

Wireless

## Radioline antenna accessories

### Content

- Concept: New antenna assembly for simple access
- Table: product overview

### Examples

- Antennas and assembly
  - RAD-2400-IFS
  - RAD-900-IFS

### Addendum

- Designing a long-distance link
- Antenna installation
- Connectors – technical details



# Radioline

Every new Phoenix Contact wireless device has the RSMA(F) connector



**Wireless module**

RSMA (female) antenna connectors on all new wireless devices



**Antenna - cable**

One cable type (RSMA male – N male) in different lengths (0.5...3 m)



**Antenna**

N (female) connector on antenna

# Antennas and cables for Radioline 2.4 GHz

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Article	RAD-ISM-2400-ANT-OMNI-2-1-RSMA	RAD-ISM-2400-ANT-VAN-3-0-RSMA	ANT-OMNI-2459-02	RAD-ISM-2400-ANT-OMNI-6-0	RAD-ISM-2459-ANT-FOOD-6-0	RAD-ISM-2400-ANT-OMNI-6-0-SW		ANT-DIR-2459-01
Order No.	2701362	2701358	2701408	2885919	2692526	2903219		2701186
Picture								
Frequency	2.4 GHz	2.4 GHz	2.4 GHz	2.4 GHz	2.4 GHz	2.4 GHz		2.4 GHz
Gain	2 dBi	3 dBi	2.5 dBi	6 dBi	>3 dBi	6 dBi		9 dBi
Polarization	Vertical	Vertical	Vertical	Vertical	Vertical	Vertical		Vertical
HPBW horizontal	 360°	 360°	 360° (2,4/5 GHz)	 360°	 360°	 360°		 75° (2.4 GHz) 55° (5 GHz)
HPBW vertical	 75°	 85°	 30°	 30°	 30°	 20°		 55° (2.4 GHz) 55° (5 GHz)
Connector	RSMA (m)	RSMA (m)	N (m)	N (f)	N (f)	N (f)		N (f)
Protection class	IP65	IP55	IP68	IP65	IP68	IP65		IP67
Temperature range	-20...+65°C	-40...+80 °C	-40...+70°C	-40...+75°C	-40...+80°C	-40...+70°C		-40...+80°C
Dimensions	82,5 x 7,8 mm	86 x 43 mm	180 x 23 mm	250 x 22 mm	92 x 52 mm	330 x 20 mm		80 x 101 x 35 mm
	Incl. fixed cable 1,5 m	Fixed cable 1,5 m	Mount on switching cabinet, use cable No. 2701402	Wall and mast mount	Incl. separate cable N/m- SMA/m (needs adapter)	Designed to operate in saltwater environments		Wall and mast mount

HPBW = Half Power Band Width = opening angle

# Antennas and cables for Radioline 2.4 GHz

overview 2/2

Article	RAD-ISM-2400- ANT-PAR-19-0		RAD-PIG-RSMA/N-x	CN-UB-70DC-6-BB	RAD-CAB-LMR**
Order No.	2867885		290326 3 /4 /5 /6	2803166	5606124 /5 /6
Picture					
Frequency	2.4 GHz		Up to 5 GHz	Up to 6 GHz	Up to 6 GHz
Gain	19 dBi		-1.2 dB/m @ 5 GHz	-	-7.6, -3.9, -3.13 dB per 100 feet
Polarization	Vertical		-	-	-
HPBW horizontal	 17°		-	-	-
HPBW vertical	 11°		-	-	-
Connector	N (f)		RSMA (m)- N (m)	N (f) – N (f)	N (m) – N (m)
Protection class	IP65		-	IP68	-
Temperature range	-20...+70°C		-40...+85°C	-40...90°C	-40...105°C
dimensions	610 x 419 mm		0,5 or 1 or 2 or 3 m	24 x 24 x 47 mm	10, 20 and 25 feet
	Wall and mast mount		Cable between wireless module and antenna or surge arrester	Antenna surge suppression	Antenna cables

HPBW = Half Power Band Width = opening angle

# Various antennas for different applications – all using the same connector

Omni 2.4 GHz  
No. 2885919

N (f)

Omni 2.4/5 GHz  
No. 2692526

N (f)

Directional 2.4/5 GHz  
No. 2701186

N (f)

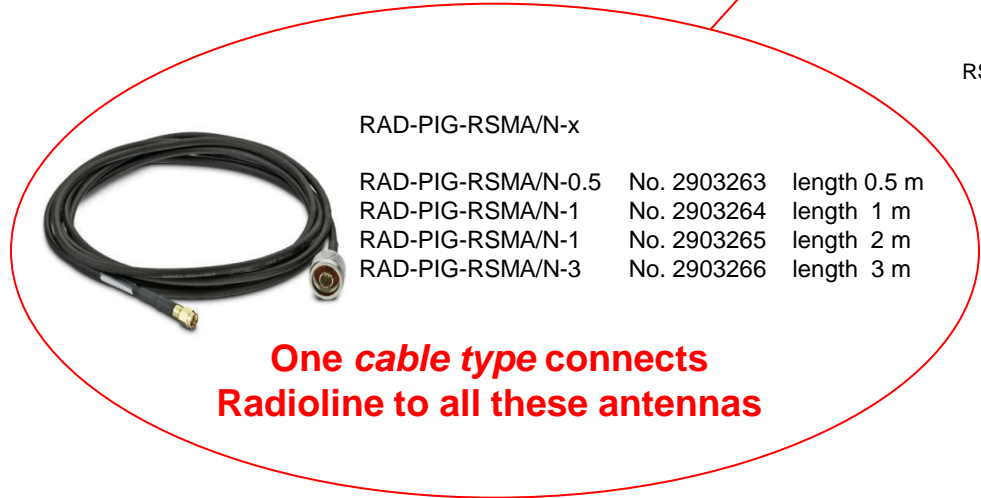
Omni 2.4 GHz saltwater  
No. 2903219

N (f)

N (m)

RSMA (m)

RSMA (f)



**RAD-PIG-RSMA/N-x**

RAD-PIG-RSMA/N-0.5	No. 2903263	length 0.5 m
RAD-PIG-RSMA/N-1	No. 2903264	length 1 m
RAD-PIG-RSMA/N-1	No. 2903265	length 2 m
RAD-PIG-RSMA/N-3	No. 2903266	length 3 m

**One cable type connects Radioline to all these antennas**



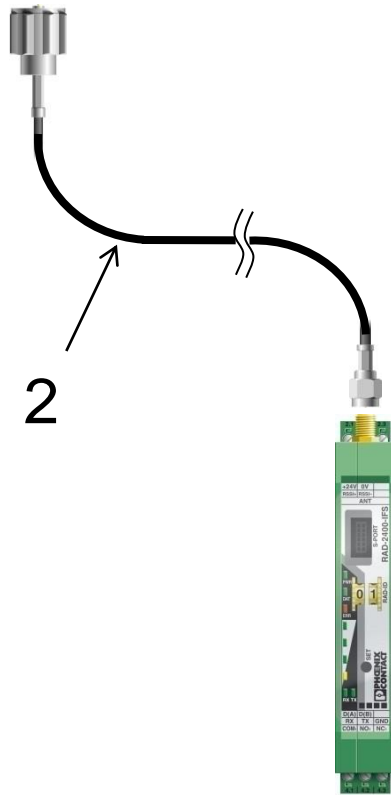
RAD-2400-IFS  
Art. No. 2901541



# Antenna for omnidirectional radiation with improved gain

## Bill of materials

Index	Part number	Part name	Description	Quantity
1	2885919	RAD-ISM-2400-ANT-OMNI-6-0	Omnidirectional antenna with 6 dBi gain 2.4 GHz N(f)	1
2	2903263/4/5/6	RAD-PIG-RSMA/N-0.5/1/2/3	N(m) to RSMA(m) antenna cable 0.5/1/2/3 m	1
3	2901541	RAD-2400-IFS	Radioline 2.4 GHz	1



2.4 GHz

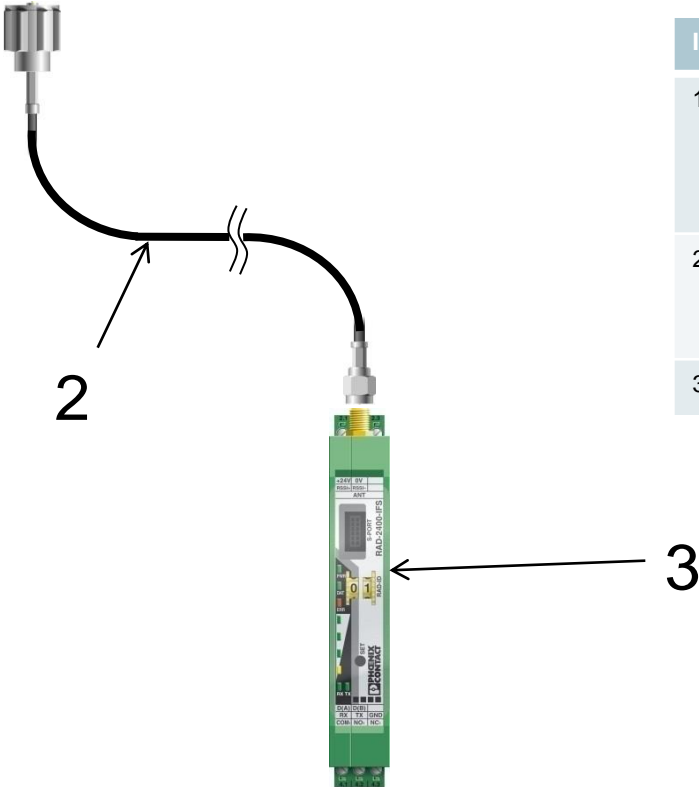
# Antenna for directional radiation with improved gain



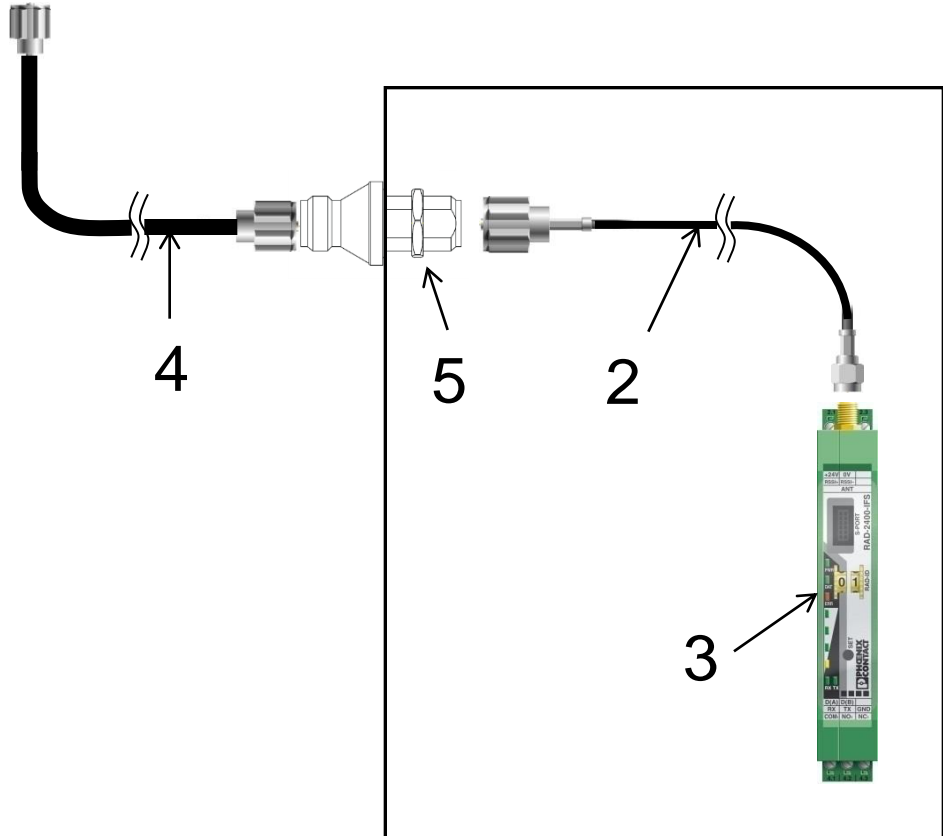
## Bill of materials

Index	Part number	Part name	Description	Quantity
1	2701186	ANT-DIR-2459-01	Panel directional antenna with 9 dBi gain 2.4 GHz IP67 N(f)	1
2	2903263/4/5/6	RAD-PIG-RSMA/N-0.5/1/2/3	N(m) to RSMA(m) antenna cable 0.5/1/2/3 m	1
3	2901541	RAD-2400-IFS	Radioline 2.4 GHz	1

2.4 GHz



# Antenna for directional radiation prolonged cable with surge protection



Mounting inside switching cabinet

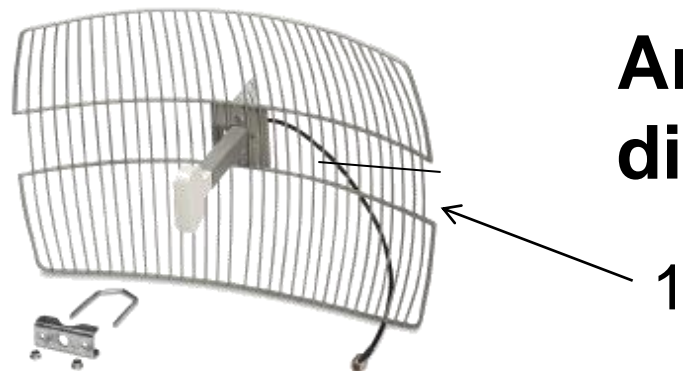
## Bill of materials

Index	Part number	Part name	Description	Quantity
1	2701186	ANT-DIR-2459-01	Panel-directional antenna with 9 dBi gain 2.4 GHz IP67 N(f)	1
2	2903263/4/5/6	RAD-PIG-RSMA/N-0.5/1/2/3	N(m) to RSMA(m) antenna cable 0.5/1/2/3 m	1
3	2901541	RAD-2400-IFS	Radioliner 2.4 GHz	1
4	5606124 5606125 5606126	RAD-CAB-LMR**	N(m) to N(m) antenna cable 10, 20, 25 foot	1
5	2803166	CN-UB-70DC-6-BB	Coaxial surge protection	1

2.4 GHz



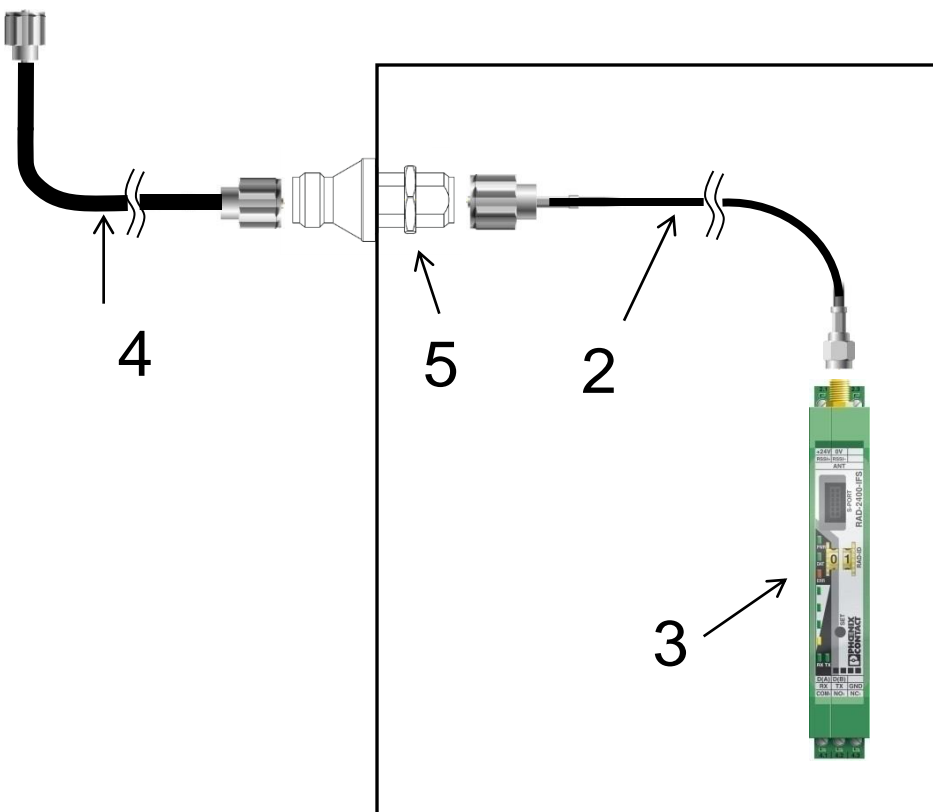
# Antenna for directional long distance communication



## Bill of materials

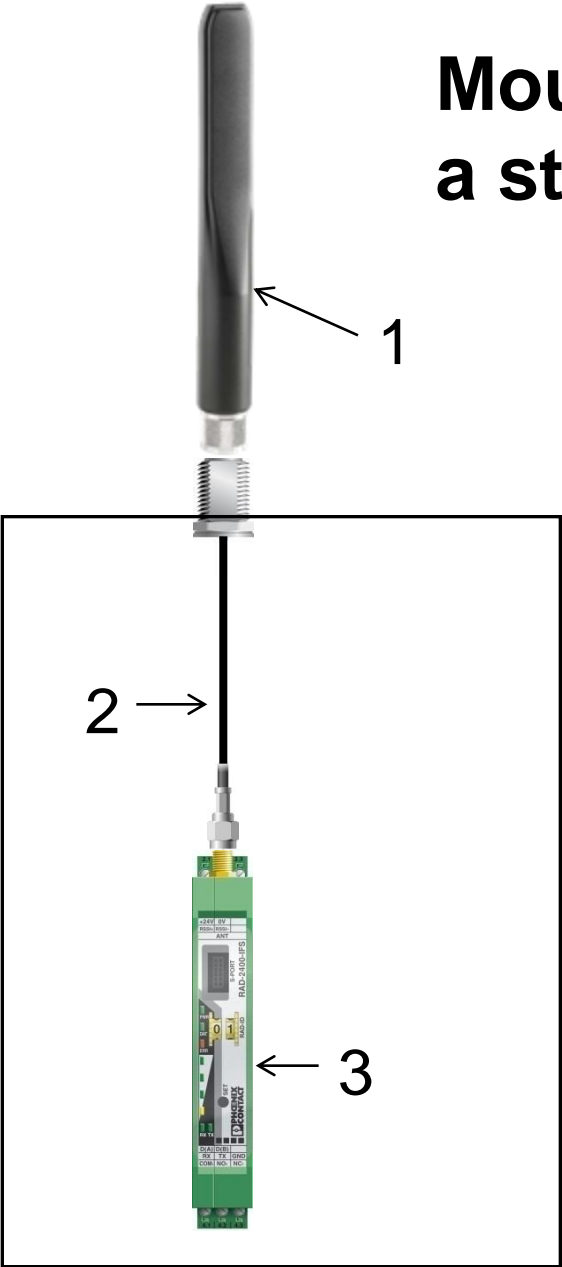
Index	Part number	Part name	Description	Quantity
1	2867885	RAD-ISM-2400-ANT-PAR-19-0	Parabolic antenna with 19 dBi gain 2.4 GHz IP65 N(f)	1
2	2903263/4/5/6	RAD-PIG-RSMA/N-0.5/1/2/3	N(m) to RSMA(m) antenna cable 0.5/1/2/3 m	1
3	2901541	RAD-2400-IFS	Radioline 2.4 GHz	1
4	5606124 5606125 5606126	RAD-CAB-LMR**	N(m) to N(m) antenna cable 10, 20, 25 foot	1
5	2803166	CN-UB-70DC-6-BB	Coaxial surge protection	1

2.4 GHz



Mounting inside switching cabinet

# Mounting the RAD-2400-IFS inside a standard switching cabinet

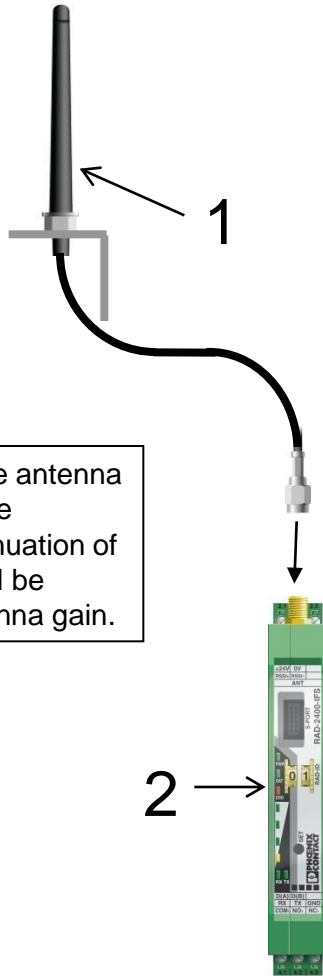


## Bill of materials

Index	Part number	Part name	Description	Quantity
1	2701408	ANT-OMNI-2459-02	Omnidirectional antenna with 2.5 dBi gain, 2.4 GHz, IP68, N(m)	1
2	2701402	RAD-PIG-EF316-N-RSMA	N(f) to RSMA(m) antenna cable (bulkhead)	1
3	2901541	RAD-2400-IFS	Radioline 2.4 GHz	1

2.4 GHz

# Mounting the omnidirectional antenna everywhere with a mounting bracket



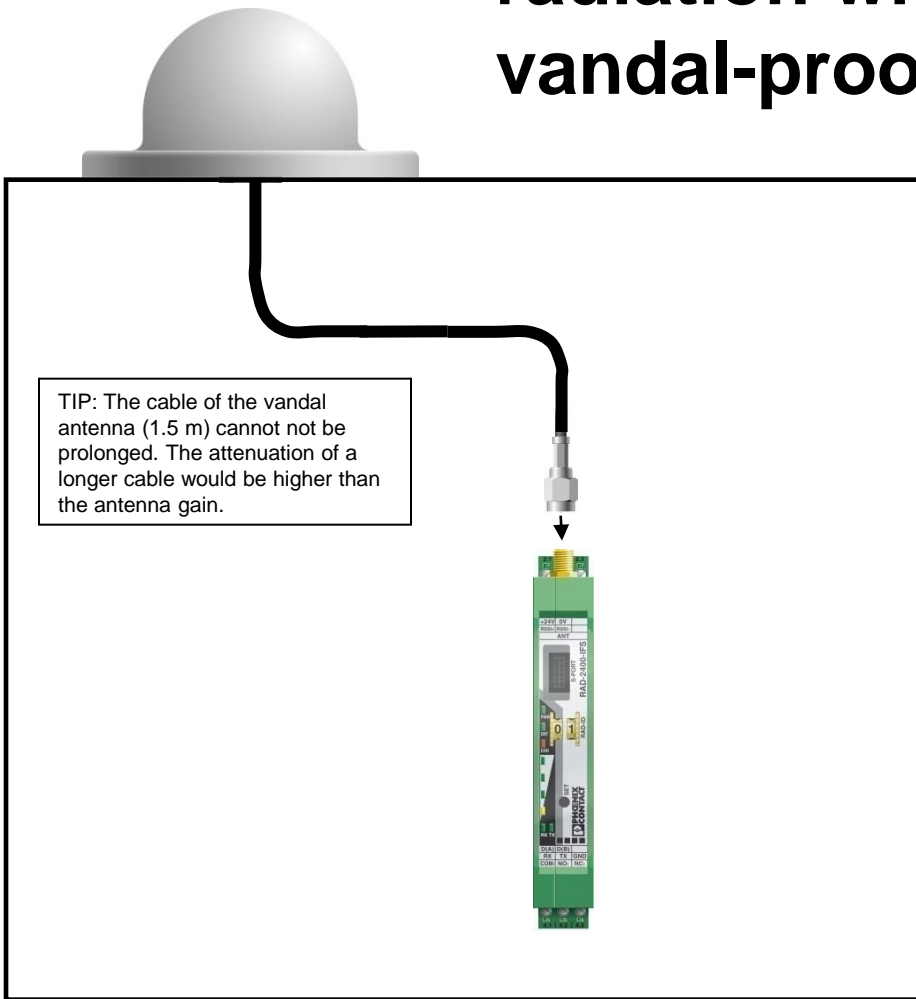
**TIP:** The cable of the antenna (1.5 m) cannot not be prolonged. The attenuation of a longer cable would be higher than the antenna gain.

## Bill of materials

Index	Part number	Part name	Description	Quantity
1	2701362	RAD-ISM-2400-ANT-OMNI-2-1-RSMA	Omnidirectional antenna with 2 dBi gain 2.4 GHz RSMA(m) IP65	1
2	2901541	RAD-2400-IFS	Radioline 2.4 GHz	1

2.4 GHz

# Antenna for omnidirectional radiation with standard gain and vandal-proof design

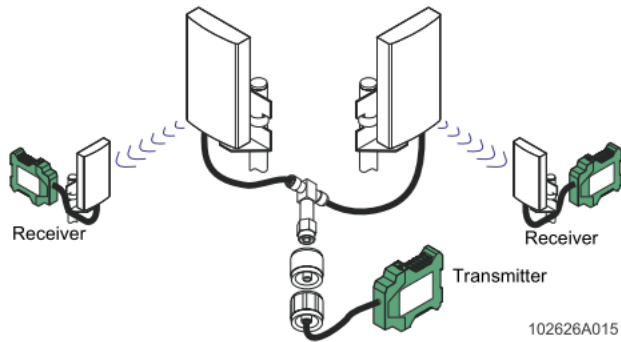


## Bill of materials

Index	Part number	Part name	Description	Quantity
1	2701358	RAD-ISM-2400-ANT-VAN-3-0-RSMA	Omnidirectional antenna with 3 dBi gain 2.4 GHz RSMA(m) IP55	1
2	2901541	RAD-2400-IFS	Radioline 2.4 GHz	1

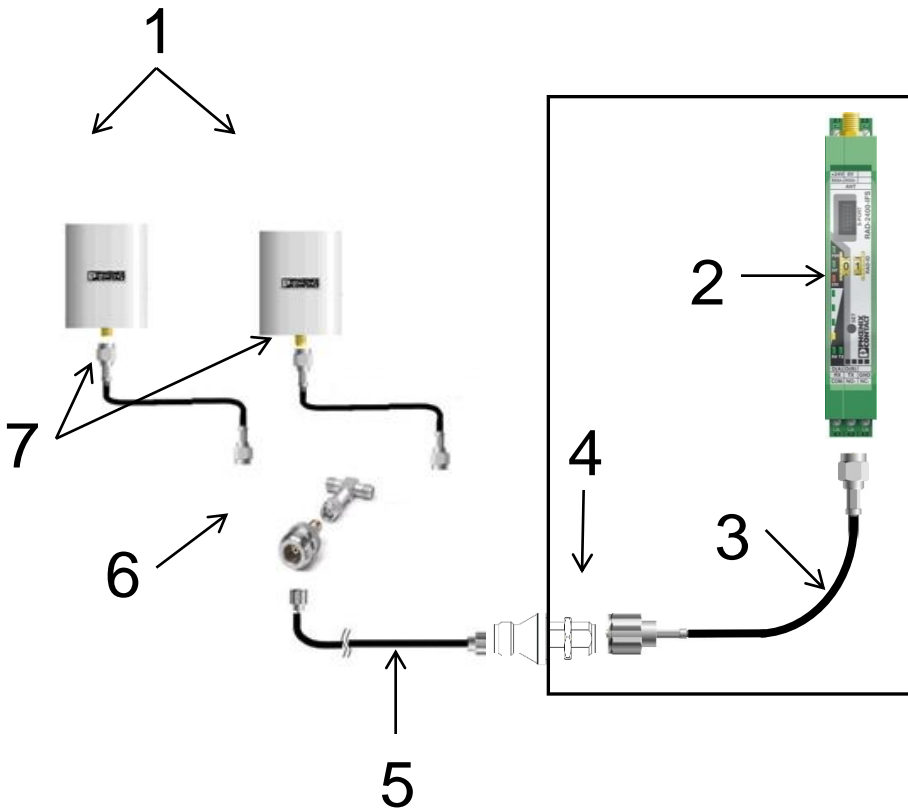
2.4 GHz

# Antenna splitter sets for repeater applications



## Bill of materials

Index	Part number	Part name	Description	Quantity
1	2867610	RAD-ISM-2400-ANT-PAN-8-0	Panel-directional antenna with 8 dBi gain 2.4 GHz SMA(f) IP55	2
2	2901541	RAD-2400-IFS	Radioline 2.4 GHz	1
3	2903263/4/5/6	RAD-PIG-RSMA/N-0.5/1/2/3	Antenna cable N(m) to RSMA(m) 0.5/1/2/3 m	1
4	2803166	CN-UB-70DC-6-BB	Coaxial surge protection	1
5	5606124 5606125 5606126	RAD-CAB-LMR**	N(m) to N(m) antenna cable 10, 20, 25 foot	1
6	2885595	RAD-ISM-2400-SPL-2-SMA	Antenna splitter: 2 SMA(f), 1 SMA(m)	1
7	2885618	RAD-PIG-EF316-SMA-SMA	Antenna cable SMA(m) to SMA(m) 0.5 m	2



2.4 GHz

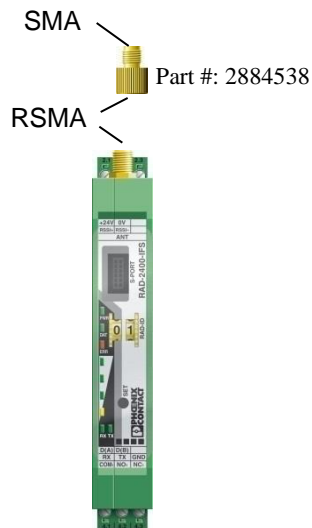
# Can the classic antenna portfolio still be used?

Yes!

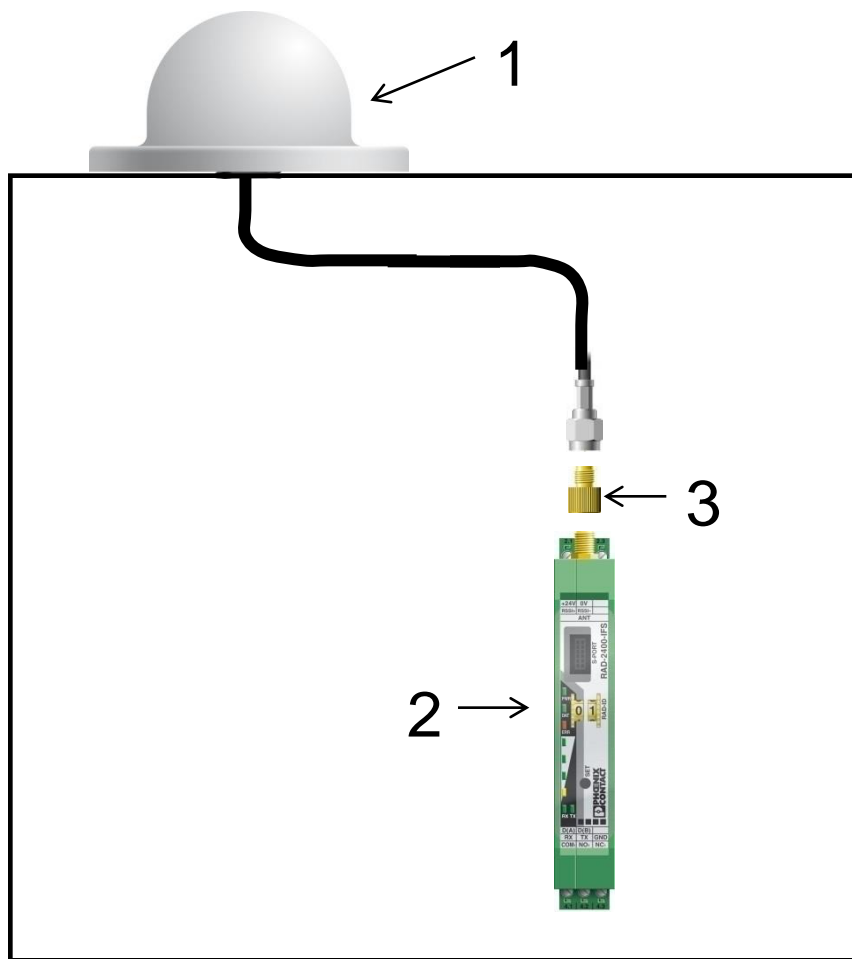
- Match the appropriate antenna with the correct frequency band

2.4 GHz

- One antenna cable adapter changes from RSMA to SMA



# Vandal-proof, omnidirectional antenna mounted on switching cabinet or mobile device

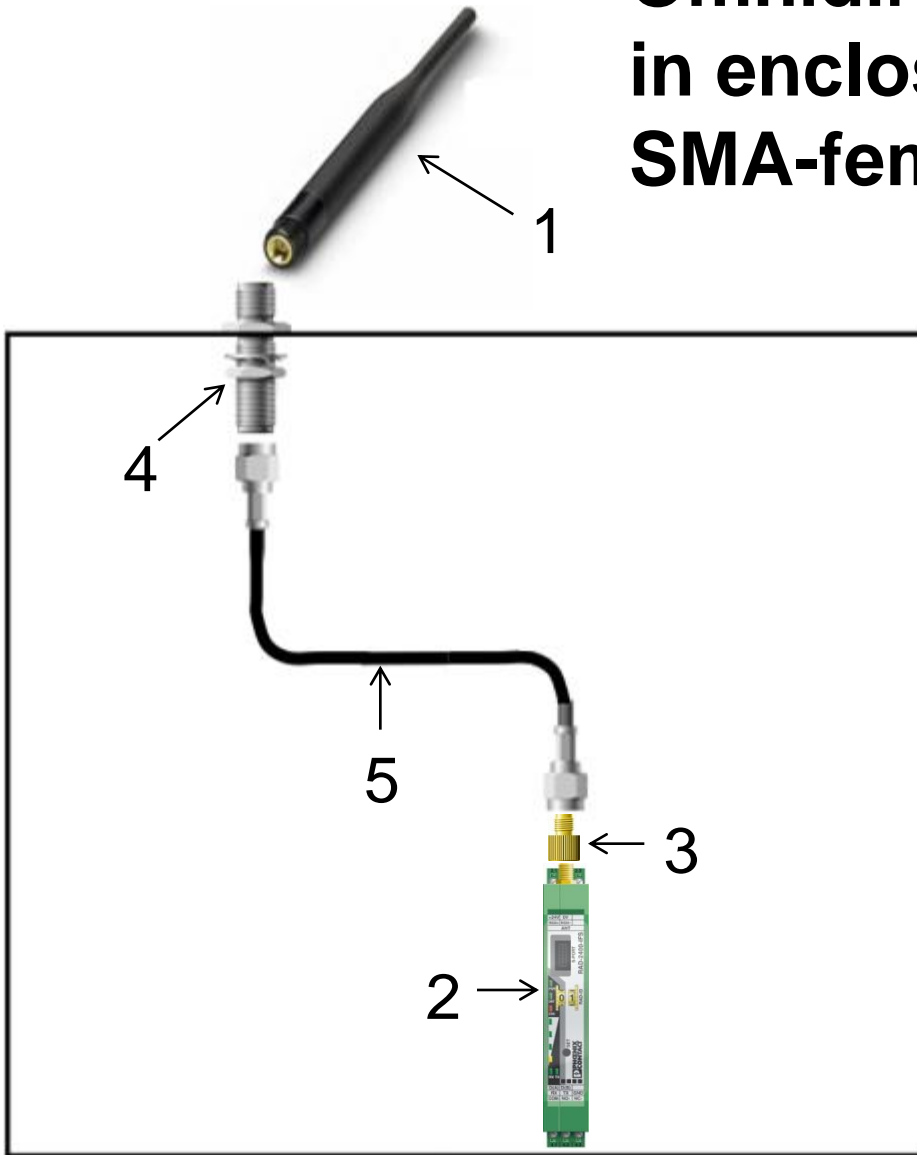


## Bill of materials

Index	Part number	Part name	Description	Quantity
1	2885867	RAD-ISM-2400-ANT-VAN-3-0-SMA	Omnidirectional antenna with 3 dBi gain 2.4 GHz SMA(m) IP55	1
2	2901541	RAD-2400-IFS	Radioline 2.4 GHz	1
3	2884538	RAD-ADP-RSMA/F-SMA/F	Adapter for RSMA(f) to SMA(f)	1

2.4 GHz

# Omnidirectional antenna (5 dBi) in enclosure with SMA-female to SMA-female bulkhead adaptor



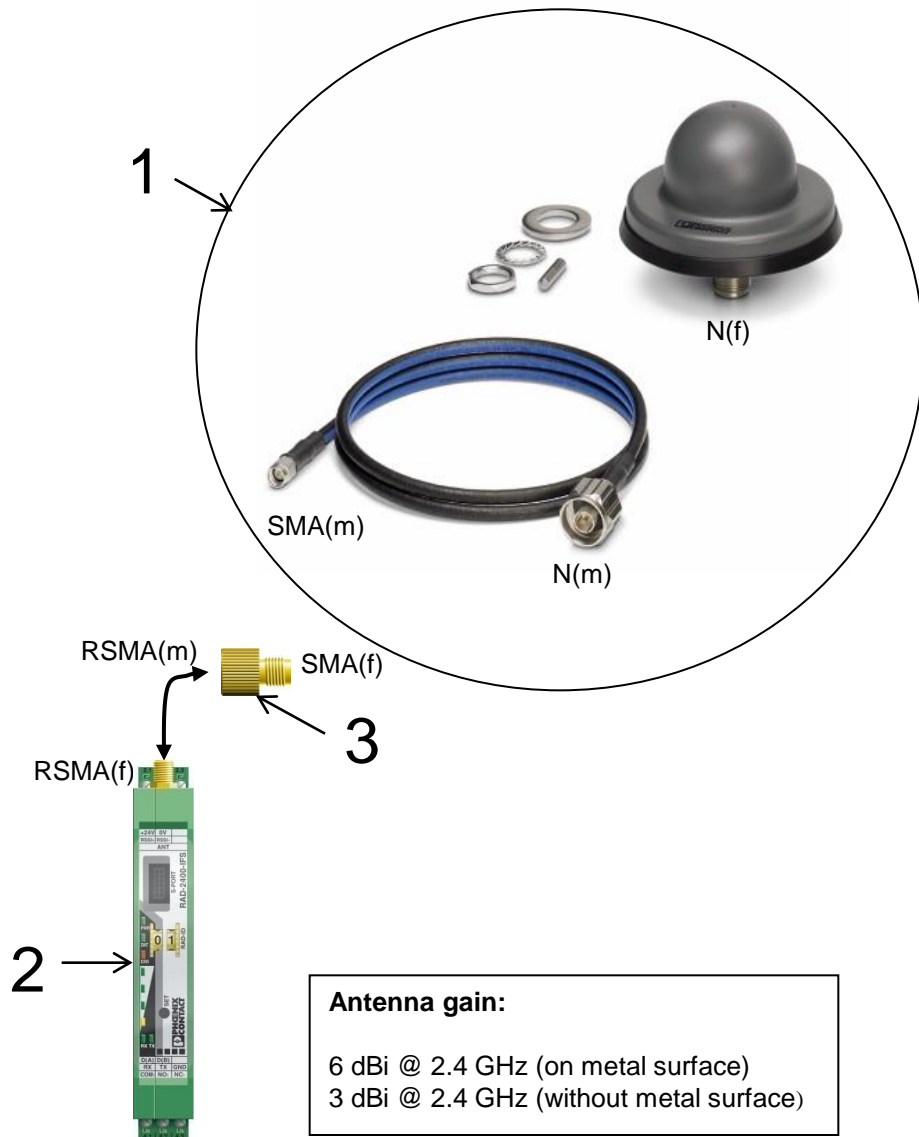
## Bill of materials

Index	Part number	Part name	Description	Quantity
1	2884923	RAD-ISM-2400-ANT-OMNI-5-0	Omnidirectional antenna with 5 dBi gain 2.4 GHz SMA(m) IP55	1
2	2901541	RAD-2400-IFS	Radioline 2.4 GHz	1
3	2884538	RAD-ADP-RSMA/F-SMA/F	Adapter for RSMA(f) to SMA(f)	1
4	2884541	RAD-ADP-SAM/F-SMA/F	Adapter for SMA(F) to SMA(f)	1
5	2885618	RAD-PIG-EF-316-SMA/M-SMA/M	Antenna cable SMA(m) to SMA(m) 0.5 m	1

2.4 GHz



# Vandal-proof, omnidirectional antenna to be mounted on switching cabinet or mobile device: IP68 for food and beverage

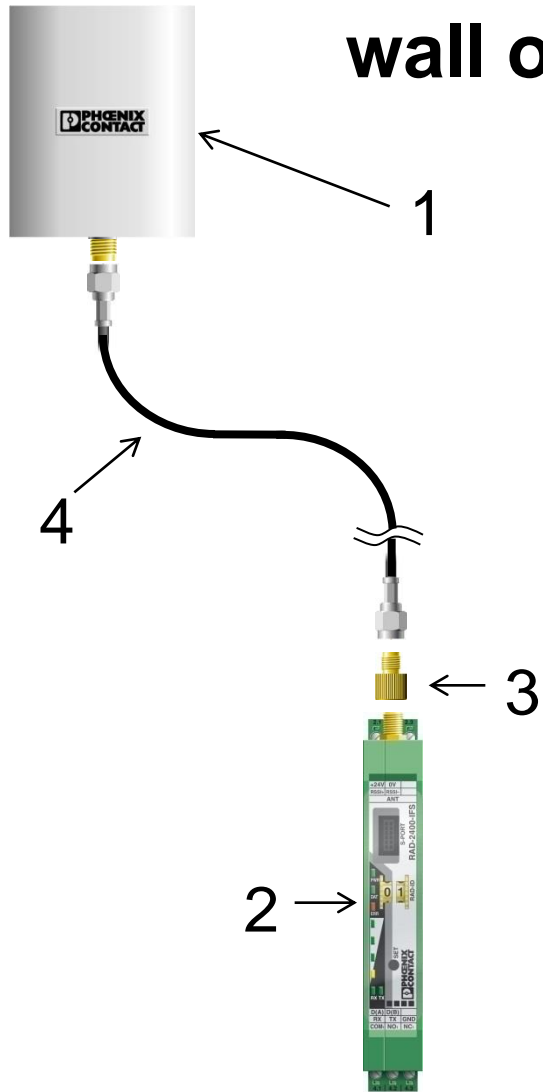


## Bill of materials

Index	Part number	Part name	Description	Quantity
1	2692526	RAD-ISM-2459-ANT-FOOD-6-0	Omnidirectional antenna with 6 dBi gain 2.4 GHz SMA(m) IP68	1
2	2901541	RAD-2400-IFS	Radioline 2.4 GHz	1
3	2884538	RAD-ADP-RSMA/F-SMA/F	Adapter for RSMA(f) to SMA(f)	1

2.4 GHz

# Directional antenna mounted on wall or mast
























## Bill of materials

Index	Part number	Part name	Description	Quantity
1	2867610	RAD-ISM-2400-ANT-PAN-8-0	Panel-directional antenna with 8 dBi gain 2.4 GHz SMA(f) IP68	1
2	2901541	RAD-2400-IFS	Radioline 2.4 GHz	1
3	2884538	RAD-ADP-RSMA/F-SMA/F	Adapter for RSMA(f) to SMA(f)	1
4	2884512 2884525	RAD-CAB-EF142-3M/5M	Antenna cable SMA(m) to SMA(m) 3/5 m	1

2.4 GHz

# Antennas and cables for Radioline 900 MHz







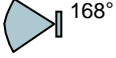
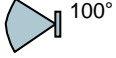
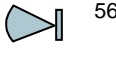

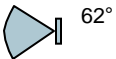

overview 2/2

Article	RAD-900-ANT-OMNI-2-2-RSMA	RAD-900-ANT-OMNI-2-N	RAD-ISM-900-ANT-OMNI-RPSMA	RAD-ISM-900-ANT-OMNI-0-N	RAD-ISM-900-ANT-OMNI-FG-3-N	RAD-ISM-900-ANT-OMNI-FG-6-N	RAD-ISM-900-ANT-OMNI-5
Order No.	2904801	2904802	2885676	5604160	2867791	2885579	2867199
Picture							
Frequency	900 MHz	900 MHz	900 MHz	900 MHz	902-928 MHz	900 MHz	900 MHz
Gain	2.15 dBi	2.15 dBi	2 dBi	2.15 dBi	5.15 dBi	8 dBi	7 dBi
Polarization	Vertical	Vertical	Vertical	Vertical	Vertical	Vertical	Vertical
HPBW horizontal	 360°	 360°	 360°	 360°	 360°	 360°	 360°
HPBW vertical	 78°	 78°	 78°	 78°	 28°	 15°	 30°
Connector	RSMA (m)	N (f)	RPSMA (m)	N (f)	N (f)	N(f)	N (f)
Protection class	IP65	IP66	IP55	IP65	IP65	IP65	IP65
Temperature range	-40...+75°C	-40...+70°C	-20...+65°C	-40...+75°C	-40...+80°C	-40...+80°C	-40...+80°C
Dimensions	89 x 12 mm	89 x 38 mm	203 x 13 mm	89 x 3 mm	1120 x 60 mm	1800 x 60 mm	610 x 3 mm
	Fixed cable 6 m	Mounts on switching cabinet	Direct mount on radio	Fixed cable 76 mm	Fiber glass with wall mount kit	Fiber glass with wall mount kit	Wall and mast mount

HPBW = Half Power Band Width = opening angle

# Antennas and cables for Radioline 900 MHz

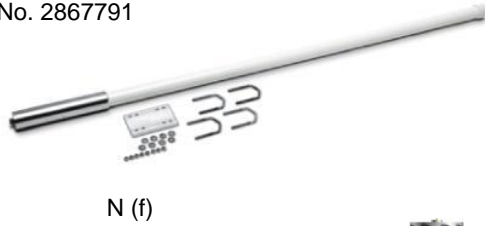
overview 2/2

Article	RAD-ISM-900-ANT-YAGI-3-N	RAD-ISM-ANT-YAGI-6.5-N	RAD-ISM-900-ANT-YAGI-10-N		RAD-PIG-RSMA/N-x	CN-UB-70DC-6-BB	RAD-CAB-LMR**
Order No.	2867801	2867814	5606614		290326 3 /4 /5 /6	2803166	5606124 /5 /6
Picture							
Frequency	900 MHz	900 MHz	900 MHz		up to 5 GHz	up to 6 GHz	up to 6 GHz
Gain	5 dBi	8.5 dBi	12.15 dBi		-1.2 dB/m @ 5 GHz	-	-7.6, -3.9, -3.13 dB per 100 feet
Polarization	Vertical	Vertical	Vertical		-	-	-
HPBW horizontal	 168°	 100°	 56°		-	-	-
HPBW vertical	 78°	 62°	 46°		-	-	-
Connector	N (f)	N (f)	N(f)		RSMA (m) – N (m)	N (f) – N (f)	N (m) – N (m)
Protection class	IP65	IP65	IP65		-	IP68	-
Temperature range	-40...+80°C	-40...+80°C	-40...+70°C		-40...+85°C	-40...+90°C	-40...105°C
dimensions	170 x 60 mm	170 x 60 mm	172 x 60.5 mm		0,5 or 1 or 2 or 3 m	24 x 24 x 47 mm	10, 20 and 25 feet
	Yagi directional antenna	Yagi directional antenna	Yagi directional antenna		Cable between wireless module and antenna or surge arrester	Antenna surge suppression	Antenna cables, Visit <a href="http://www.phoenixcontact.com/antennas">www.phoenixcontact.com/antennas</a> for more lengths

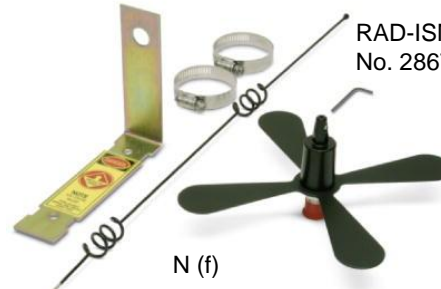
HPBW = Half Power Band Width = opening angle

# Various antennas for different applications – all using the same connector (900 MHz)

RAD-ISM-900-ANT-OMNI-FG-3-N  
No. 2867791



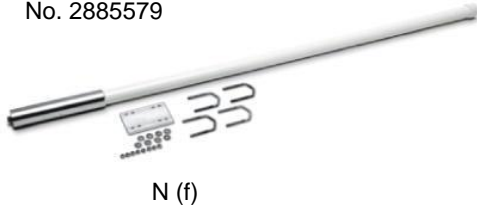
RAD-ISM-900-ANT-OMNI-5  
No. 2867199



RAD-ISM-900-ANT-YAGI-3-N  
No. 2867801



RAD-ISM-900-ANT-OMNI-FG-6-N  
No. 2885579



N (m)

RSMA (m)

RSMA (f)



RAD-900-IFS  
Art. No. 2901540

900 MHz

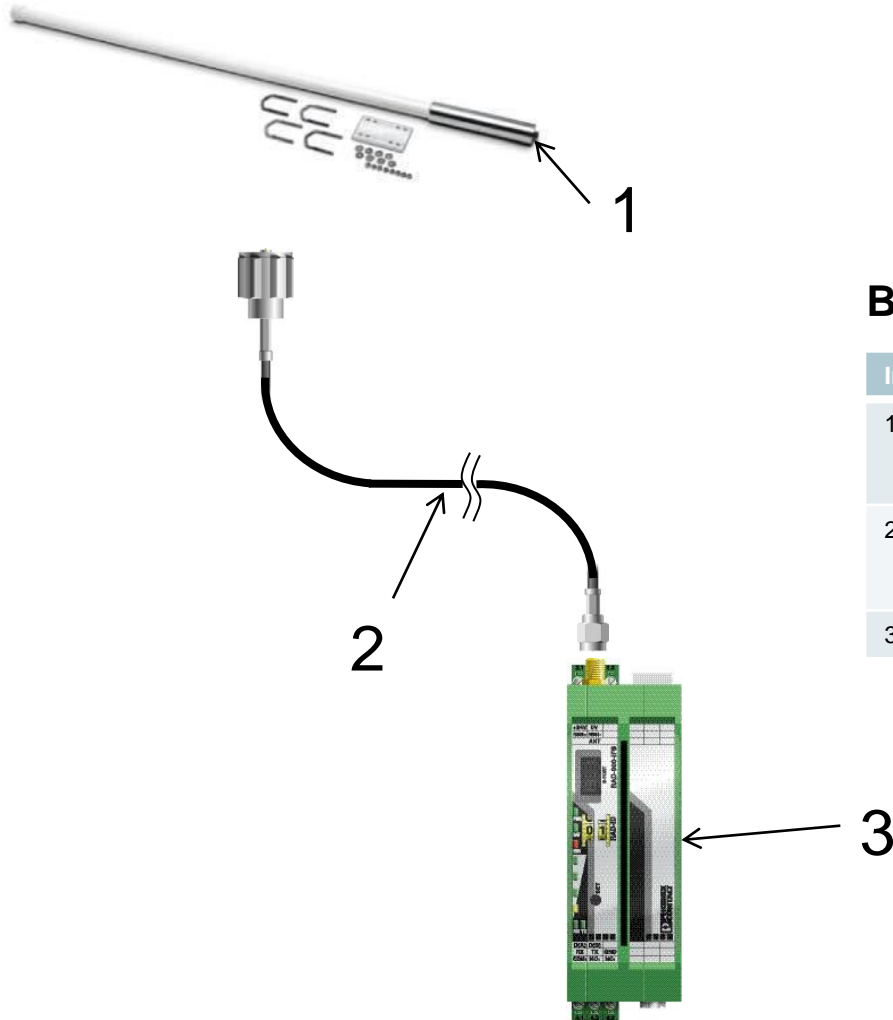
RAD-PIG-RSMA/N-x



RAD-PIG-RSMA/N-0.5	No. 2903263	length 0.5 m
RAD-PIG-RSMA/N-1	No. 2903264	length 1 m
RAD-PIG-RSMA/N-1	No. 2903265	length 2 m
RAD-PIG-RSMA/N-3	No. 2903266	length 3 m

**One cable type connects Radioline to all these antennas**

# Antenna for omnidirectional radiation with improved gain (5 dBi)

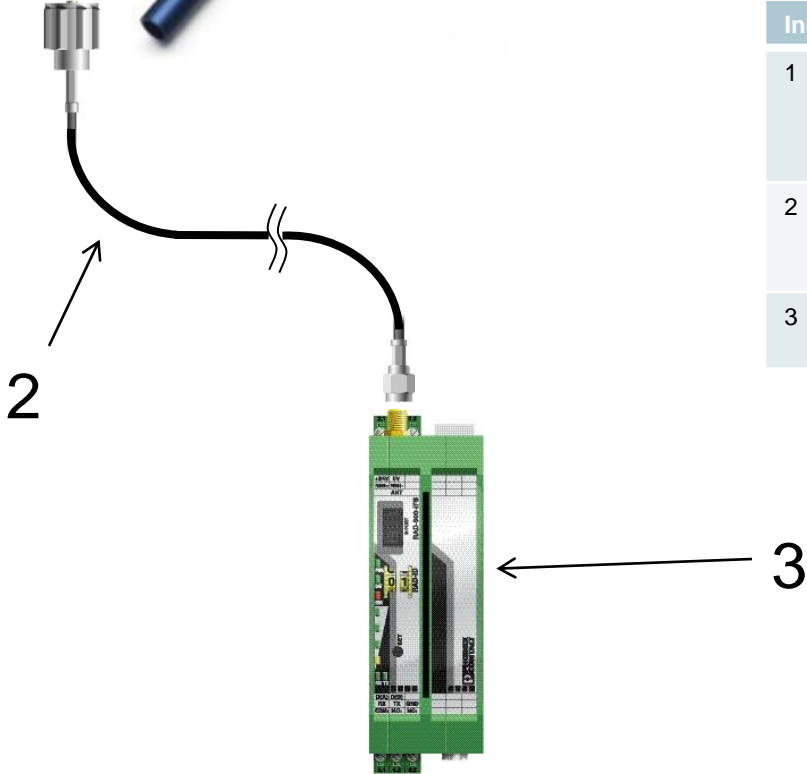


## Bill of materials

Index	Part number	Part name	Description	Quantity
1	2867791	RAD-ISM-900-ANT-OMNI-FG-3-N	Omnidirectional antenna with 5 dBi gain 900 MHz N(f)	1
2	2903263/4/5/6	RAD-PIG-RSMA/N-0.5/1/2/3	N(m) to RSMA(m) antenna cable 0.5/1/2/3 m	1
3	2901540	RAD-900-IFS	Radioline 900 MHz	1

900 MHz

# Antenna for directional radiation with improved gain (8.5 dBi)

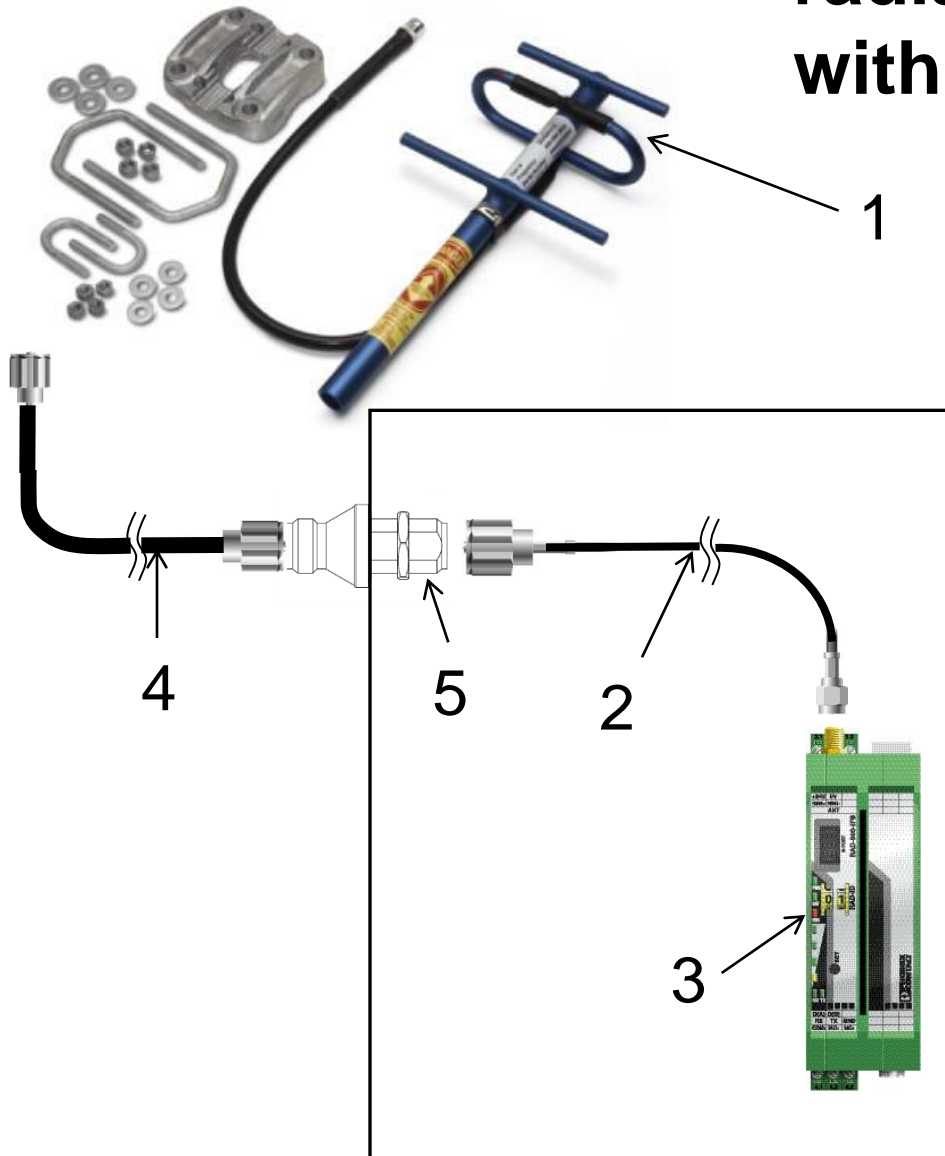


## Bill of materials

Index	Part number	Part name	Description	Quantity
1	2867814	RAD-ISM-900-ANT-YAGI-6.5-N	Yagi directional antenna with 8.5 dBi gain 900 MHz N(f)	1
2	2903263/4/5/6	RAD-PIG-RSMA/N-0.5/1/2/3	N(m) to RSMA(m) antenna cable 0.5/1/2/3 m	1
3	2901540	RAD-2400-IFS	Radioline 900 MHz	1

900 MHz

# Antenna for directional radiation prolonged cable with surge protection



Mounting inside switching cabinet

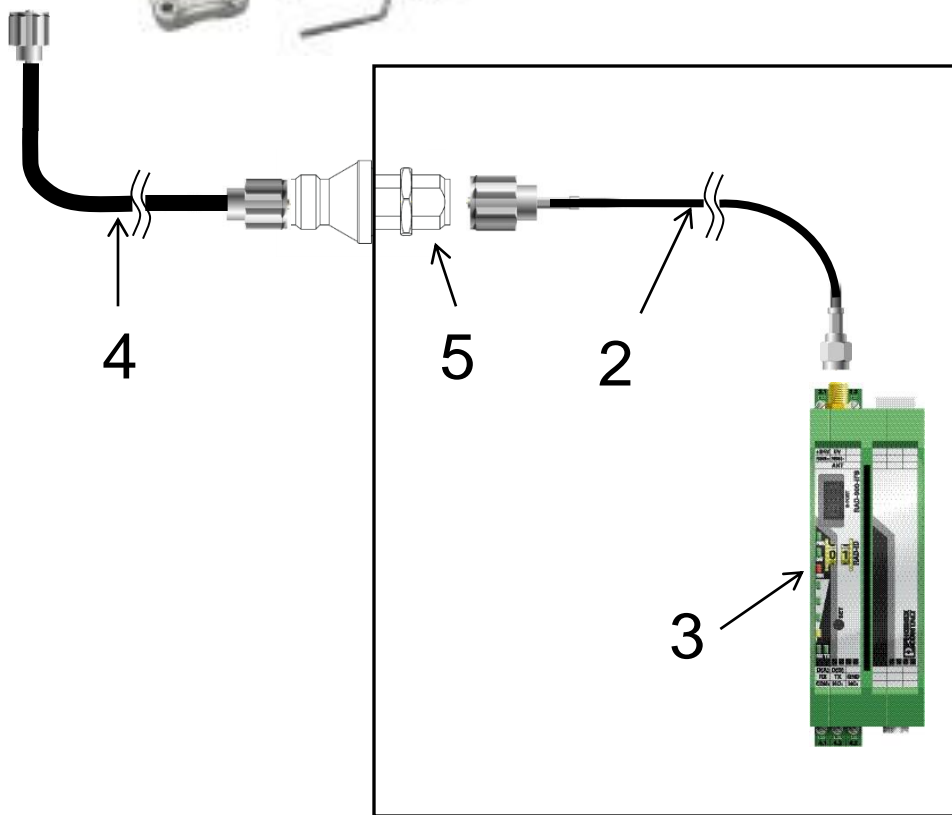
## Bill of materials

Index	Part number	Part name	Description	Quantity
1	2867814	RAD-ISM-900-ANT-YAGI-6.5-N	Yagi directional antenna with 8.5 dBi gain 900 MHz N(f)	1
2	2903263/4/5/6	RAD-PIG-RSMA/N-0.5/1/2/3	N(m) to RSMA(m) antenna cable 0.5/1/2/3 m	1
3	2901540	RAD-900-IFS	Radioline 900 MHz	1
4	5606124 5606125 5606126	RAD-CAB-LMR**	N(m) to N(m) antenna cable 10, 20, 25 foot	1
5	2803166	CN-UB-70DC-6-BB	Coaxial surge protection	1

900 MHz



# Antenna for directional long distance communication



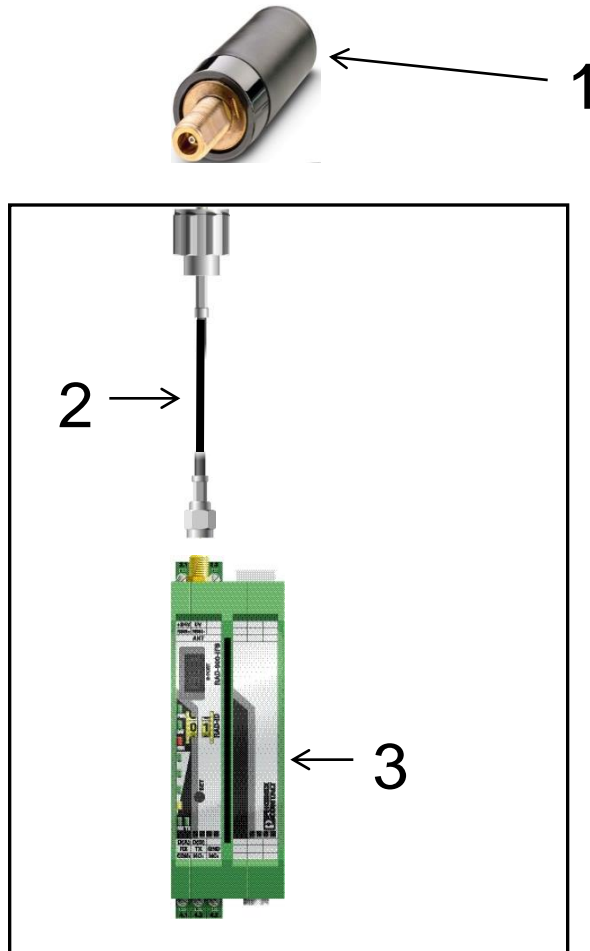
Mounting inside switching cabinet

## Bill of materials

Index	Part number	Part name	Description	Quantity
1	5606614	RAD-ISM-900-ANT-YAGI-10-N	Yagi directional antenna with 12.15 dBi gain 900 MHz N(f)	1
2	2903263/4/5/6	RAD-PIG-RSMA/N-0.5/1/2/3	N(m) to RSMA(m) antenna cable 0.5/1/2/3 m	1
3	2901540	RAD-900-IFS	Radioline 900 MHz	1
4	5606124 5606125 5606126	RAD-CAB-LMR**	N(m) to N(m) antenna cable 10, 20, 25 foot	1
5	2803166	CN-UB-70DC-6-BB	Coaxial surge protection	1

900 MHz

# Mounting the RAD-900-IFS inside a standard switching cabinet

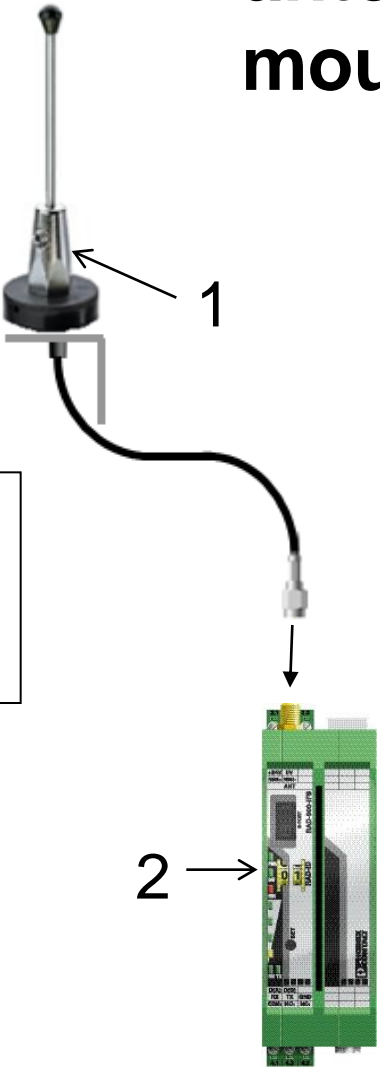


## Bill of materials

Index	Part number	Part name	Description	Quantity
1	2904802	RAD-900-ANT-OMNI-2-N	Omnidirectional antenna with 2 dBi gain 900 MHz N(f)	1
2	2903263/4/5/6	RAD-PIG-RSMA/N-0.5/1/2/3	N(m) to RSMA(m) antenna cable	1
3	2901540	RAD-900-IFS	Radioline 900 MHz	1

900 MHz

# Mounting the omnidirectional antenna everywhere with a mounting bracket



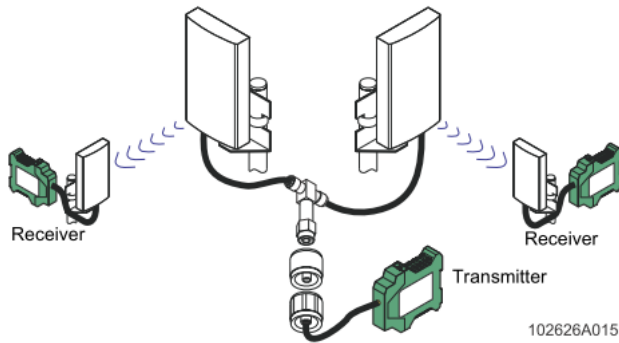
**TIP:** The cable of the antenna (1.5 m) cannot not be prolonged. The attenuation of a longer cable would be higher than the antenna gain.

## Bill of materials

Index	Part number	Part name	Description	Quantity
1	2904801	RAD-900-ANT-OMNI-2-2-RSMA	Omni directional antenna with 2 dBi gain 900 MHz RSMA(m) IP65	1
2	2901540	RAD-900-IFS	Radioline 900 MHz	1

900 MHz

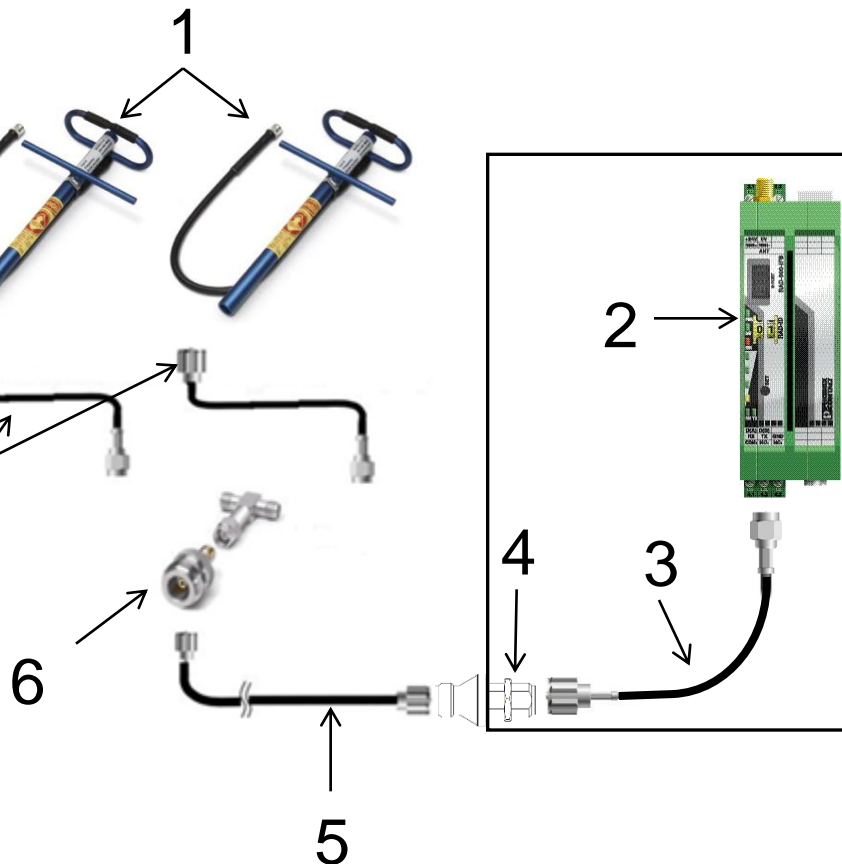
# Antenna splitter sets for repeater applications



## Bill of materials

Index	Part number	Part name	Description	Quantity
1	2867814	RAD-ISM-900-ANT-YAGI-3-N	Yagi directional antenna with 5 dBi gain 900 MHz N(f) IP65	2
2	2901540	RAD-900-IFS	Radioline 900 MHz	1
3	2903263/4/5/6	RAD-PIG-RSMA/N-0.5/1/2/3	Antenna cable N(m) to RSMA(m) 0.5/1/2/3 m	1
4	2803166	CN-UB-70DC-6-BB	Coaxial surge protection	1
5	5606124 5606125 5606126	RAD-CAB-LMR**	N(m) to N(m) antenna cable 10, 20, 25 foot	1
6	2885595	RAD-ISM-2400-SPL-2-SMA	Antenna splitter: 2 SMA(f), 1 SMA(m)	1
7	2867403	RAD-CON-SMA-N-SS	Antenna cable SMA(m) to N(m) 1.2 m	2

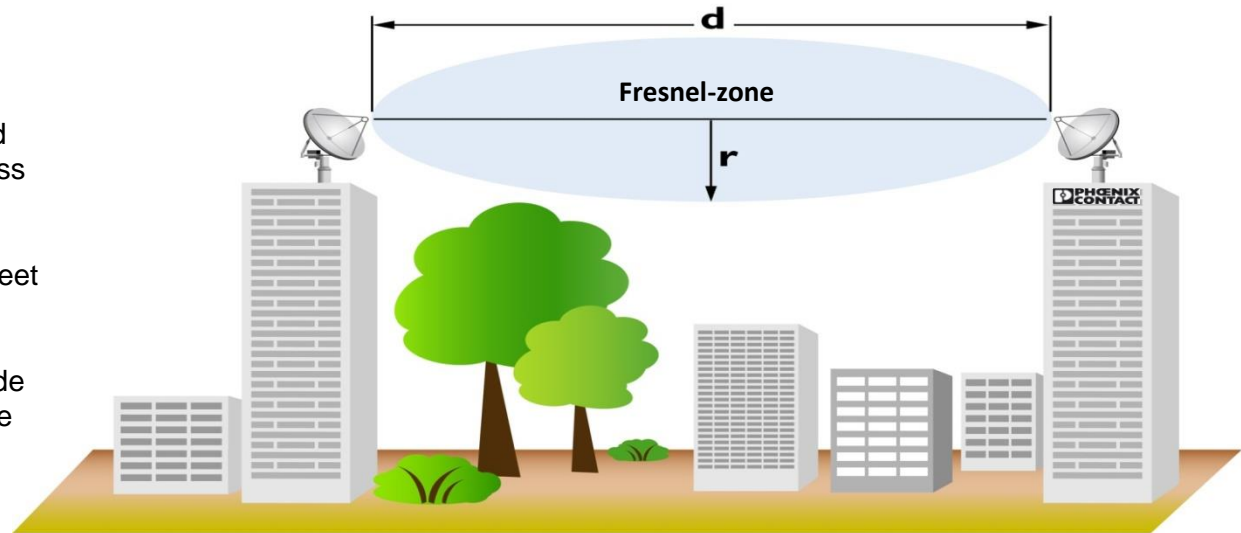
900 MHz



# Dimensioning a long distance link

## Boundary conditions for planning of a wireless link:

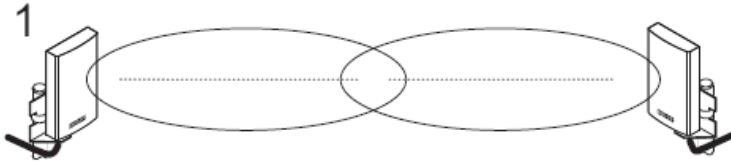
A free line of sight is recommended between the communicating wireless devices, especially for longer distances. It may be necessary to mount the device (antenna) a few feet above the ground, keeping the so-called "Fresnel-zone" clear. No additional obstacles should be inside the Fresnel-zone. The energy of the radio transmission is transferred within the entire Fresnel-zone, not only in line of sight.



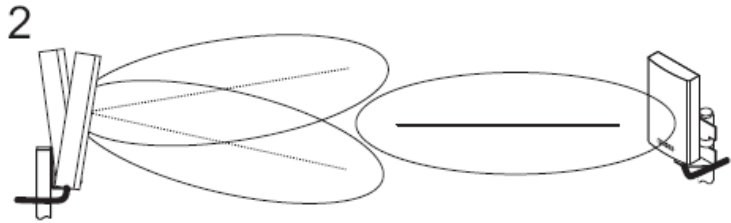
Distance wireless link (d)		Antenna height 2.4 GHz (r)	Antenna height 5 GHz (r)
200 m		2.5 m	1.5 m
500 m		4 m	2.5 m
1000 m		5 m	4 m
2000 m		8 m	6 m
4000 m		11 m	8 m

# Directional/Yagi antenna installation

## Adjustment of a directional panel antenna



**Good:** two antennas facing each other



**Bad:** one antenna beam cannot reach the opposite antenna

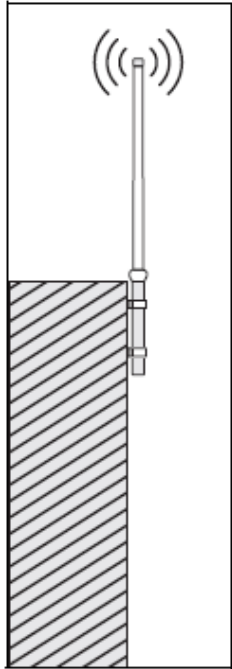


Both possibilities are okay.

A metal plane behind a directional antenna is **not critical** because of its radiation purpose to the front.

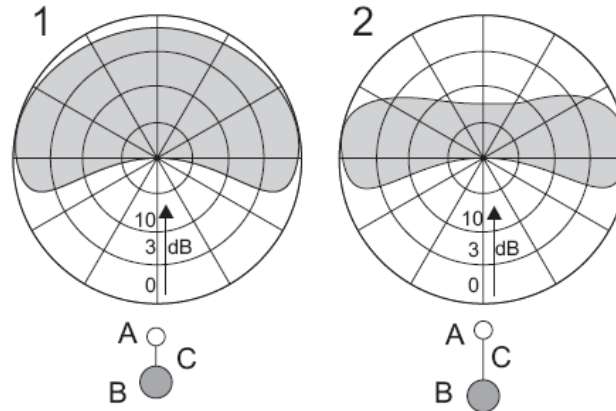


# Omnidirectional antenna installation



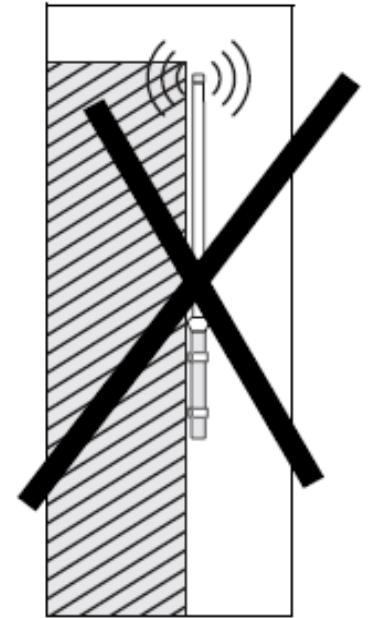
Correct installation of an omnidirectional antenna: free radiation in all directions

Top view: omnidirectional antenna radiation



	1	2
<b>A</b>	Antenna	Antenna
<b>B</b>	Mast	Mast
<b>C</b>	Antenna bracket (C = 3 cm)	Antenna bracket (C = 6 cm)

Bad influence of metal near the radiating part of the antenna: the radiation pattern is deformed. The antenna no longer works as an omnidirectional antenna.



Wrong installation: The radiating part is "grounded" to a metal plane

# Adapter comparison



SMA female

SMA male

RSMA female

RSMA male

	Radio	Antenna	Cable
Connector	RSMA* female	N female	RSMA* male - N male

\*RSMA = Reverse- SMA

## Reverse SMA (RSMA):

- A common antenna connector type approved worldwide
- Connector polarity is “reverse”, which means RSMA “female” has a pin



N male

N female





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### Наши контакты:

**Телефон:** +7 812 627 14 35

**Электронная почта:** [sales@st-electron.ru](mailto:sales@st-electron.ru)

**Адрес:** 198099, Санкт-Петербург,  
Промышленная ул, дом № 19, литера Н,  
помещение 100-Н Офис 331