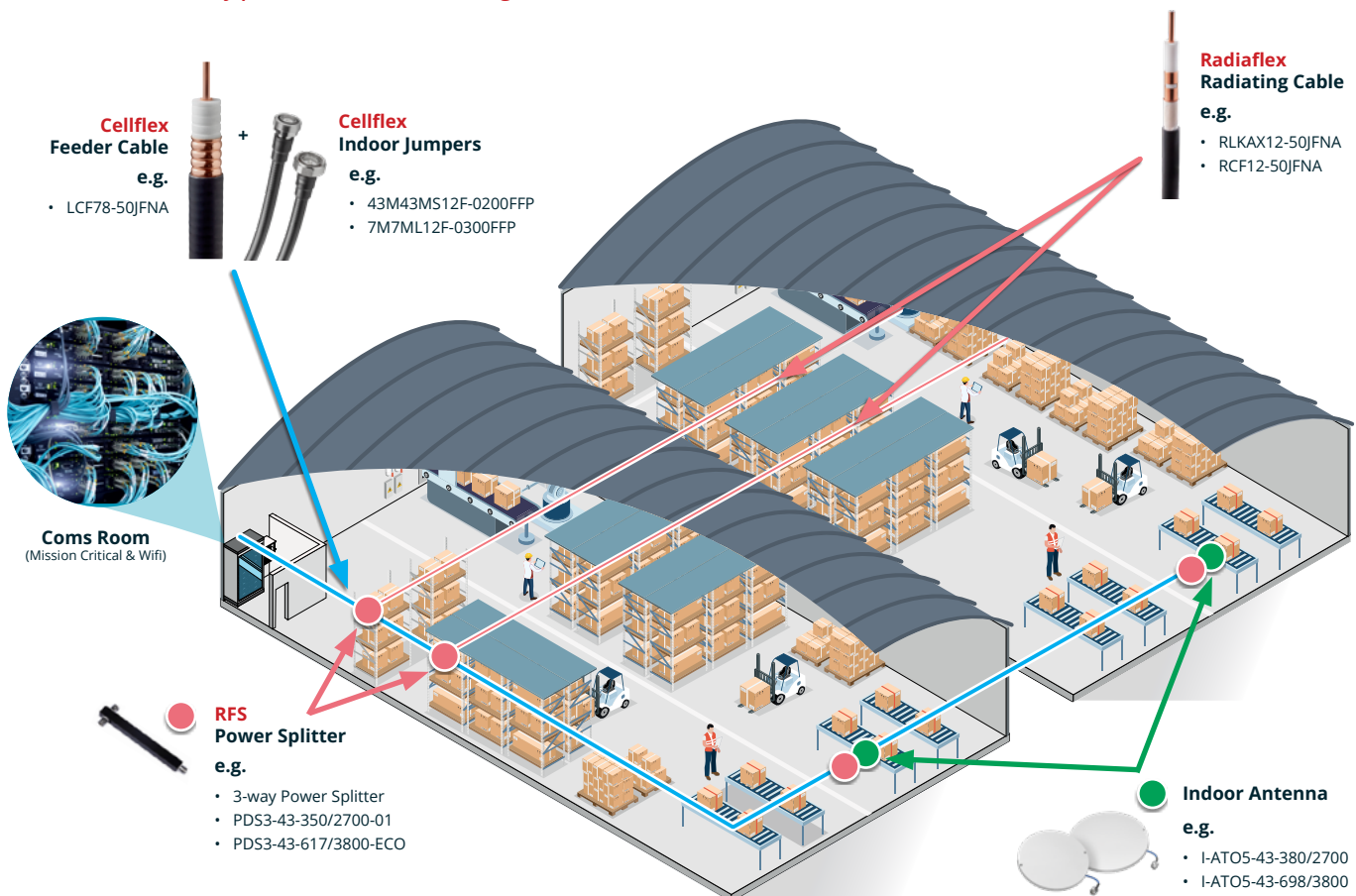
Warehouses are full of 'wireless unfriendly' materials that block signals and make complete coverage a challenge. However, full site connectivity is essential for any warehouse operation. It is paramount to ensure the safety of both the site and its staff, and having a reliable mission-critical network in place is crucial to comply with fire safety regulations across the world. RFS uses a combination of solutions to flood both open spaces and densely packed areas with coverage for both mission-critical and commercial use.



DISCOVER



**Warehouse**  
on our interactive LANDSCAPE

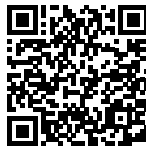


## SOLUTIONS BY INDUSTRY

# TAILORED ANSWERS FOR EVERY SECTOR

## AIRPORT

Airports have multiple applications that demand reliable connectivity, from mission-critical coverage to commercial networks for thousands of passengers. RFS works to deploy technology-agnostic solutions that can support multiple operators and all frequency bands up to 6 GHz. With a commitment to reliability, high-performance and fire safety, RFS is able to meet the needs of complex indoor and outdoor deployments, delivering essential and desired coverage and, at the same time, ensuring regulatory compliance.

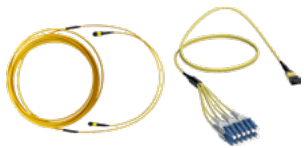


DISCOVER



# Airport

on our interactive LANDSCAPE



**Fiber Jumper**  
e.g.

- FONF-FF06S-010M
- FONF-FF12S-010M
- HB012-B-04U1-S12F
- FONT-24x01SA1-F00



**Coms Room**  
(BTSS, Ethernet, Mission Critical & Public Radio)

**Combiner**  
Mission Critical + 5G

**Remote Unit**

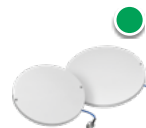


**Telecom Closets**  
e.g.

- SBIF-0Z12SS-APAP-YC
- SBIF-0Z12SS-APCA-YC



**Cellflex Feeder Cable**  
e.g.  
• LCF12-50JFN



**Indoor Antenna + Coupler**  
e.g.  
• I-ATO5-43-380/2700  
• I-ATO5-43-698/3800

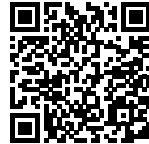
e.g.  
• CDS20-43-617/3800-ECO  
• CDS20-43-555/6000

## SOLUTIONS BY INDUSTRY

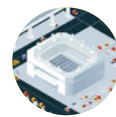
# TAILORED ANSWERS FOR EVERY SECTOR

## STADIUM

Stadiums are designed to hold thousands of fans with an expectation of access to high-capacity mobile coverage for the duration of an event. At the same time, security teams, police, and other emergency responders need reliable access to mission-critical communications. Wireless connectivity, therefore, needs to extend throughout indoor and outdoor areas, including difficult spaces like stairwells, tunnels, passageways, and underground rooms, which need specific solutions to ensure complete coverage. RFS is an expert in building complete solutions for stadiums to deliver contoured coverage across site that meets the needs of all users.

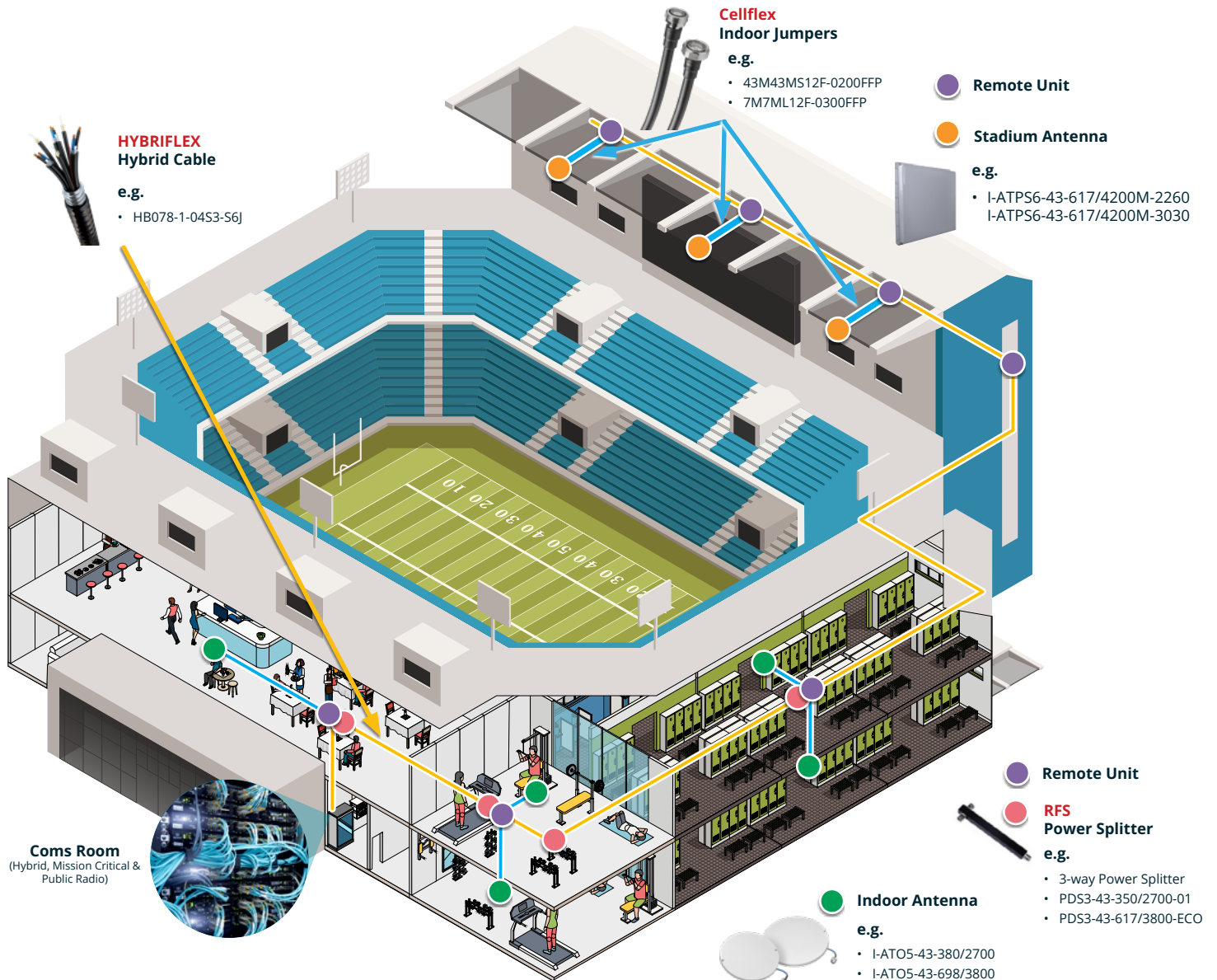


DISCOVER



### Stadium

on our interactive LANDSCAPE





## SOLUTIONS BY INDUSTRY

# TAILORED ANSWERS FOR EVERY SECTOR

## RAIL TUNNEL

Rail tunnels are hostile environments where space is tight and ventilation is often poor. These challenges increase deployment costs. There are very limited locations to install antennas and repeaters in these ultra-confined spaces. It takes significant RF expertise to ensure mission-critical rail systems have continuous access to highly reliable wireless connectivity. Radio signals must also penetrate trains packed with passengers while compensating for the losses caused by train materials and human bodies. With complex RF designs to implement, but relatively few locations where equipment can be installed, only solutions that are precision-engineered for optimal performance can reduce total cost of ownership (TCO). **RFS RADIAFLEX is the industry's most advanced portfolio of 5G-ready radiating cables for contoured wireless coverage in buildings and underground.**

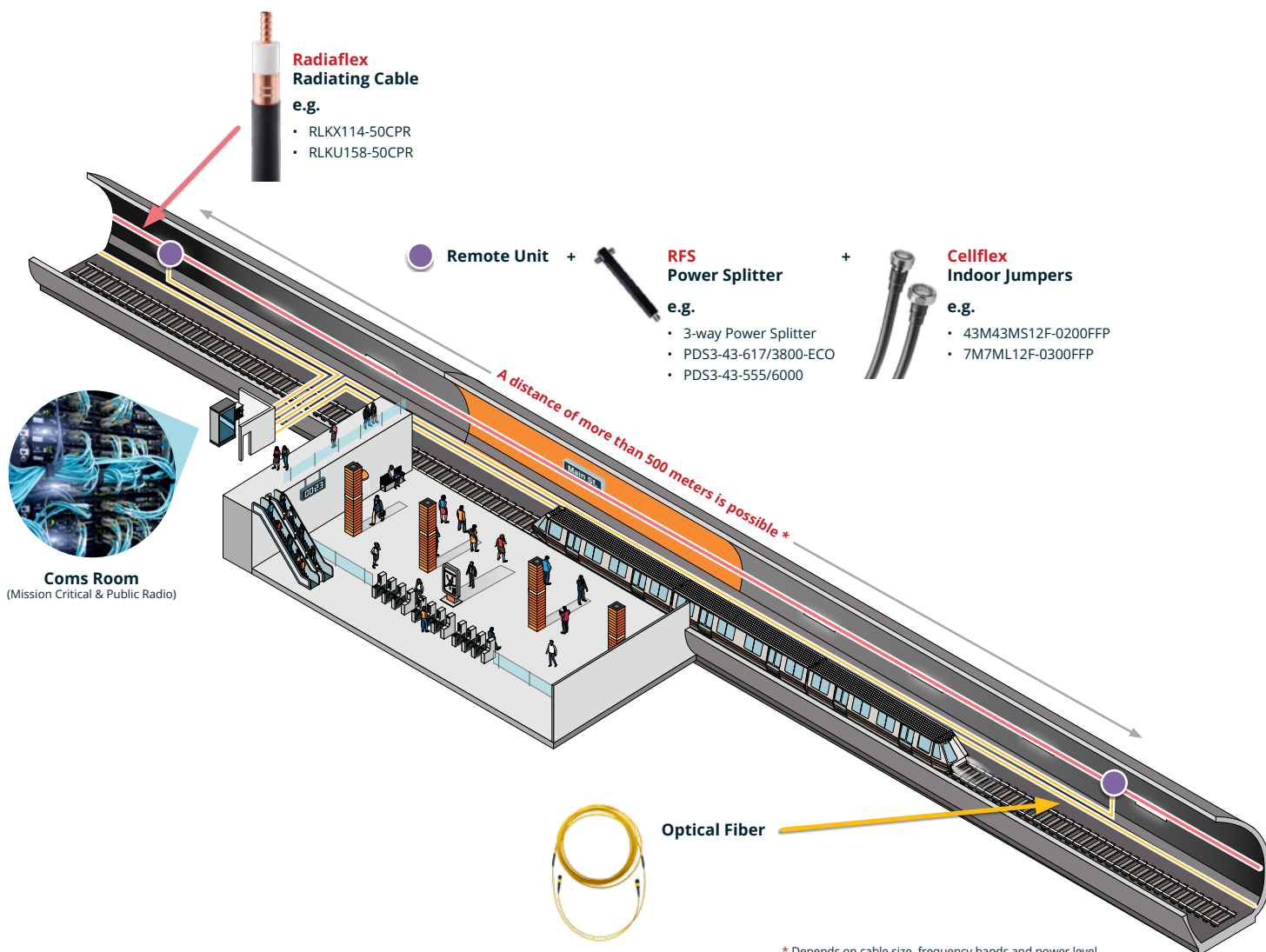


DISCOVER



### Rail Tunnel

on our interactive **LANDSCAPE**



\* Depends on cable size, frequency bands and power level

## HYBRIFLEX® FIBER PLUG-AND-PLAY SOLUTION

HYBRIFLEX fiber assemblies allow multiple fiber solutions to be combined into a single cable. This allows maximum flexibility as HYBRIFLEX can be configured to meet the exact connectivity needs of any indoor scenario.

### Fiber Optic Backbone Cable, 12 x single mode fibers, MTP12(f) to MTP12(f), indoor, LSZH

FIBER ASSEMBLIES,  
PRE-TERMINATED, MTP12  
FEMALE CONNECTORS  
BOTH ENDS, INDOOR

MODEL NUMBER	LENGTH m (ft)	MODEL NUMBER	LENGTH m (ft)
FONF-FF06S-010M	10 (32.8)	FONF-FF06S-110M	110 (360.9)
FONF-FF06S-020M	20 (65.6)	FONF-FF06S-120M	120 (393.7)
FONF-FF06S-030M	30 (98.4)	FONF-FF06S-130M	130 (426.5)
FONF-FF06S-040M	40 (131.2)	FONF-FF06S-140M	140 (459.3)
FONF-FF06S-050M	50 (164.0)	FONF-FF06S-150M	150 (492.1)
FONF-FF06S-060M	60 (196.8)	FONF-FF06S-160M	160 (524.9)
FONF-FF06S-070M	70 (229.7)	FONF-FF06S-170M	170 (557.7)
FONF-FF06S-080M	80 (262.5)	FONF-FF06S-180M	180 (590.5)
FONF-FF06S-090M	90 (295.3)	FONF-FF06S-190M	190 (623.4)
FONF-FF06S-100M	100 (328.1)	FONF-FF06S-200M	200 (656.2)

### Fiber Optic Backbone Cable, 24 x single mode fibers, 2 x MTP12(f) to 2 x MTP12(f), indoor, LSZH

FIBER ASSEMBLIES,  
PRE-TERMINATED,  
2 X MTP12 FEMALE  
CONNECTORS BOTH  
ENDS, INDOOR

MODEL NUMBER	LENGTH m (ft)	MODEL NUMBER	LENGTH m (ft)
FONF-FF12S-010M-01	10 (32.8)	FONF-FF12S-110M-01	110 (360.9)
FONF-FF12S-020M-01	20 (65.6)	FONF-FF12S-120M-01	120 (393.7)
FONF-FF12S-030M-01	30 (98.4)	FONF-FF12S-130M-01	130 (426.5)
FONF-FF12S-040M-01	40 (131.2)	FONF-FF12S-140M-01	140 (459.3)
FONF-FF12S-050M-01	50 (164.0)	FONF-FF12S-150M-01	150 (492.1)
FONF-FF12S-060M-01	60 (196.8)	FONF-FF12S-160M-01	160 (524.9)
FONF-FF12S-070M-01	70 (229.7)	FONF-FF12S-170M-01	170 (557.7)
FONF-FF12S-080M-01	80 (262.5)	FONF-FF12S-180M-01	180 (590.5)
FONF-FF12S-090M-01	90 (295.3)	FONF-FF12S-190M-01	190 (623.4)
FONF-FF12S-100M-01	100 (328.1)	FONF-FF12S-200M-01	200 (656.2)

### Fiber Optic Branch Cable, 12 x single mode fibers, MTP12(m) to MTP10(m) & 2 x SC/APC, indoor, LSZH

FIBER ASSEMBLIES,  
PRE-TERMINATED WITH  
MTP12 MALE TO MTP10  
MALE AND 2 X SC/APC  
SIMPLEX CONNECTORS,  
INDOOR

MODEL NUMBER	LENGTH m (ft)	MODEL NUMBER	LENGTH m (ft)
FONF-ME06S-001M	1 (3.3)	FONF-ME06S-006M	6 (19.7)
FONF-ME06S-002M	2 (6.6)	FONF-ME06S-007M	7 (23.0)
FONF-ME06S-003M	3 (9.8)	FONF-ME06S-008M	8 (26.2)
FONF-ME06S-004M	4 (13.1)	FONF-ME06S-009M	9 (29.5)
FONF-ME06S-005M	5 (16.4)	FONF-ME06S-010M	10 (32.8)

### Fiber Optic Span Connect Cable, 12 x single mode fibers, MTP12(m) to MTP12(m), indoor, LSZH

FIBER ASSEMBLIES,  
MTP12 MALE  
CONNECTORS BOTH  
ENDS, INDOOR

MODEL NUMBER	LENGTH m (ft)	MODEL NUMBER	LENGTH m (ft)
FONF-MM06S-001M	1 (3.3)	FONF-MM06S-006M	6 (19.7)
FONF-MM06S-002M	2 (6.6)	FONF-MM06S-007M	7 (23.0)
FONF-MM06S-003M	3 (9.8)	FONF-MM06S-008M	8 (26.2)
FONF-MM06S-004M	4 (13.1)	FONF-MM06S-009M	9 (29.5)
FONF-MM06S-005M	5 (16.4)	FONF-MM06S-010M	10 (32.8)

# PASSIVE DAS

## BRINGING WIRELESS NETWORKS CLOSER TO PEOPLE

### HIGH PERFORMING SOLUTIONS END-TO-END

In addition to our world-renowned CELLFLEX, ClearFillLine and RADIAFLEX cables, our end-to-end passive DAS solutions include:

- Compact and lightweight broadband and ultra-broadband indoor antennas that deliver high performance and low visual impact
- Passive RF infrastructure products to distribute RF signals in the most efficient and effective way possible
- RFS RF network infrastructure products are designed to comply with highest requirements in order to avoid network interference issues and to achieve highest network performance

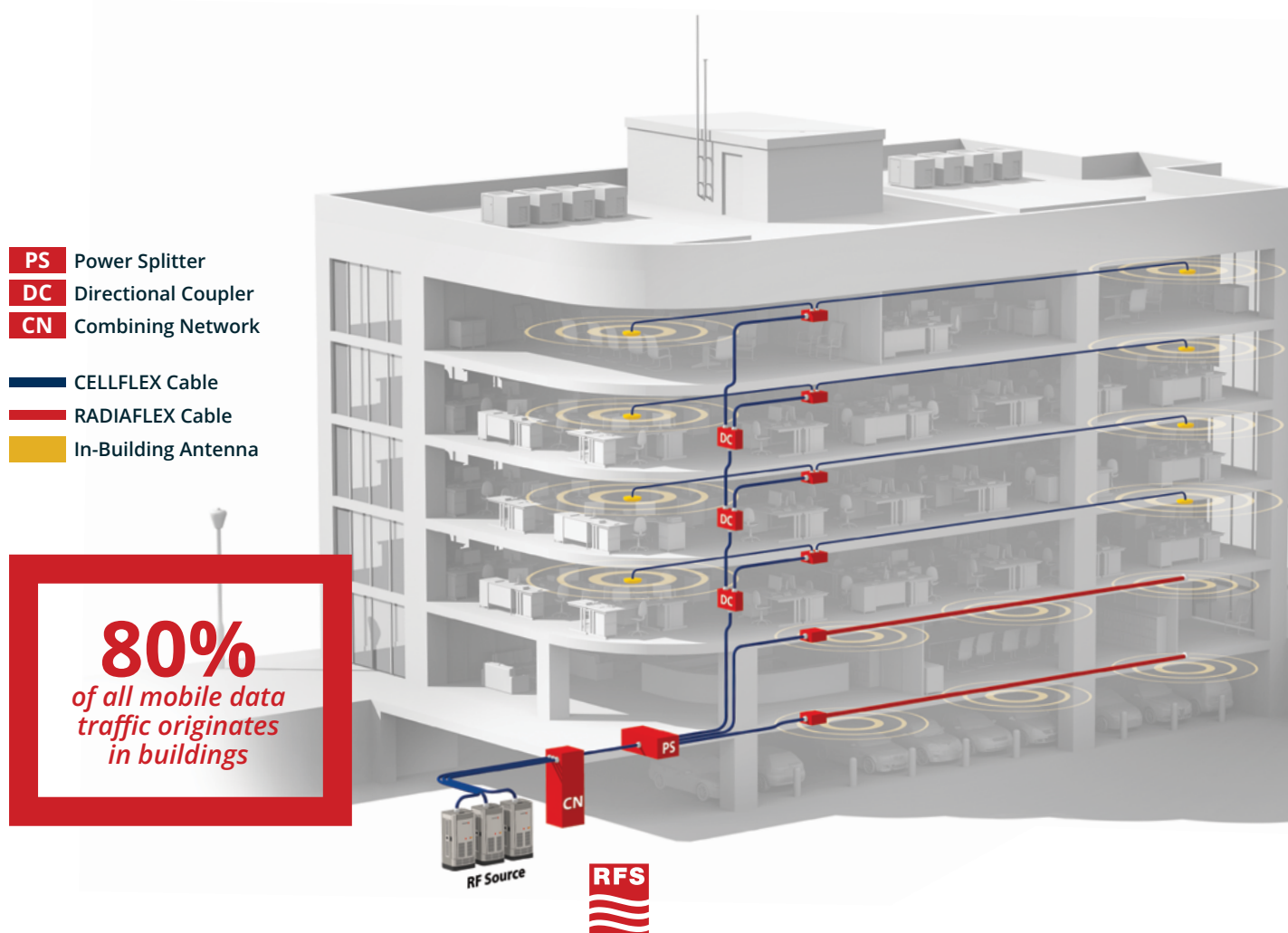
All of our non-cable components are proven to maintain overall system performance and key performance characteristics such as passive intermodulation (PIM) performance.

### TAILORED AND SCALABLE FOR ANY INDOOR OR UNDERGROUND ENVIRONMENT

Every RFS passive DAS solution is purpose-built to match business objectives, application requirements and physical environment. We can tailor our solutions for any indoor or underground environment, from the most basic to those with the most difficult and complex RF challenges.

### DELIVERING LOW TOTAL COST OF OWNERSHIP

Once installed, RFS passive DAS solutions require no maintenance and consume no electricity. These savings keep costs down and ensures error-free operation and high system availability —key requirements for mission-critical services.





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## PASSIVE DAS INDOOR ANTENNAS UP TO 6 GHZ

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RFS passive DAS antenna solutions are highly flexible. They support 350 MHz to 6000 MHz applications, all wireless standards and technologies as 2G/3G/4G/5G cellular services, analog and digital mission-critical radio, and WIFI/WLAN networks.

RFS indoor antennas feature:

- Sealed, UV-stable radomes
- Low VSWR, high gain, stable performance
- Compact, lightweight designs



I-ATO5-43-617/3800M

### BROADBAND AND ULTRA-BROADBAND DAS ANTENNAS

All RFS indoor antennas are designed for high performance and low visual impact. Antennas can be mounted on walls or ceilings. Antennas and the cables connecting them can also be painted to match surrounding colors and blend into the building aesthetic.

RFS provides four types of indoor antennas to meet every in-building requirement:

- Omnidirectional antennas
- Panel antennas
- Directional antennas
- Bidirectional antennas

## RFS SERVICES SPOTLIGHT



### Services 360: From Concept to Construction

Because we design and manufacture end-to-end RF solutions, we know exactly which environments solution components can and cannot withstand, the best techniques to install them and how to optimize their performance over the long term.

No matter how complex the project, we provide a single point of contact and long-range visibility into every phase of the deployment process and the ecosystem of network experts involved.

RFS goes well beyond other services companies to deliver the end-to-end RF solutions, expertise and oversight needed for smooth, efficient deployments in wireless, broadcast and defense networks in any location.

Learn how our turnkey indoor communications solutions extended safety-critical wireless coverage to every area on 30 oil and gas platforms in Brazil.

[\*Read the story now\*](#)

<https://bit.ly/From-Concept-to-Construction>

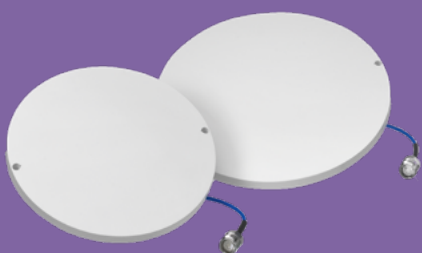
# PASSIVE DAS

## INDOOR ANTENNAS UP TO 6 GHZ

### Indoor Antennas

DIRECTIVITY	SISO   MIMO	FREQUENCY, MHz	MODEL NUMBER
<b>5G In-Building Antennas</b>			
Omni	SISO	380-520 / 698-960 / 1710-2700	I-ATO5-43-380/2700
Omni	SISO	698-960 / 1427-3800	I-ATO5-43-617/3800
Omni	SISO	617-960 / 1427-2700 / 3300-3800	I-ATO5-43-617/3800-T
Omni	SISO	698-960 / 1350-2700 / 3400-4000	I-ATO5-43-698/4000
Omni	SISO	350-520 / 600-960 / 1350-1550 / 1690-2700 / 3300-4200 / 4900-6000	I-ATO5-43-350/6000
Omni	SISO	617-960 / 1330-1550 / 1690-2700 / 3300-3800 / 4900-6000	I-ATO5-43-617/6000
Omni	2x2 MIMO	617-960 / 1427-2700 / 3300-3800	I-ATO5-43-617/3800M
Omni	2x2 MIMO	698-960 / 1710-2700 / 3400-4000	I-ATO5-43-698/4000M
Omni	2x2 MIMO	617-960 / 1330-1550 / 1690-2700 / 3300-3800 / 4900-6000	I-ATO5-43-617/6000M
Omni	4x4 MIMO	617-698 / 698-960 / 1695-2700 / 3300-4000 / 4800-6000	I-ATO5-43-617/6000M4
Panel	SISO	617-960 / 1427-2700 / 3300-3800	I-ATP5-43-617/3800
Panel	SISO	698-960 / 1710-2700 / 3400-4000	I-ATP5-43-698/4000
Panel	2x2 MIMO	617-960 / 1427-2700 / 3300-3800	I-ATP5-43-617/3800M
Panel	4x4 MIMO	617-960 / 1427-2700 / 3300-3800	I-ATP5-43-617/3800M4
<b>Stadium and High Capacity Venue Antennas</b>			
22x60deg	2x2 MIMO	617-960 / 1695-2700 / 3300-4200	I-ATPS6-43-617/4200M-2260
30x30deg	2x2 MIMO	617-960 / 1695-2700 / 3300-3800	I-ATPS6-43-617/4200M-3030
60x60deg	2x2 MIMO	698-960 / 1695-2700 / 3300-3800	I-ATPS6-43-698/3800M-6060

\* More components and other interfaces are available, please contact RFS



I-ATO5-43-617/6000



I-ATO5-43-617/6000M



I-ATO5-43-617/3800-T

I-ATP5-43-617/3800

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## PASSIVE DAS COMPONENTS UP TO 6 GHz

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RFS provides a complete family of passive components that operate in all frequency bands from 555 MHz to 6 GHz:

- **Combiners** that support one service per frequency band, multiple services per band, and multi-band applications. We also offer standardized combiner modules in 19-inch racks.
- **Hybrid combiners and couplers** that combine multiple signals in the same wireless band onto a common feeder cable.
- **Directional couplers** and tappers that uniformly distribute RF signals.
- **Diplexers and triplexers** that combine and separate signals in different wireless bands.
- **Power splitters** that evenly split input signals with minimal reflections or loss.
- **Loads** that terminate all types of open RF ports.

All RFS passive components provide optimal PIM performance to reduce interference and support the highest possible throughput levels end-to-end.

**NEW**

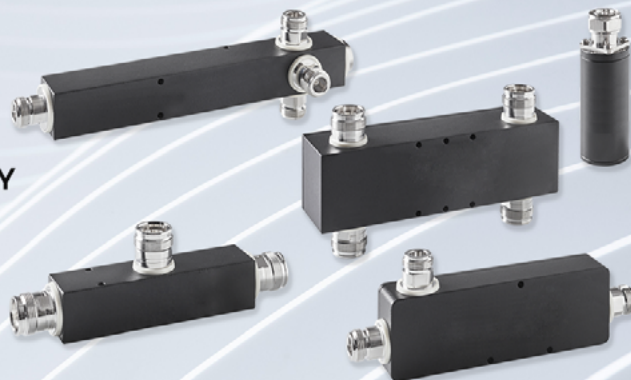
### Passive DAS Series: ECO

**COST EFFICIENT | HIGH TECHNICAL QUALITY  
BROADBAND | MANY VERSION AVAILABLES:**

e.g. Splitter, Coupler Loads or Indoor Antennas



**DISCOVER NOW ON OUR E-SHOP**



### SUPPORT MULTI-OPERATOR REQUIREMENTS ANYWHERE IN THE WORLD

Our passive components are the perfect complementary solution for our CELLFLEX® coax cables, RADIAFLEX® radiating cables, and indoor antennas, which also operate in all frequency bands up to 6 GHz.

Together, our passive DAS solution components provide complete flexibility to support 5G and deliver broadband multi-operator, multi-technology services using a single DAS, anywhere in the world.



# PASSIVE DAS COMPONENTS UP TO 6 GHZ

RFS Passive DAS Components	Frequency Range		
	380-2700 MHz	617-3800 MHz	555-6000 MHz
<b>Hybrid Coupler - 4.3-10 Female</b>			
3dB Directional Hybrid Coupler	CDS2x2-43-350/2700-01	CDS2x2-43-617/3800-ECO	CDS2x2-43-555/6000
	-	CDS4x4-43-617/3800-ECO	CDS4x4-43-555/6000
<b>Power Splitter - 4.3-10 Female</b>			
2-way power splitter	PDS2-43-350/2700-01	PDS2-43-617/3800-ECO	PDS2-43-555/6000
3-way power splitter	PDS3-43-350/2700-01	PDS3-43-617/3800-ECO	PDS3-43-555/6000
4-way power splitter	PDS4-43-350/2700-01	PDS4-43-617/3800-ECO	PDS4-43-555/6000
6-way power splitter	-	PDS6-43-617/3800-ECO	-
<b>Directional Coupler - 4.3-10 Female</b>			
6dB Directional Coupler	CDS6-43-350/2700-01	CDS6-43-617/3800-ECO	CDS6-43-555/6000
8dB Directional Coupler	-	CDS8-43-617/3800-ECO	CDS8-43-555/6000
10dB Directional Coupler	CDS10-43-350/2700-01	CDS10-43-617/3800-ECO	CDS10-43-555/6000
15dB Directional Coupler	CDS15-43-350/2700-01	CDS15-43-617/3800-ECO	CDS15-43-555/6000
20dB Directional Coupler	CDS20-43-350/2700-01	CDS20-43-617/3800-ECO	CDS20-43-555/6000
30dB Directional Coupler	CDS30-43-350/2700-01	CDS30-43-617/3800-ECO	CDS30-43-555/6000
<b>Unequal Power Divider / Tapper - 4.3-10 Female</b>			
5 dB / 3:1 Unequal Power Divider / Tapper	TPS5-43-350/2700-01	TPS5-43-617/3800-ECO	TPS5-43-350/6000
6dB / 4:1 Unequal Power Divider / Tapper	TPS6-43-350/2700-01	TPS6-43-617/3800-ECO	TPS6-43-350/6000
8dB / 6:1 Unequal Power Divider / Tapper	TPS8-43-350/2700-01	TPS8-43-617/3800-ECO	TPS8-43-350/6000
10dB / 10:1 Unequal Power Divider / Tapper	TPS10-43-350/2700-01	TPS10-43-617/3800-ECO	TPS10-43-350/6000
13dB / 20:1 Unequal Power Divider / Tapper	TPS13-43-350/2700-01	TPS13-43-617/3800-ECO	TPS13-43-350/6000
15dB / 30:1 Unequal Power Divider / Tapper	TPS15-43-350/2700-01	TPS15-43-617/3800-ECO	TPS15-43-350/6000
20dB / 100:1 Unequal Power Divider / Tapper	TPS20-43-350/2700-01	TPS20-43-617/3800-ECO	TPS20-43-350/6000
30dB / 1000:1 Unequal Power Divider / Tapper	TPS30-43-350/2700-01	TPS30-43-617/3800-ECO	TPS30-43-350/6000
<b>Low PIM Cable Loads - 4.3-10 Male</b>			
Cable Load, IP65, PIM -163, 50W	TERP-43-3800-50W		TERP-43-6000-50W
Cable Load, IP65, PIM -163, 100W	TERP-43-3800-100W		TERP-43-6000-100W
<b>Indoor Dummy Loads - 4.3-10 Male</b>			
Termination Load 2W	TER-43-3800-2W		TER-43-6000-2W
Termination Load 5W	TER-43-3800-5W		TER-43-6000-5W
Termination Load 10W	TER-43-3800-10W		TER-43-6000-10W
Termination Load 20W	TER-43-3800-20W		TER-43-6000-20W
Termination Load 30W	TER-43-3800-30W		TER-43-6000-50W
Termination Load 50W	TER-43-3800-50W		TER-43-6000-100W
Termination Load 100W	TER-43-3800-100W		TER-43-6000-200W

\* More components and other interfaces are available, please contact RFS



## PROOF BY EXAMPLE

### CASE STUDIES & REFERENCES

RFS's complete indoor wireless solutions are proven across thousands of sites worldwide.

The flexibility of the solutions on offer means they can be tailored to virtually any indoor environment. For both business and mission-critical applications, RFS addresses the specific needs of customers across a broad range of industries to achieve coverage and compliance without compromise.

**Here is a small selection of some of our most recent indoor wireless case studies:**

#### BRINGING 5G TO HONG KONG

**Overview:** Hong Kong International Airport (HKIA) required an upgrade to its wireless communication infrastructure as part of the region's push to 5G.

**Solution:** RFS took care of all cabling requirements using a combination of RADIAFLEX and CELLFLEX solutions. This included developing a specific 1¼ inch cable operational up to 3.8GHz and tailoring indoor devices to address frequencies ranging from 617MHz to 6000MHz to meet spectrum requirements. The upgraded wireless infrastructure contributed to Airport Authority HK being awarded the Gold Award for "Best Innovation for Future Enterprise" in the CAHK Star Awards 2021.



#### SECURE AND SAFE CONNECTIVITY FOR A MANUFACTURING WORLD LEADER

**Overview:** TSMC, the world leader in semiconductor manufacturing, needed a highly secure network across all its manufacturing and R&D facilities, with fire safety and security as its top priorities.

**Solution:** RFS supplied complete indoor coverage solutions, which comprised of RADIAFLEX radiating cable, fire-resistant cable, connectors, and passive components. This combination of solutions allowed RFS to build a highly secured MVPN to meet the needs of TSMC, with the RFS solution now in place at TSMC's facilities around the world.



#### COMPLETE CONNECTIVITY FOR ONE OF THE UK'S LARGEST WAREHOUSES

**Overview:** One of the UK's largest warehouses spanning 400,000 m2, needed to upgrade its connectivity infrastructure to ensure the mission-critical coverage needed to keep the facility and its staff safe.

**Solution:** RFS worked with the customer to deliver a two-part solution. RADIAFLEX radiating cable overcame the challenges the customer faced trying to achieve complete coverage in the storage space within the warehouse, while a DAS system provided complete coverage in the open loading areas of the site.



## PROOF BY EXAMPLE CASE STUDIES & REFERENCES



### RFS RADIAFLEX RADIATING CABLE FOR WUHAN METRO

**Overview:** Wuhan Metro is one of the world's largest metro systems, spanning nearly 500 kilometers and over 300 stations, and needs robust mission-critical communication equipment to ensure safety.

**Solution:** Since 2007, RFS's RADIAFLEX radiating cable technology has been integrated into the TETRA and signaling systems of the Wuhan Metro, supporting efficient and safe communications across six lines. RFS has installed nearly 600 kilometers of radiating cables, playing a crucial role in Wuhan Metro's rapid expansion, and in 2024, was awarded the signal system project for the extension of Line 11.



### SPECIALIZED MINING CABLES IN GREECE

**Overview:** A mine operator in Greece needed support deploying communications equipment to meet their connectivity requirements as they developed and expanded multiple copper and gold mines.

**Solution:** RFS has been supplying specialized cables and accessories to support the infrastructure for these mines since 2013. After a pause, the project has resumed, and RFS has delivered 15 km of specialized mining cables to the project so far. This includes robust feeder cables for the main tunnels and more flexible cables for the lateral tunnels. With the mines expected to operate for at least 15 more years, RFS has delivered long-life and reliable solutions that meet the deployment needs.



### CONNECTED SECURITY FOR MANUFACTURING FACILITY

**Overview:** A manufacturing facility needed mission-critical connectivity to underpin its connected safety and security systems.

**Solution:** RFS was able to deliver a mission-critical HYBRIFLEX solution with build-in contingency to ensure constant connectivity that met the deployment needs. The deployment combined a single hybrid cable and a single, uninterruptible power supply to deliver traditional Ethernet services as well as mission-critical wireless services. The solution provided the high reliability and power supply security needed to support mission-critical wireless applications, in this instance, CCTV cameras and remote IoT devices that form part of the security system.





# RADIO FREQUENCY SYSTEMS

**TO SERVE YOU BETTER**

Any questions, comments or suggestions that would help us improve our products and services? **Scan this QR Code!**