



# Radioline

Easy startup at the turn of a wheel

# Radioline

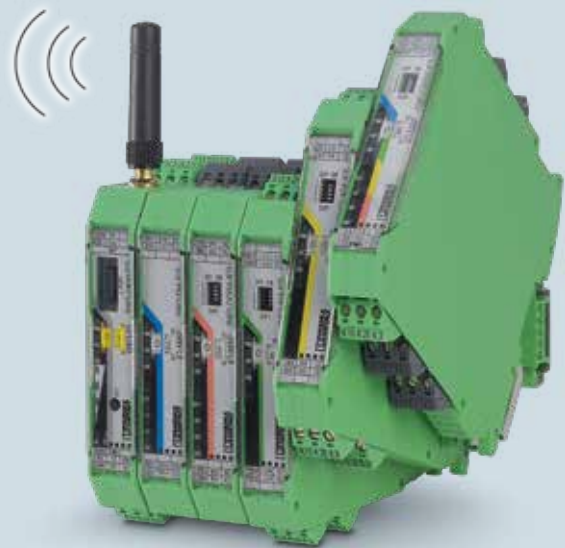
## Solutions for inside and outside of the cabinet

The Radioline system makes it possible to transmit data and signals over several miles. A powerful 900 MHz radio module provides robust and reliable wireless communication, and a 2.4 GHz option allows operation worldwide. Multiple housing options provide the ability for the user to quickly install units inside or outside the cabinet.



**The Trusted Wireless 2.0 wireless technology was specially developed for industrial use. It features:**

- Reliable communication via the frequency hopping spread spectrum (FHSS)
- Excellent coexistence features
- Self-healing network structures
- Secure data encryption according to AES and authentication
- Long ranges thanks to high receiver sensitivity and variable data transmission speeds
- Extensive diagnostic properties



### **Modular din rail mount customizing applications**

- Din rail mounted wireless module with expandable IO
- Up to 32 IO expansion modules per wireless module
- Hot swappable IO reduces down time
- Channel-to-channel isolation reduces inaccurate measurements
- Supports both IO and serial communication
- Multifunctional wireless module reduces the need for multiple part numbers

### **NEMA4X version for quick and simple installation**

- All-in-one 900 MHz wireless module in a NEMA4X housing with built-in IO and antenna
- Two half-inch NPT conduit glands allow power and data isolation
- Universal AC/DC power supply allows flexible power option
- Wide range -40 to 70 deg C temperature range
- Simple thumbwheel configuration for easy IO communication



### **Radioline modules for worldwide use:**



#### **Radioline wireless module 900 MHz**

- Can be used in the 900 MHz license-free frequency band (North and South America and Canada)
- Wireless module with 10 ... 30 dBm output power and particularly high receiver sensitivity
- Superhet receiver with additional level of filtering and frequency conversion for particularly high noise immunity and improved coexistence
- Adjustable wireless data transmission speed, 16 ... 500 kBit/s



#### **Radioline 2.4 GHz wireless module**

- Can be used worldwide in the license-free 2.4 GHz frequency band
- Wireless module with 0 ... 20 dBm output power and particularly high receiver sensitivity
- Adjustable wireless data transmission speed, 16 ... 250 kBit/s

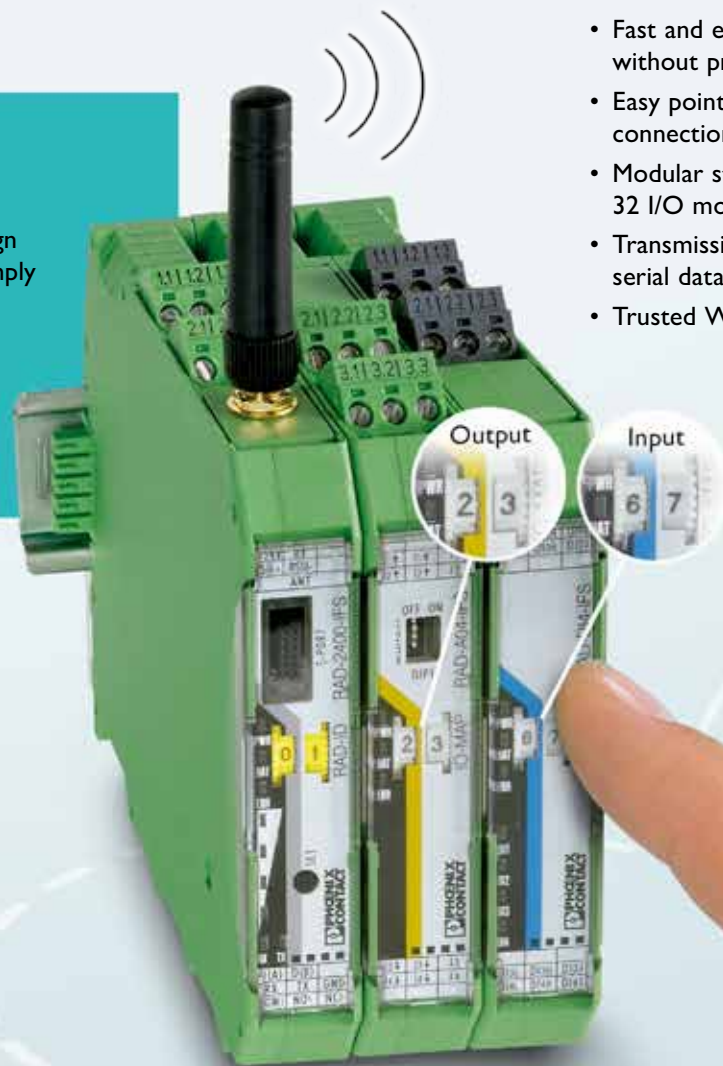
# The Radioline wireless system

## Distribute signals easily with I/O mapping

Radioline is the wireless system from Phoenix Contact for extended systems and networks for up to 250 stations. Special features include extremely easy assignment of inputs and outputs (I/O) by simply turning the thumbwheel – without any programming. Thanks to the latest Trusted Wireless technology, Radioline is the ideal choice for industrial use.

### What advantages does I/O mapping offer?

I/O mapping simplifies signal distribution in your system. Assign inputs and outputs quickly by simply turning the thumbwheel. In this way, you can distribute and multiply I/O signals freely in your network – without the need for any complex programming.



### Radioline features:

- Fast and easy startup without programming
- Easy point-to-point or network connections (line, star, mesh)
- Modular station structure with up to 32 I/O modules per station via T-bus
- Transmission of I/O signals and serial data
- Trusted Wireless 2.0 technology





**The I/O extension modules feature:**

- Easy I/O mapping via the thumbwheel on the front with no need for programming
- Easy module replacement even during operation (hot-swappable)
- Channel-to-channel electrical isolation
- Extended temperature range: -40°C to +70°C

**It's easy with Radioline:**



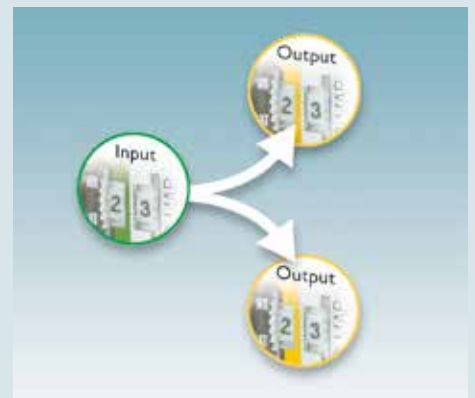
**Easy installation**

Create a modular wireless station in the control cabinet and extend or replace it easily during operation.



**Easy addressing**

Set the address on the wireless module by simply turning the thumbwheel.

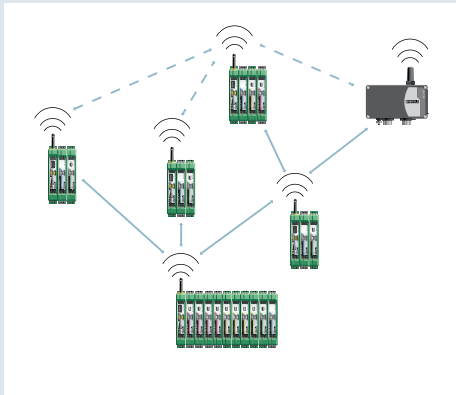


**Easy distribution**

On the I/O module, the thumbwheel is also used to assign the inputs and outputs, thereby easily distributing the I/O signals in the system.

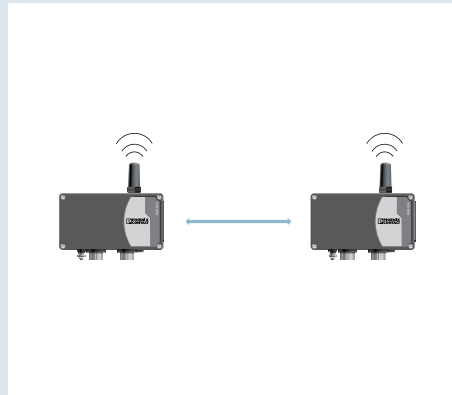
# More flexibility for all applications

## Signal transmission with the Radioline wireless system



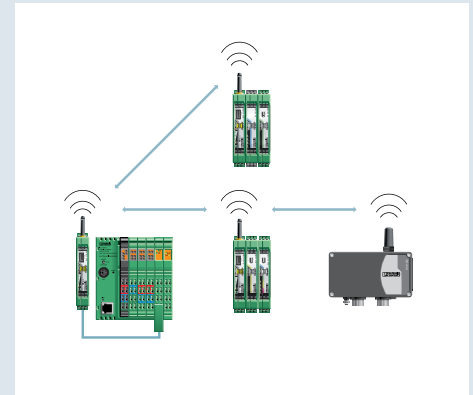
### I/O to I/O

Radioline enables easy I/O signal distribution throughout the network, as well as the creation of various network structures – from a simple point-to-point connection to complex networks.



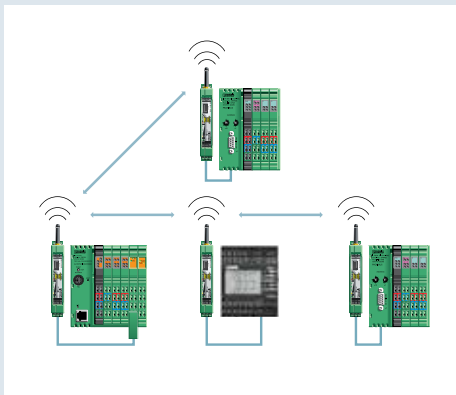
### Outdoor I/O to I/O

Using two of the outdoor Radioline modules, a simple point-to-point I/O link can be established.



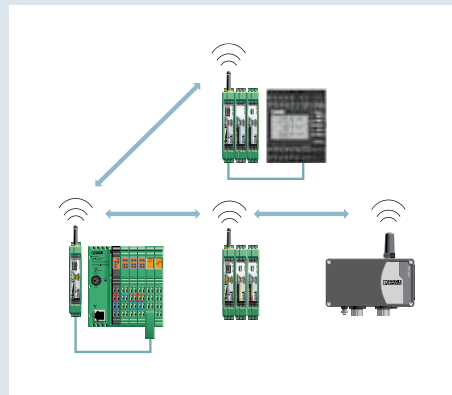
### I/O to serial (Modbus RTU)

With Radioline, I/O modules can be connected to the controller directly via the integrated RS-232 and RS-485 interfaces by means of wireless communication using the Modbus protocol.



### Serial to serial (transparent)

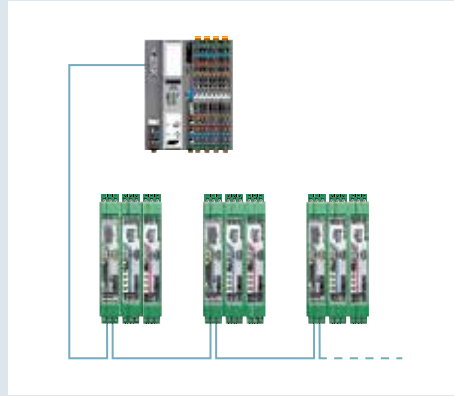
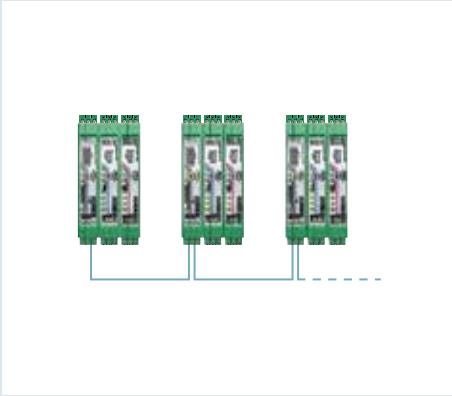
Radioline can be used to network multiple controllers or serial I/O devices quickly and easily using wireless technology. In this way, serial RS-232/RS-485 cables can be replaced.



### Dual mode (Serial + I/O)

Dual mode provides simultaneous serial and I/O module mapping over a Radioline network via Modbus. Serial Modbus devices and Radioline I/O modules, via T-bus, can be transmitted simultaneously over the Radioline wireless network.

## Signal transmission with the Radioline RS-485 bus module



### I/O to I/O

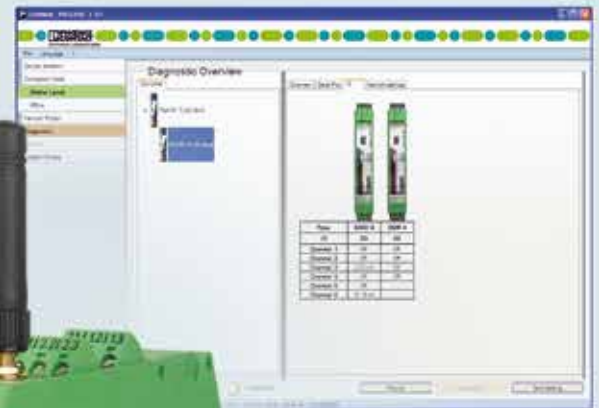
With the Radioline multipoint multiplexer, I/O signals can be distributed to various stations with ease via an RS-485 2-wire line.

### I/O to serial (Modbus RTU)

Using the RS-485 interface, it is possible to address any Radioline station via the Modbus RTU protocol. This allows the equipment to be used in any Modbus network.

## Advanced configuration and diagnostic options

To operate multiple networks securely in parallel, use unique network addressing with a plug-in configuration memory. User-friendly software enables comprehensive diagnostics of all network devices via the master, as well as enabling advanced network parameter settings.



# Product range and accessories

The Radioline wireless system consists of wireless modules for the 2.4 GHz and 900 MHz frequency ranges. The Radioline extension modules enable the transmission of digital and analog signals, as well as temperature signals.

Matching accessories are also available.



## International Ex approval

The 2.4 GHz wireless and extension modules are certified according to 94/9/EC (ATEX) directives and can therefore be used internationally in potentially explosive areas.

## I/O extension modules – can be used on all front modules

### Digital extension modules with 4 channels



**RAD-DI4-IFS**  
Order No. 2901535  
**RAD-DOR4-IFS**  
Order No. 2901536

- 4 digital wide-range inputs: 0 ... 250 V AC/DC
- 4 digital relay outputs: 24 V DC/250 V AC/5 A
- Extended temperature range: -40°C to +70°C

### Digital extension modules with 8 channels










**RAD-DI8-IFS**  
Order No. 2901539  
**RAD-DO8-IFS**  
Order No. 2902811

- 8 digital inputs: 0 ... 30.5 V DC
- 2 pulse inputs: 100 Hz, 32 bit
- 8 digital transistor outputs: 30.5 V DC/200 mA
- Extended temperature range: -40°C to +70°C



## Front modules – can be extended with I/O extension modules\*


900 MHz wireless module	900 MHz wireless module	2.4 GHz wireless module	RS-485 bus module
			
<p><b>RAD-900-IFS</b> Order No. 2901540</p> <ul style="list-style-type: none"> <li>• Supply voltage: 10.8 ... 30.5 V DC</li> <li>• Extended temperature range: -40°C to +70°C</li> <li>• Antenna connection: RSMA (female)</li> <li>• For use in North and South America and Canada</li> <li>• Range: up to 20 miles</li> </ul>	<p><b>RAD-900-DAIO6</b> Order No. 2702877</p> <p>Supply voltage: Selectable: 10.8-30.5 V DC or 100-240 V AC</p> <ul style="list-style-type: none"> <li>• Extended temperature range: -40°C to +70°C</li> <li>• Antenna connection: N (female)</li> <li>• For use in North and South America and Canada</li> <li>• Range: up to 20 miles</li> <li>• NEMAX housing On board IO-2 DI, 2 DO, 1AI, 1AO</li> </ul> <p>* The RAD-900-DAIO6 is not expandable</p>	<p><b>RAD-2400-IFS</b> Order No. 2901541</p> <p>Supply voltage: 19.2 ... 30.5 V DC</p> <ul style="list-style-type: none"> <li>• Extended temperature range: -40°C to +70°C</li> <li>• Antenna connection: RSMA (female)</li> <li>• Worldwide use</li> <li>• Range: up to 1 mile</li> </ul>	<p><b>RAD-RS485-IFS</b> Order No. 2702184</p> <p>Supply voltage: 19.2 ... 30.5 V DC</p> <ul style="list-style-type: none"> <li>• Extended temperature range: -40°C to +70°C</li> <li>• RS-485 2-wire connection (screw terminal block)</li> <li>• Worldwide use</li> </ul>

Analog/digital extension module	Analog extension modules	Pt100 extension module
		
<p><b>RAD-DAIO6-IFS</b> Order No. 2901533</p> <ul style="list-style-type: none"> <li>• 1 analog input: alternatively 0/4 ... 20 mA</li> <li>• 1 analog output: alternatively 0/4 ... 20 mA, 0 ... 10 V DC</li> <li>• 2 digital wide-range inputs/outputs: 0 ... 250 V AC/DC</li> <li>• Extended temperature range: -40°C to +70°C</li> </ul>	<p><b>RAD-AI4-IFS</b> Order No. 2901537</p> <p><b>RAD-AO4-IFS</b> Order No. 2901538</p> <ul style="list-style-type: none"> <li>• 4 analog inputs: alternatively 0/4 ... 20 mA</li> <li>• 4 analog outputs: alternatively 0/4 ... 20 mA, 0 ... 10 V DC</li> <li>• Extended temperature range: -40°C to +70°C</li> </ul>	<p><b>RAD-PT100-4-IFS</b> Order No. 2904035</p> <ul style="list-style-type: none"> <li>• 4 Pt100 inputs</li> <li>• Temperature measuring range: -50°C to +250°C</li> <li>• 2- or 3-wire connection</li> <li>• Extended temperature range: -40°C to +70°C</li> </ul>


## Radioline – Antennas, cables, and accessories

### Antennas


#### 900 MHz


	Type	Gain	Connection	Order No.	Description
	Omnidirectional antenna	2 dBi	RSMA (male)	2885676	RAD-ISM-900-ANT-OMNI-RPSMA
	Omnidirectional antenna	2 dBi	RSMA (male)	2904801	RAD-900-ANT-OMNI-2-2-RSMA
	Omnidirectional antenna	2 dBi	N (female)	2904802	RAD-900-ANT-OMNI-2-N
	Omnidirectional antenna	7 dBi	N (female)	2867199	RAD-ISM-900-ANT-OMNI-5
	Omnidirectional antenna	8 dBi	N (female)	2885579	RAD-ISM-900-ANT-OMNI-FG-6-N
	Yagi directional antenna	5 dBi	N (female)	2867801	RAD-ISM-900-ANT-YAGI-3-N
	Yagi directional antenna	8.5 dBi	N (female)	2867814	RAD-ISM-900-ANT-YAGI-6.5-N
	Yagi directional antenna	12 dBi	N (female)	5606614	RAD-ISM-900-ANT-YAGI-10-N

#### 2.4 GHz


	Type	Gain	Connection	Order No.	Description
	Omnidirectional antenna	2 dBi	RSMA (male)	2701362	RAD-ISM-2400-ANT-OMNI-2-1-RSMA
	Omnidirectional antenna	3 dBi	RSMA (male)	2701358	RAD-ISM-2400-ANT-VAN-3-0-RSMA
	Omnidirectional antenna	6 dBi	N (female)	2885919	RAD-ISM-2400-ANT-OMNI-6-0
	Panel antenna	9 dBi	N (female)	2701186	ANT-DIR-2459-01
	Parabolic panel antenna	19 dBi	N (female)	2867885	RAD-ISM-2400-ANT-PAR-19-0

## Antenna cables

N (male) to N (male)				
	Length	Frequency	Order No.	Description
	10 ft. (3 m)	900 MHz/2.4 GHz	5606124	RAD-CAB-PFP240-10
	20 ft. (6 m)	900 MHz/2.4 GHz	5606125	RAD-CAB-PFP400-20
	25 ft. (7.6 m)	900 MHz/2.4 GHz	5606126	RAD-CAB-PFP500-25
	50 ft. (15.2 m)	900 MHz	2867225	RAD-CAB-RG213-50
	80 ft. (24.4 m)	900 MHz	2867393	RAD-CAB-PFP400-80
	100 ft. (30.5 m)	900 MHz	2867238	RAD-CAB-PFP400-100
	125 ft. (38 m)	900 MHz	2885171	RAD-CAB-PFP400-125
	150 ft. (45.7 m)	900 MHz	2885184	RAD-CAB-PFP400-150

RSMA (male) to N (male)				
	Length	Frequency	Order No.	Description
	1.5 ft. (0.5 m)	900 MHz/2.4 GHz	2903263	RAD-PIG-RSMA/N-0.5
	3 ft. (1 m)	900 MHz/2.4 GHz	2903264	RAD-PIG-RSMA/N-1
	6 ft. (2 m)	900 MHz/2.4 GHz	2903265	RAD-PIG-RSMA/N-2
	10 ft. (3 m)	900 MHz/2.4 GHz	2903266	RAD-PIG-RSMA/N-3
	16.5 ft. (5 m)	900 MHz/2.4 GHz	2702140	RAD-PIG-RSMA/N-5

## Accessories and surge suppression

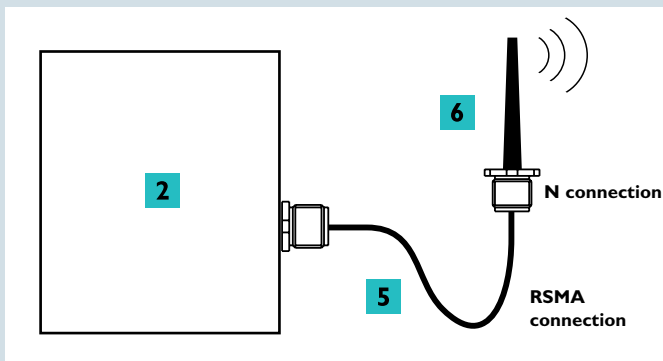
	Type	Frequency	Order No.	Description
	Antenna surge suppressor N(f)-N(f)	0-6 GHz	2803166	CN-UB-70DC-6-BB
	Antenna surge suppressor N(m) - N(f)	0-6 GHz	2803153	CN-UB-70DC-6-SB
	Configuration stick	2.4 GHz	2902814	RAD-CONF-RF3
	Configuration stick	2.4 GHz	2902815	RAD-CONF-RF5
	Configuration stick	2.4 GHz	2902816	RAD-CONF-RF7
	Configuration stick	900 MHz	2702122	RAD-900-CONF-RF1
	Memory stick	900 MHz/2.4 GHz/RS-485	2902828	RAD-MEMORY
	USB cable	900 MHz/2.4 GHz/RS-485	2903447	RAD-CABLE-USB
	Sealing tape		2903182	RAD-TAPE-SV-19-3

# Antenna installation

## Principles and technology

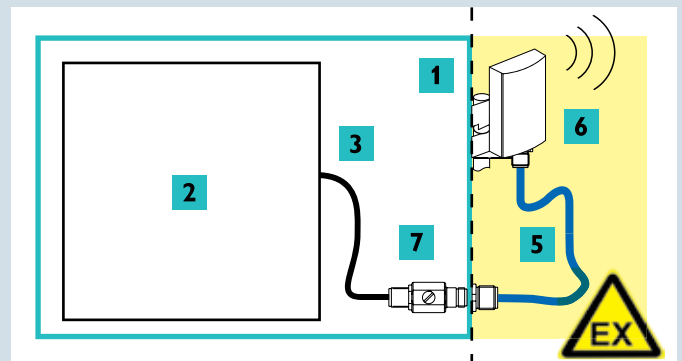
It goes without saying that we also offer the necessary accessories for using our wireless product range indoors and outdoors.

All components are designed for industrial use and therefore operate just as safely and reliably as the wireless modules.



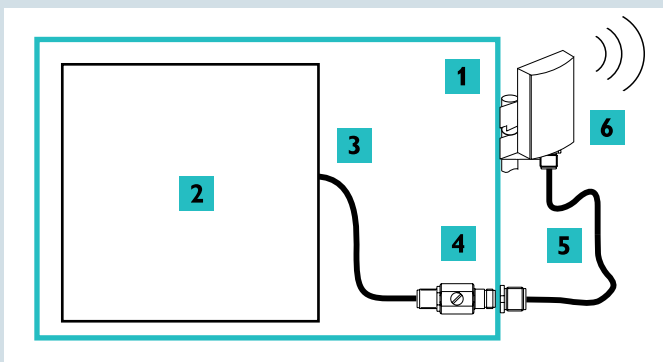
### Simplified antenna connection

All wireless modules with an RSMA connection are connected directly to the N connection of the antennas via a cable. Cable lengths vary between 1.5 ft. (0.5 m) and 16.5 ft. (5 m).



### Installation in a Class I Division 1 area

The antenna adapter maintains the explosion-proof integrity of the cabinet, allowing wireless module installation in UL Class I Division 1 areas. The adapter acts as a cabinet bulkhead while keeping a watertight IP66 seal.



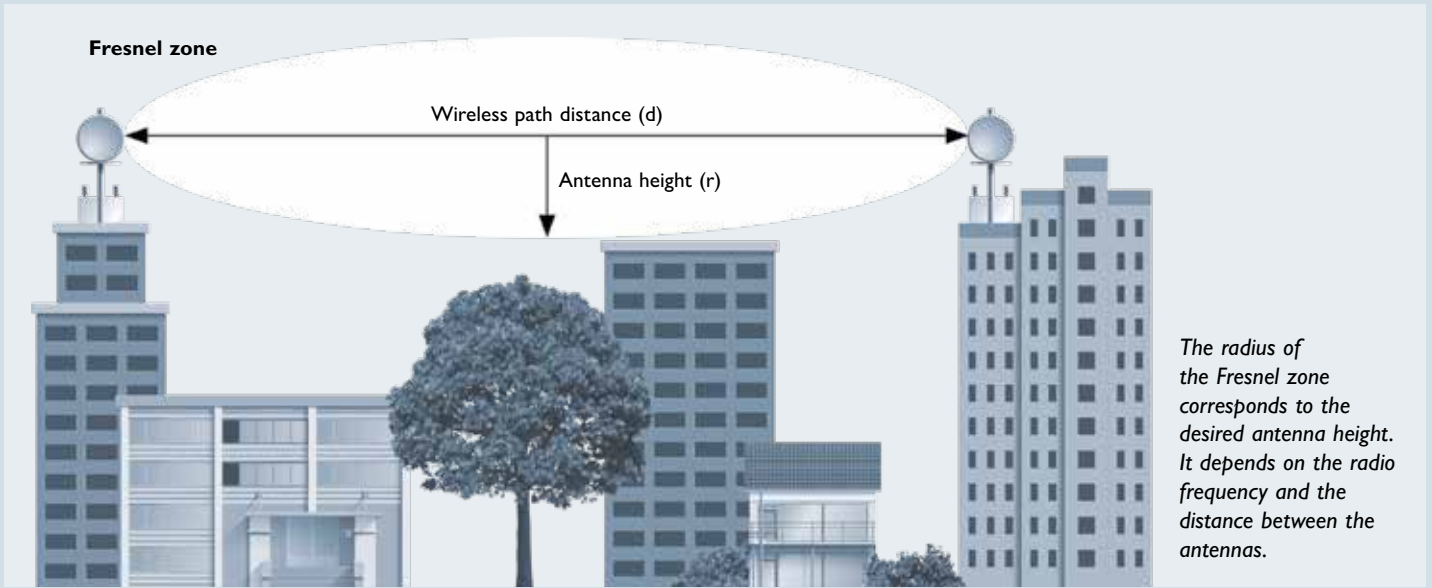
### Installation in an IP54 control box

Inside the control box, wireless modules are connected to the surge protection by means of an RSMA connection. The surge protection also functions as a panel feed-through. Additionally, extension cables with an N connection at both ends are used.

- |                    |                          |
|--------------------|--------------------------|
| 1 Control box      | 5 Antenna cable          |
| 2 Wireless module  | 6 Antenna                |
| 3 Adapter cable    | 7 Class I Div. 1 adapter |
| 4 Surge protection |                          |



## Planning a radio link



There should be a line of sight, especially in the event of longer distances, between the antennas of the wireless devices.

To keep the Fresnel zone free from any obstacles, it may be necessary to mount the antennas a few meters high. This area should also be free from any other obstacles.

### Obstacles outside or inside buildings

The wireless path may work even if obstacles (house, tree, etc.) are within the Fresnel zone. The decisive factor is the number of obstacles and the area they occupy in this zone.

In this case, it is recommended that you perform test measurements. Inside buildings, in conventional automation environments, there is a predominance of reflections, which do not occur outdoors. They contribute to a good wireless connection even if the Fresnel zone is not free from obstacles.

Wireless path distance (d)	Antenna height (r) 900 MHz	Antenna height (r) 2.4 GHz
1500 ft.	20 ft.	12 ft.
1 mile	40 ft.	25 ft.
3 miles	65 ft.	-
5 miles	85 ft.	-
10 miles	120 ft.	-
20 miles	175 ft.	-

Radius of the Fresnel zone depending on the frequency and distance. This gives the mounting height for wireless devices (antennas).

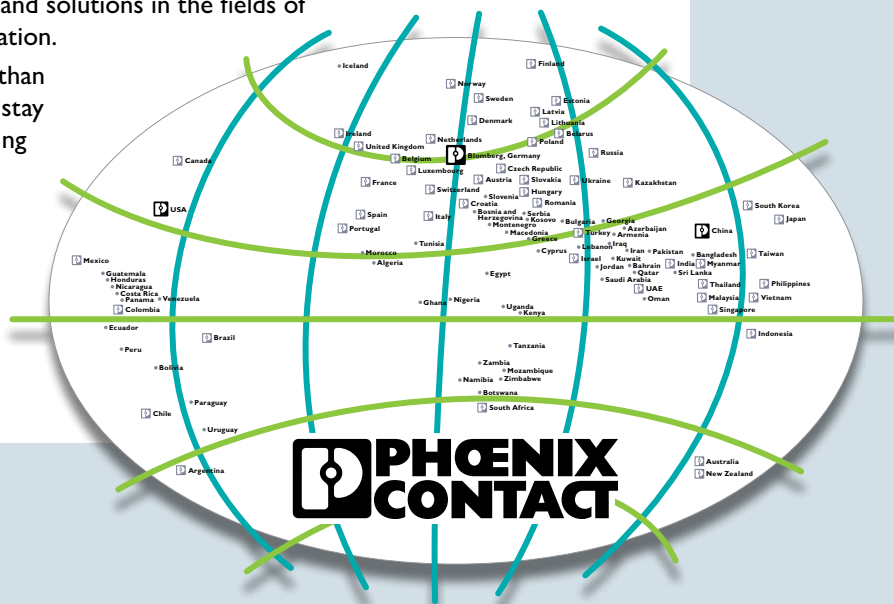




## Ongoing communication with customers and partners worldwide

Phoenix Contact is a global, market leader based in Germany. Our group is known for its future-oriented components, systems, and solutions in the fields of electrical engineering, electronics, and automation.

With a global network reaching across more than 100 countries and 14,500 employees, we can stay in close contact with our customers, something we believe is essential to success. The wide variety of our innovative products makes it easy for our customers to find future-oriented solutions for multiple applications and industries. We especially focus on the fields of energy, infrastructure, process, and factory automation.



You will find our complete product range at:  
[www.phoenixcontact.com](http://www.phoenixcontact.com)