SIEMENS

SIMATIC NET

Industrial Wireless LAN RCoax

System Manual

09/2017
C79000-G8976-C189-14

Legal information

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This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

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indicates that death or severe personal injury **may** result if proper precautions are not taken.

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We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Table of contents

Preface

1

Purpose of the system manual

This system manual contains both an explanation of the fundamental technical aspects as well as a description of the individual RCoax components and their functionality. Installation/ commissioning and connection of RCoax components and their operating principle are explained. The possible applications of the various SIMATIC NET components are described.

Certification

The products and systems listed in this document are manufactured and marketed using a quality management system complying with DIN ISO 9001 (Certificate Register no. 2613) and certified by DQS. The DQS certificate is recognized in all IQNet countries (reg. no.: 2613).

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To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed under
Link (http://www.siemens.com/industrialsecurity).

SIMATIC NET glossary

Explanations of many of the specialist terms used in this documentation can be found in the SIMATIC NET glossary.

You will find the SIMATIC NET glossary on the Internet at the following address:

50305045 (http://support.automation.siemens.com/WW/view/en/50305045)

Trademarks

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SIMATIC NET, SCALANCE, C-PLUG, RCoax

Basics of RCoax

2

2.1 Introduction

Note

You will find further notes and instructions on the use of RCoax on the Internet at : (http://support.automation.siemens.com/WW/view/de/18689160/130000/)

Why is an RCoax installation necessary?

In wireless communication, electromagnetic waves are transmitted and received by antennas. There are, however, conditions in which the transmission or reception range cannot be covered well or even at all with the transmission and reception range of conventional antennas. Such conditions can occur in certain buildings (for example tunnels, canals and elevator shafts) or in communication involving rail vehicles.

In such situations, the fact that cable also emits electromagnetic waves can be put to good use if the cable has a suitable physical design. With leaky feeder cables, the emission can be adapted to the spatial conditions.

The RCoax cables provide a reliable wireless connection without wear and tear particularly for conveyor systems and all types of rail-guided vehicles (overhead monorails, automated guided vehicles).

Examples of the use of RCoax cables are as follows:

- Overhead monorail conveyors
- Automated guided vehicles (AGV)
- Cranes
- High bay storage systems
- Transfer lines
- Tool changer carriages
- Tunnels
- Elevators

Short distance between RCoax cable and antenna

The advantage here is that the RF field has a good quality when the distance to the leaky feeder is short. This ensures that the wireless connection to a node is as good as possible when its antennas move along the leaky feeder cable if they remain in the close vicinity of the cable (as is the case, for example, with rail-guided vehicles). It must nevertheless not be forgotten that the radio waves radiated by the leaky feeder cable exist not only in the immediate vicinity of the moving node but also that radio waves from third-party systems can affect the leaky feeder cable. This means that interference to the communication between antenna and leaky feeder cable or between other wireless components is possible.

Principle of electromagnetic radiation of cables

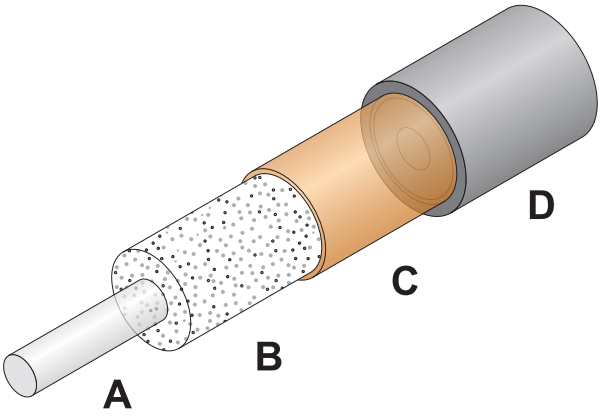
The determining variables of an electromagnetic wave are an electric and a magnetic field. These two fields are perpendicular to each other and to the direction of propagation.

Electromagnetic waves can also propagate within a coaxial cable. If the cable has a closed outer conductor, no electromagnetic radiation can be detected outside this shield and no electromagnetic fields outside the cable can affect the wave in the inner conductor. If the outer conductor has slots in it, there is electromagnetic coupling between the inner conductor and the environment of the cable at these points. In this case, the electromagnetic fields of the inner conductor can be measured outside the cable. In the other direction, and electromagnetic field outside the cable can affect the inner conductor.

2.2 Construction of RCoax cables

The typical construction of leaky feeder cables is shown below:

- Inner conductor
- Dielectric:
  normally air or a plastic with a low dielectric constant and low HF losses.
- Outer conductor:
  with longitudinal and transverse slots. The geometry and number of these slots define the radiation characteristics of the cable.
- Cable jacket:
  The outer insulation of Siemens RCoax cables is flame-retardant and halogen-free (HLFR).



A	Inner conductor	C	Outer conductor
B	Dielectric	D	Cable jacket

Figure 2-1 Structure of an RCoax cable

2.3 Function of RCoax cables

In industrial communication, three types of cable are used mainly as leaky feeders (cables in radiating mode, cables with slotted sections and cables in coupling mode). Siemens cables operate in radiating mode.

Cables in radiating mode

Cables in radiating mode have openings in the coaxial shield and the spacing between these openings is determined by the wavelength or the frequency to be radiated. This means that the usable frequency of this cable is limited to a comparatively narrow frequency band because the coupling attenuation rises considerably above and below this nominal frequency. The advantage is that interference outside this range is attenuated by this bandpass action.

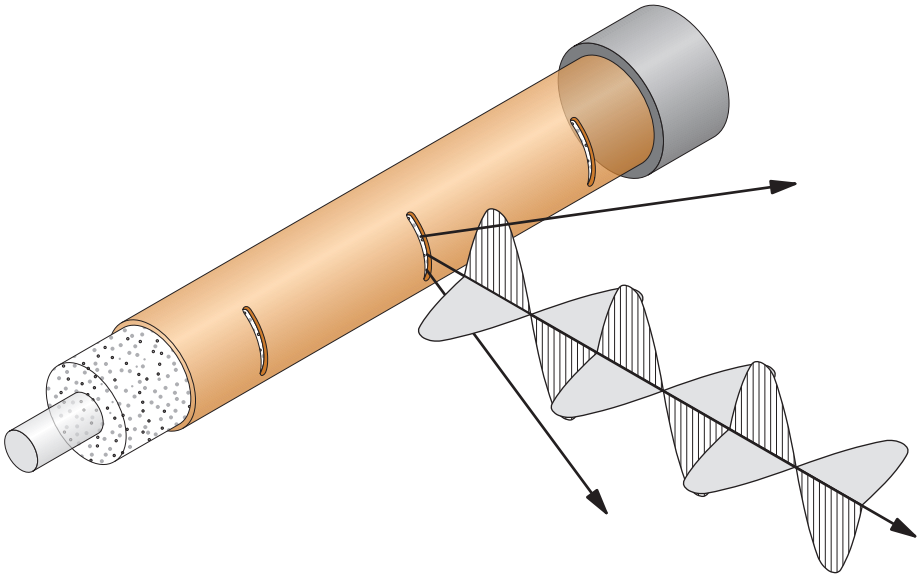


Figure 2-2 Radiation from an opening in the outer conductor

The schematic diagram shows the radiation from a slot in the outer conductor.
The electrical field is in a plane parallel to the cable axis and is shown in gray. The magnetic field is in a plane perpendicular to the cable axis and is shown in hatched gray. Both fields are perpendicular to the direction of propagation (black arrows).

2.4 Note on usage

Siemens cables operate in radiating mode and, similar to a cable with slotted sections, have been optimized for the particular transmission frequency by the special arrangement of the openings in the shield.

Different RCoax cables are required for the 2.4 GHz and 5 to 6 GHz range.

Note

Within the area of an RCoax installation, there should be no other wireless networks operating in the same frequency range.

Product overview

3

3.1 RCoax cables

Due to slots in the outer conductor, the SIEMENS SIMATIC NET IWLAN RCoax cable 1/2" has the function of an antenna and is available in the following frequency bands:

RCoax cable	Article number
2.4 GHz	6XV1875-2A
5 GHz	6XV1875-2D

Note

Technical specifications

You will find technical information on these products in the section "Technical specifications (Page 41)".

3.2 Access points

SCALANCE W700

The SCALANCE W700 access points with one or more wireless interfaces are suitable for setting up Industrial Wireless LANs. Both infrastructure networks and point-to-point links can be implemented. The most important characteristics of the various product variants are shown in the table below. You will find detailed information in the documentation of the relevant device.

Type	Connectors for external antennas		Number of connectable devices (3)	iPCF mode (1)	IEEE 802.11 a/b/g/h	IEEE 802.11n	Article number
	R-SMA	N-Connect					
W761-1 RJ45	1		4		•	1 x 1	6GK5761-1FC00-0AA0 6GK5761-1FC00-0AB0 (4)
W774-1 RJ45	2		8	• (2)	•	2 x 2	6GK5774-1FX00-0AA0 6GK5774-1FX00-0AB0 (4) 6GK5774-1FX00-0AC0 (5)
W774-1 M12	2		8	• (2)	•	3 x 3	6GK5774-1FY00-0TA0 6GK5774-1FY00-0TB0 (4)
W774-1 M12 EEC	2		8	• (2)	•	3 x 3	6GK5774-1FY00-0TA0 6GK5774-1FY00-0TB0 (4)
W778-1 M12	2		8	• (2)	•	3 x 3	6GK5774-1FY00-0TA0 6GK5774-1FY00-0TB0 (4)

Type	Connectors for external antennas		Number of connectable devices (3)	iPCF mode (1)	IEEE 802.11 a/b/g/h	IEEE 802.11n	Article number
	R-SMA	N-Connect					
W778-1 M12 EEC	2		8	• (2)	•	3 x 3	6GK5774-1FY00-0TA0 6GK5774-1FY00-0TB0 (4)
W788-1 M12		3	8	• (2)	•	3 x 3	6GK5788-1GD00-0AA0 6GK5788-1GD00-0AB0 (4)
W788-2 M12		6	8	• (2)	•	3 x 3	6GK5788-2GD00-0AA0 6GK5788-2GD00-0AB0 (4)
W788-2 M12 EEC		6	8	• (2)	•	3 x 3	6GK5788-2GD00-0TA0 6GK5788-2GD00-0TB0 (4)
W788-1 RJ-45	3		8	• (2)	•	3 x 3	6GK5788-1FC00-0AA0 6GK5788-1FC00-0AB0 (4)
W788-2 RJ-45	6		8	• (2)	•	3 x 3	6GK5788-2FC00-0AA0 6GK5788-2FC00-0AB0 (4) 6GK5788-2FC00-0AC0 (5)
W786-1 RJ-45	3		8	• (2)	•	3 x 3	6GK5786-1FC00-0AA0 6GK5786-1FC00-0AB0 (4) 6GK5786-2FC00-0AC0 (5)
W786-2 RJ-45	6		8	• (2)	•	3 x 3	6GK5786-2FC00-0AA0 6GK5786-2FC00-0AB0 (4)
W786-2IA RJ-45			8	• (2)	•	3 x 3	6GK5786-2HC00-0AA0 6GK5786-2HC00-0AB0 (4)
W786-2 SFP	6		8	• (2)	•	3 x 3	6GK5786-1FE00-0AA0
W788C-2 RJ-45	6		8		•	3 x 3	6GK5788-2FC00-0AA0
W788C-2 M12		6	8		•	3 x 3	6GK5788-2GD00-0AA0
W788C-2 M12 EEC		6	8		•	3 x 3	6GK5788-2GD00-1TA0
W786C-2 RJ-45	6		8		•	3 x 3	6GK5786-2FC00-0AA0
W786C-2IA RJ-45			8		•	3 x 3	6GK5786-2HC00-0AA0

• suitable

(1) The iPCF mode provides an optimized data throughput and minimum handover times.

(2) With KEY-PLUG inserted

(3) In client mode

(4) US variant

(5) IL variant

3.3 Client modules

SCALANCE W700

The SCALANCE W700 client modules establish a connection between wired Ethernet and Industrial Wireless LAN. The most important characteristics of the various product variants are shown in the table below. You will find detailed information in the documentation of the relevant device.

Type	Connectors for external antennas		Number of connectable devices (3)	iPCF mode (1)	IEE 802.11 a/ b/g/h	IEEE 802.11n	Article number
	R-SMA	N-Connect					
W721-1 RJ45	1		4		•	1 x 1	6GK5721-1FC00-0AA0 6GK5721-1FC00-0AB0 (4)
W722-1 RJ45	1		4	• (2)	•	1 x 1	6GK5722-1FC00-0AA0 6GK5722-1FC00-0AB0 (4)
W734-1 RJ45	2		8	• (2)	•	2 x 2	6GK5734-1FX00-0AA0 6GK5734-1FX00-0AB0 (4)
W738-1 M12		2	8	• (2)	•	2 x 2	6GK5738-1GY00-0AA0 6GK5738-1GY00-0AB0 (4)
W748-1 M12		3	8		•	3 x 3	6GK5748-1GD00-0AA0 6GK5748-1GD00-0AB0 (4)
W748-1 RJ-45	3		8		•	3 x 3	6GK5748-1FC00-0AA0 6GK5748-1FC00-0AB0 (4)

• suitable

(1) The iPCF mode provides an optimized data throughput and minimum handover times.

(2) With KEY-PLUG inserted

(3) In client mode

(4) US variant

Mobile Panel 277 IWLAN

The Mobile Panel is a mobile HMI device for tasks of medium complexity for use in PROFIBUS DP networks or in PROFINET environments. Apart from the standard HMI functionality, the range of applications can be expanded by the WinCC flexible options Smart Access, Smart Service and Audit.

ET 200pro IWLAN

The SIMATIC ET 200pro is an I/O system that can be mounted directly on the machine. To achieve this, various interface modules are available for connection to PROFINET or PROFIBUS both in standard and fail-safe versions. For communication between the ET 200pro and higher-level controllers via Industrial Wireless LAN (IWLAN) networks, you require an interface module.

Type	Connectors for external antennas		iPCF mode (1)	IEEE 802.11 a/b/g/h	IEEE 802.11n	Article number
	R-SMA	N-Connect				
Mobile Panel 277 (F) IWLAN	2		•	•		Mobile Panel 277 IWLAN • 6AV6645-0Dxxx-xxx1 • 6AV6645-0Fxxx-xxx1 (2) Mobile Panel 277F IWLAN • 6AV6645-0Exxx-xxx1 • 6AV6645-0Gxxx-xxx1 (2)
Interface module IM 154-6 PN HF IWLAN		2	•	•		6ES7154-6AB00-0AB0 6ES7154-6AB50-0AB0 (2)

• suitable

(1) The iPCF mode provides an optimized data throughput and minimum handover times.

(2) US variant

3.4 RCoax accessories

The components listed are suitable for use with 2.4 GHz and 5 GHz RCoax cables:

Component	Description	Article number
SIEMENS SIMATIC NET IWLAN RCoax N-Connect Female N-Connector On-Site-Assembly	RCoax cable connector for attaching further components, connector N-connect female	6GK5798-0CN00-0AA0
SIMATIC NET IWLAN RCoax Threaded Washer M6 for Cable Clip 1/2" – pack of 10	RCoax threaded washer M6 for securing clip	6GK5798-8MC00-0AC1
SIMATIC NET IWLAN RCoax Threaded Washer M6 for Cable Clip 1/2" – pack of 100	RCoax threaded washer M6 for securing clip	6GK5798-8MC00-0AM1
SIMATIC NET IWLAN RCoax Spacer 85 mm for Cable Clip 1/2" – pack of 10	RCoax spacer 85 mm for securing clip	6GK5798-8MD00-0AC1
SIMATIC NET IWLAN RCoax Spacer 85 mm for Cable Clip 1/2" – pack of 100	RCoax spacer 85 mm for securing clip	6GK5798-8MD00-0AM1
SIEMENS SIMATIC NET IWLAN RCoax N-Connect Stripping Tool	Stripping tool for an RCoax cable.	6GK1901-1PH00

Component	Description	Article number
SIMATIC NET IWLAN RCoax Cable Clip 1/2" – pack of 10	RCoax securing clip	6GK5798-8MB00-0AC1
SIMATIC NET IWLAN RCoax Cable Clip 1/2" – pack of 100	RCoax securing clip	6GK5798-8MB00-0AM1

Table: RCoax accessories that are described in this system manual.

Note

Technical specifications

You will find technical information on these products in the section "Technical specifications (Page 41)".

Component	Description	Article number
SIEMENS SIMATIC NET IWLAN RCoax/ Antenna N-Connect Male Termination Impedance 50 Ω	Terminator for an RCoax cable. Impedance 50 Ω, connector N-Connect, male.	6GK5795-1TN00-1AA0
SIEMENS SIMATIC NET IWLAN RCoax/ Antenna RSMA male Termination Impedance 50 (ohms) I795-1R	R-SMA terminator for fitting to the unused antenna socket of a SCALANCE W7xx when using one antenna only. Impedance 50 Ω, connector R-SMA male	6GK5795-1TR10-0AA6
SIEMENS SIMATIC NET IWLAN RCoax/ Antenna N-Connect Female Power Splitter 2-way	Two-way power splitter, three N-Connect female connectors.	6GK5798-0SN00-0EA0
SIEMENS SIMATIC NET IWLAN RCoax/ Antenna Connection Cable N-Connect male/male, preassembled 1 m	Flexible connecting cable for connecting two RCoax cables. Preassembled with two N-Connect male connectors. Length 1 m.	6XV1875-5AH10
SIEMENS SIMATIC NET IWLAN RCoax/ Antenna Connection Cable N-Connect male/male, preassembled 2 m	Flexible connecting cable for connecting two RCoax cables. Preassembled with two N-Connect male connectors. Length 2 m	6XV1875-5AH20
SIEMENS SIMATIC NET IWLAN RCoax/ Antenna Connection Cable N-Connect male/male, preassembled 5 m	Flexible connecting cable for connecting two RCoax cables. Preassembled with two N-Connect male connectors. Length 5 m	6XV1875-5AH50
SIEMENS SIMATIC NET IWLAN RCoax/ Antenna Connection Cable N-Connect male/male, preassembled 10 m	Flexible connecting cable for connecting two RCoax cables. Preassembled with two N-Connect male connectors. Length 10 m.	6XV1875-5AN10
SIEMENS SIMATIC NET IWLAN RCoax/ Antenna Connection Cable N-Connect/ RSMA male/male, preassembled 0.3 m	Flexible connecting cable for connecting an RCoax cable or an antenna to a SCALANCE W7xx. Preassembled with two N-Connect male connectors and R-SMA male. Length 0.3 m	6XV1875-5CE30

Component	Description	Article number
SIEMENS SIMATIC NET IWLAN RCoax/ Antenna Connection Cable N-Connect/ RSMA male/male, preassembled 1 m	Flexible connecting cable for connecting an RCoax cable or an antenna to a SCALANCE W7xx. Preassembled with two N-Connect male connectors and R-SMA male. Length 1 m	6XV1875-5CH10
SIEMENS SIMATIC NET IWLAN RCoax/ Antenna Connection Cable N-Connect/ RSMA male/male, preassembled 2 m	Flexible connecting cable for connecting an RCoax cable or an antenna to a SCALANCE W7xx. Preassembled with two N-Connect male connectors and R-SMA male. Length 2 m	6XV1875-5CH20
SIEMENS SIMATIC NET IWLAN RCoax/ Antenna Connection Cable N-Connect/ RSMA male/male, preassembled 5 m	Flexible connecting cable for connecting an RCoax cable or an antenna to a SCALANCE W7xx. Preassembled with two N-Connect male connectors and R-SMA male. Length 5 m	6XV1875-5CH50
SIEMENS SIMATIC NET IWLAN RCoax/ Antenna Connection Cable N-Connect/ RSMA male/male, preassembled 10 m	Flexible connecting cable for connecting an RCoax cable or an antenna to a SCALANCE W7xx. Preassembled with two connectors N-Connect male and R-SMA male. length 10 m.	6XV1875-5CN10
SIEMENS SIMATIC NET IWLAN RCoax/ Antenna Connection Cable RSMA/SMA male/male, preassembled 0.3 m	Flexible connecting cable for connecting a SCALANCE W7xx or IWLAN/PB Link PN IO to components with R-SMA and SMA connectors, for example cabinet feedthrough. Preassembled with two R-SMA male to SMA male connectors: Length 0.3 m	6XV1875-5DE30
SIEMENS SIMATIC NET IWLAN RCoax/ Antenna Connection Cable RSMA/SMA male/male, preassembled 2 m	Flexible connecting cable for connecting a SCALANCE W7xx or IWLAN/PB Link PN IO to components with R-SMA and SMA connectors, for example cabinet feedthrough. Preassembled with two R-SMA male to SMA male connectors: Length 2 m	6XV1875-5DH20
SIEMENS SIMATIC NET IWLAN RCoax/ Antenna N-Connect male/female Attenuator 10 dB	10 dB attenuator with N-Connect male / N-Connect female connectors	6GK5798-0AP00-4CA0
SIEMENS SIMATIC NET IWLAN RCoax/ Antenna N-Connect/SMA female/female Panel Feedthrough	Panel feedthrough for wall thicknesses up to a maximum of 5.5 mm, SMA female and N-Connect female connectors.	6GK5798-0PT00-2AA0
SIEMENS SIMATIC NET IWLAN RCoax/ Antenna N-Connect/N-Connect Panel Feedthrough	Panel feedthrough/adapter N-N for wall thicknesses up to a maximum of 4.5 mm, N-Connect/N-Connect connectors	6GK5798-2PP00-2AA6
SIMATIC NET IWLAN Lightning Protector LP798-1N	Lightning protector with gas discharge capsule, also suitable for DC current on the flexible connecting cable	6GK5798-2LP00-2AA6
SIMATIC NET IWLAN Lightning Protector LP798-2N	Lightning protector with maintenance-free quarter-wave technology for frequencies in the range 2 to 6 GHz.	6GK5798-2LP10-2AA6

Table: IWLAN accessories that are described in the "Passive Network Components IWLAN" system manual.

Note

Further information

You will find further information on these accessories in the "Passive Network Components IWLAN" system manual.

3.5 Antennas

RCoax antennas

Component	Description	Article number
IWLAN RCoax N-Connect Female Antenna ANT792-4DN	RCoax helical antenna with circular polarization for RCoax systems, 2.4 GHz	6GK5792-4DN00-0AA6
IWLAN RCoax N-Connect Female Antenna ANT793-4MN	RCoax λ5/8 antenna with vertical polarization for RCoax systems, 5 GHz	6GK5793-4MN00-0AA6

Note

Technical specifications

You will find technical information on RCoax antennas in the section "Technical specifications (Page 41)".

Other antennas

Component	Description	Article number
ANT795-6MN	Omnidirectional antenna for ceiling mounting or mounting on vehicles, 2.4 GHz / 5 GHz.	6GK5795-6MN00-0AA6
ANT792-6MN	Omnidirectional antenna with N-Connector female, 2.4 GHz	6GK5792-6MN00-0AA6
ANT793-6MN	Omnidirectional antenna with N-Connector female, 5 GHz	6GK5793-6MN00-0AA6
ANT792-8DN	Directional antenna with N-Connect female, 2.4 GHz.	6GK5792-8DN00-0AA6
ANT793-8DJ	Directional antenna with dual horizontal/vertical polarization, 5 GHz	6GK5793-8DJ00-0AA0
ANT793-8DK	Directional antenna with dual horizontal/vertical polarization, 5 GHz	6GK5793-8DK00-0AA0
ANT793-6DT	MIMO antenna with three QMA connectors and three polarization levels (vertical and ±45°), 5 GHz.	6GK5793-6DT00-0AA0
ANT795-4MA	Omnidirectional antenna with R-SMA connector, 2.4 GHz / 5 GHz Radial rotation with additional joint	6GK5795-4MA00-0AA3
ANT795-4MC	Omnidirectional antenna with N-Connector male, 2.4 GHz / 5 GHz	6GK5795-4MC00-0AA3

Component	Description	Article number
ANT795-4MD	Omnidirectional antenna with N-Connector male, 2.4 GHz / 5 GHz	6GK5795-4MD00-0AA3
ANT795-6DC	Dual-band directional antenna with linear polarization 2.4 GHz / 5 GHz	6GK5795-6DC00-0AA0
ANT793-6DG	Dual directional antenna with linear polarization and polarization levels at ±45°, 5 GHz.	6GK5793-6DG00-0AA0
ANT795-6MT	MIMO antenna with three QMA connectors 2.4 GHz / 5 GHz	6GK5795-6MT00-0AA0
ANT793-8DP	Directional antenna with N-Connect female, 4.9 GHz / 5.9 GHz	6GK5793-8DP00-0AA0
ANT793-8DL	Directional antenna with N-Connect female, 4.9 GHz / 5.9 GHz	6GK5793-8DL00-0AA0
ANT795-6MP	Omnidirectional antenna with N-Connector female, 2.4 GHz / 5 GHz	6GK5795-6MP00-0AA0
ANT896-6MM	Antenna for mobile wireless, WLAN and global navigation satellite systems 2.4 GHz / 5 GHz	6GK5896-6MM00-0AA0
ANT795-4MX	Omnidirectional antenna with N-Connector male, 2.4 GHz / 5 GHz	6GK5795-4MX00-0AA0

Note

Technical specifications

You will find technical information on the antennas in the compact operating instructions of the relevant antenna.

Installation

4

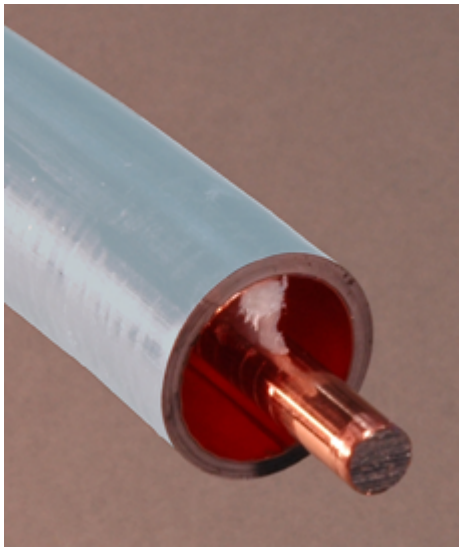
4.1 Fitting connector to RCoax cable

To fit a connector to an RCoax cable, you require an RCoax N-connect stripping tool to strip the RCoax cable and two 22 gauge open-ended wrenches.

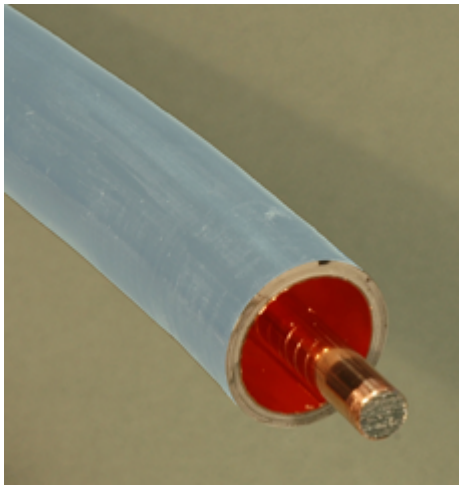
Have the RCoax N-connect stripping tool to strip the RCoax cable at hand.

Place the stripping tool on the end of the RCoax cable and turn the tool in a clockwise direction.

After reaching the fixed cutting depth of 37 mm, the tip of the inner conductor meets the tool. This completes the preparation for fitting the connector.



The dielectric between the inner and outer conductor is now cut out to a length of 23 mm. The outer conductor is flush with the cable jacket. The inner conductor extends 14 mm beyond the cable jacket and outer conductor.

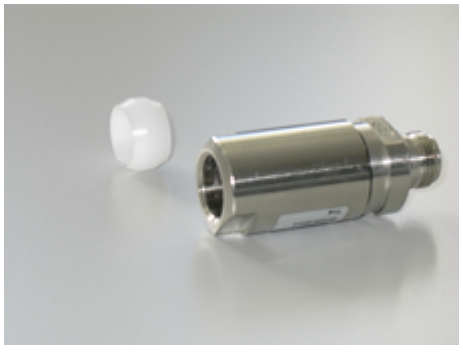


Carefully remove any remnants of the dielectric from the cable.

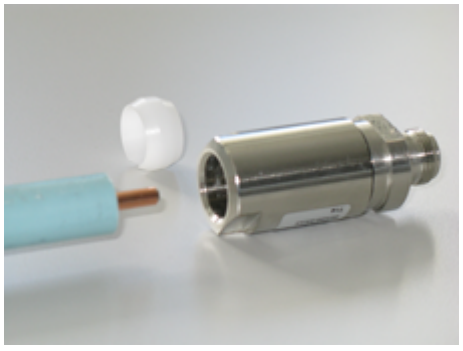
Chamfer the edge of the cable jacket and inner conductor with a file.

Make sure that no shavings get into the cable.

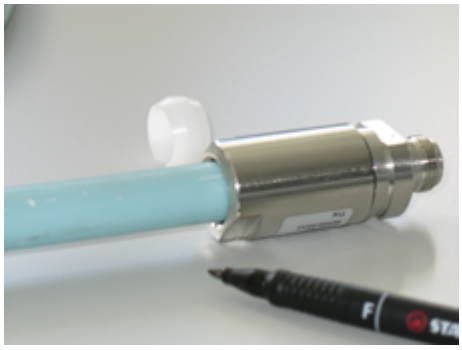
Unscrew the connector to open it and remove the white plastic ring.



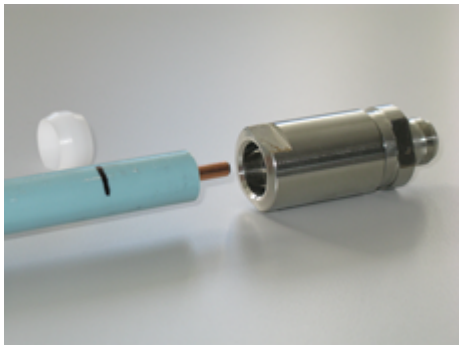
Screw the two parts of the connector together again. Do not tighten these.



Push the connector as far as possible onto the stripped end of the RCoax cable.

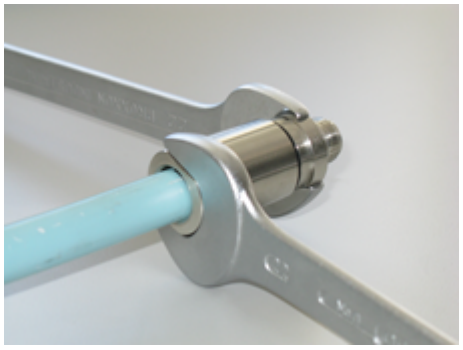


Mark the point where the RCoax cable enters the connector on the cable jacket.



Remove the connector from the RCoax cable again and open it.

Position the parts of the connector on the RCoax cable as shown in the figure. Push the right half of the connector as far as possible onto the RCoax cable.



Screw the two parts of the connector housing together until the O ring is covered by the outer part of the housing.

As the tool use two open-ended wrenches with a width of 22 across the flats. With one wrench, hold the right-hand part of the connector in a fixed position and tighten the sleeve with the second wrench (maximum torque 30 Nm).

The distance from the marking on the cable jacket to the connector must not exceed four millimeters.

A larger distance means that the connector is not correctly mounted. In this case mount a new connector. To do this, repeat the steps.

Note

Only use new connectors, a connector must not be assembled more than once.

General information

When cabling with the RCoax cable, remember the following points:

- **Alignment of the cable**
  To help orientation of the RCoax cable during installation, there is a flat ridge on the outer jacket. The cable should be aligned so that this ridge is on the side towards the carrier monorail and away from the antenna. In the photograph below, this ridge is indicated by a red arrow.

Note

The maximum gap between two successive segments must not exceed 1 m (see also section "Segment lengths (Page 38)").

- **Bending radius**
  When laying the cable, make sure that the cable is not bent tighter than the minimum bending radius of 20 cm to avoid damaging the RCoax cable.

Note

Avoid kinking.

- **Securing the cable**
  Keep the distance between securing clips between 0.5 m and 1.2 m. The maximum distance between two suspension points of the RCoax cable is 1.20 m. Make sure that the securing clips do not cover the openings in the coaxial shield of the RCoax cable (decoupling points as transverse slots, every 15 cm).

  Note

  Using metallic clamps can have a detrimental effect on the radiation characteristics and the matching of the RCoax cable.
  Use only the recommended clips and spacers to secure the RCoax cable to the rail.
  - RCoax securing clip ½" (article number 6GK5798-8MB00-0A**)
  - RCoax threaded washer M6 for securing clip ½" (Article number 6GK5798-8MC00-0A**)
  - RCoax spacer 85 mm for securing clip ½" (Article number 6GK5798-8MD00-0A**)

- **Securing the RCoax antenna**
  Make sure that the tip of the antenna is aligned with the slots. The distance from the tip of the antenna to the cable should be approx. 4 to 7 cm at 2.4 GHz and approx. 10 cm at 5 GHz .Good results are normally achieved with an angle of 90° between antenna and cable (see figure below). At an angle of approx. 50° you achieve a reduction in the coupling loss. For more detailed information, refer to the section "Optimizing the system (Page 27)".

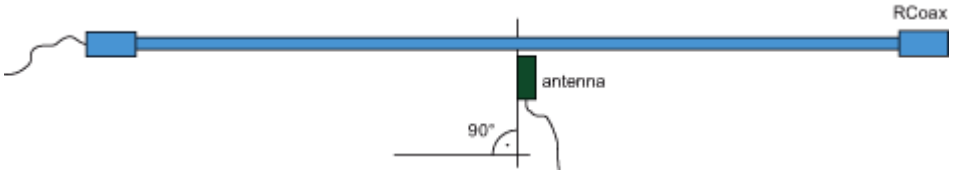


Figure 4-1 Alignment of the antenna

4.2 Installation

Preparing for installation

1. Check the cable lengths of the individual segments.
2. Strip the RCoax cable as required.

   Note

   To strip the RCoax cable, use a suitable iron saw to achieve a straight and flat cut. (If you use, for example, cable pliers, the RCoax cable will be put out of shape to an unacceptable degree.)

3. Fit the connectors to the RCoax cable segments, see section "Fitting connector to RCoax cable (Page 19)".
4. Protect the connectors (for example tape them) so that they are not damaged or contaminated during installation.

Laying RCoax cable

1. Align the RCoax cable roughly before fitting it in the rail, see aection "Fitting connector to RCoax cable (Page 19)".
2. Start securing the cable at one end of the segment or the other, see section "Fitting connector to RCoax cable (Page 19)" and "Mounting the fixing clip and spacer (Page 25)".
3. There should be two people to lay the RCoax cable and even three if the segments are long. One person secures the cable in the rail and tells the other or others which way to twist the cable so that it is oriented towards the antenna.

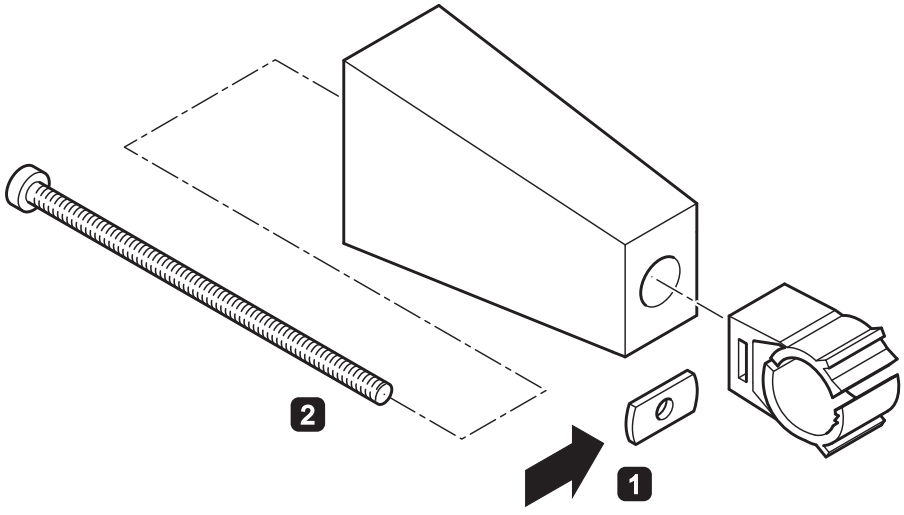
Note

Make sure that the orientation of the cable is correct while laying the cable because twisting it is extremely difficult once secured in the clips.

4.3 Mounting the fixing clip and spacer

Mounting fixing clip clips and spacers with an M6 screw

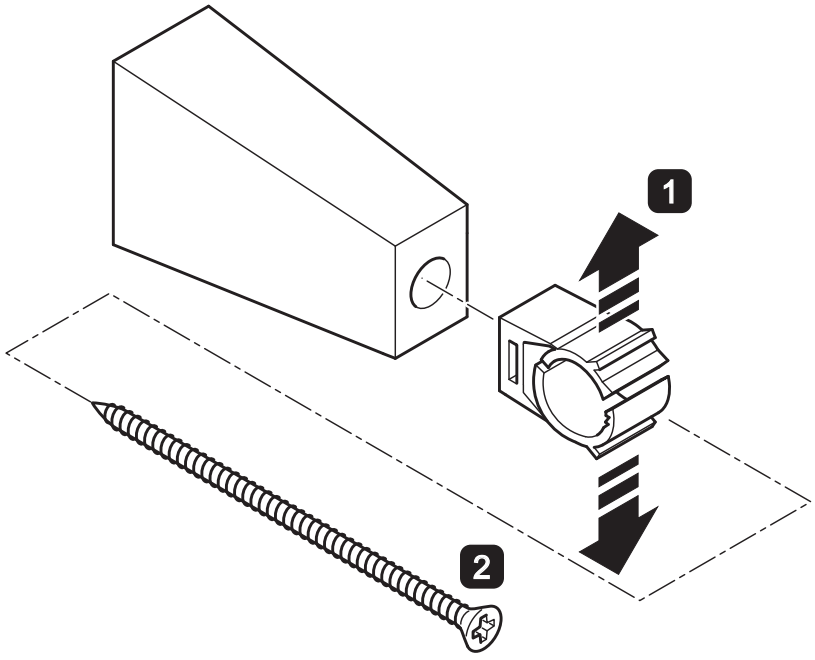
On thin walls, you can mount the fixing clip clip and spacer from the back with a suitably long M6 machine screw. Follow the steps outlined below:



1. Insert the threaded washer in the fixing clip clip and position the spacer and cable clip at the required location.
2. Feed the M6 screw through the hole in the spacer and secure it with the threaded washer in the fixing clip.

Mounting fixing clip clips and spacers with a wooden screw

If they can only be mounted from the front, the fixing clip clip and spacer are installed using a wooden screw with a suitable plug in the brickwork or concrete. Follow the steps outlined below:



1. Position the spacer and fixing clip clip at the required location and push the two halves of the cable clip apart.
2. Feed the wood screw through the holes in the fixing clip clip and spacer and screw it to the wall or support.

4.4 Example of an overhead monorail

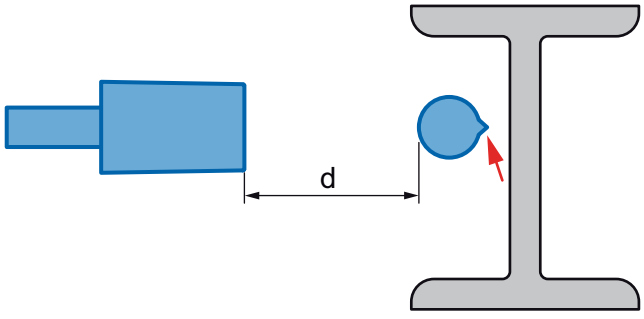


Figure 4-2 Cross-section through an overhead monorail rail and RCoax cable

The ridge lies on the outer jacket faces the overhead monorail rail. For the distance d between the RCoax cable and RCoax antenna, the following values apply as a rule of thumb:

5 GHz band: 10 cm

2.4 GHz band: 4 to 7 cm

Points to note when working with overhead monorails

- Laying the RCoax cable in the immediate vicinity of the metallic rail changes the characteristics of the radiated field (shielding/shadow areas). It must be expected that communication on the far side of the rail will be restricted.
- The close proximity of the RCoax cable to metal surfaces causes an increase in the longitudinal attenuation Δ_{rc}.
- Cables running parallel to the RCoax cable or metallic constructions along the cable (rails) can increase the coupling loss Δ_{co}.
- An RCoax cable running parallel can influence the transmission characteristics (coupling in of fields). The behavior cannot be predicted with any precision. Such an arrangement is therefore not recommended.
- For overhead monorail applications, the antenna is located in the near field of the RCoax cable. This near field is characterized by signal level fluctuations.

Note

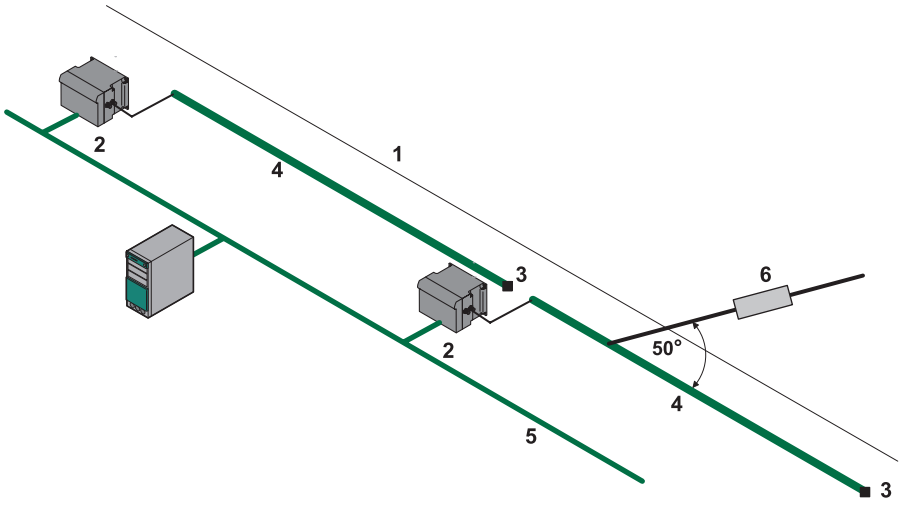
The maximum gap between two successive segments should not exceed 1 m (see also section "Segment lengths (Page 38)").

4.5 Optimizing the system

Optimized antenna alignment

At an angle of approximately 50° (instead of 90°) between the RCoax cable and antenna, you achieve a reduction in the coupling loss of some 5 dB (at this angle the coupling loss is actually increased, but fluctuations in the received power are minimized so that better overall transmission performance is achieved).

In this case, make absolutely certain that in systems with several segments, the signal propagation direction (access point feed-in point in the direction of the terminating resistor) is the same along the entire travel path (see figure below).



1	Guideway	4	RCoax cable
2	Access point	5	LAN
3	Terminating resistor	6	Antenna

Figure 4-3 System with several segments

Transmit powers

With short segments and/or when segments are in close proximity to each other, you should reduce the transmit power both of the access points and the clients to minimize mutual interference.

The following table serves as a general guideline (applies only to 2.4 GHz).

Segment length	Attenuation
< 10 m	30 - 35 dB
< 25 m	25 - 30 dB
< 50 m	20 - 25 dB
< 75 m	15 - 20 dB
< 100 m	10 - 15 dB
< 125 m	5 - 10 dB
< 150 m	0 - 5 dB
< 175 m	0 dB

The attenuation can be achieved with cascadable 10 dB attenuators (SIMATIC NET IWLAN RCoax N-Connect Male/Female Attenuator 10 dB). The transmit power of all SCALANCE W devices can also be configured.

Note

Please make sure that the settings for the transmit power on the access point and the corresponding clients is the same.

Connecting

5

5.1 Connecting and operating with SCALANCE W78x

SCALANCE W78x as access point

All access points of the SCALANCE W range with an external antenna connector can be used to feed the signal into the RCoax cable. The access points differ from each other not only in their design but also in the number of wireless cards they contain. One RCoax cable per wireless card can be connected.

Connect a flexible connecting cable to one of the R-SMA or N-Connect sockets of an access point. Connect the other end of the connecting cable to the RCoax cable.

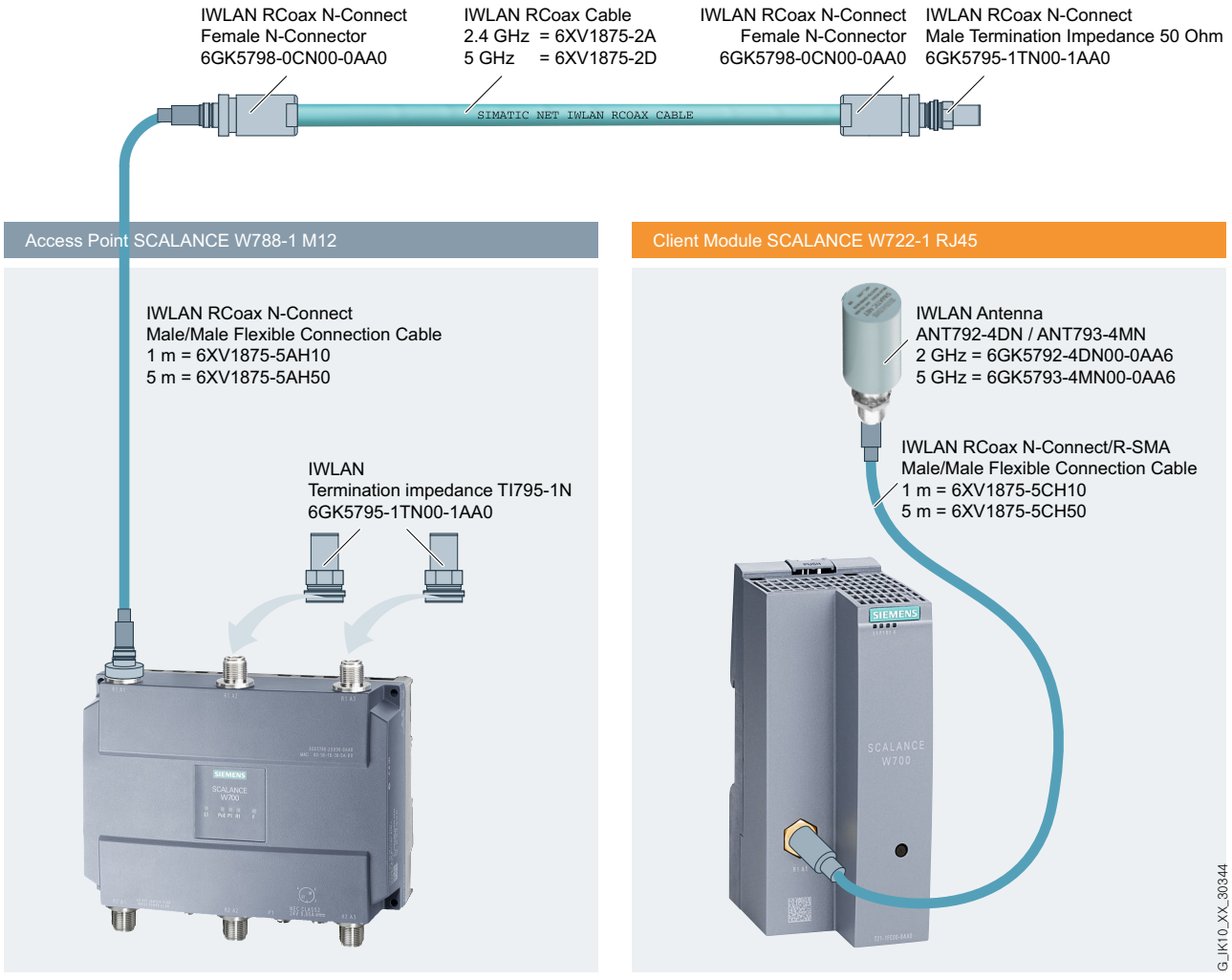


Figure 5-1 SCALANCE W788-1PRO with connected, flexible cable and RCoax connector, beside it an R-SMA terminator 50 Ω.

Note

Transmission disruptions

With SCALANCE W devices complying with IEEE 802.11n, each WLAN interface has three antenna connectors. Since only one antenna connector can be used to connect to the RCoax cable, the unused connectors must be fitted with a 50 Ω terminator.

With SCALANCE W devices complying with IEEE 802.11n, the antennas R1A1 and R2A1 must always be connected as soon as the corresponding WLAN interface is activated. If no antenna is connected, the corresponding interface must be deactivated. Otherwise, there may be transmission disruptions.

The antennas need to be suitably configured on the device (see configuration manual SCALANCE W700).

The maximum possible transmit power of the device can be specified in the configuration of the device. To avoid exceeding the legally stipulated maximum transmit power, it is necessary to reduce the transmit power of the antenna. Reducing the transmit power effectively reduces cell size. With short RCoax cable segment lengths, the input damping may be necessary to avoid radiated emissions affecting other RCoax cables running parallel to them. There are also separate attenuators available for this purpose.

Note

The maximum possible transmit power varies depending on the channel and data rate.

You will find detailed information on the transmit power and receiver sensitivity in the document "Leistungsdaten 802.11abgn PCIe Minicard / Performance data 802.11abgn PCIe Minicard" on the supplied data medium (REF_W700-RadioInterface_xx.pdf).

5.2 Feeding into RCoax from both ends

Initial situation

An RCoax cable is fed into by an access point at both ends.

Note

Same/overlapping channels

The two access points must not transmit on the same or overlapping channels.

Effects

In contrast to the standard use case, in which the 50 Ω terminator at the end of the cable largely prevents reflections, when feeding in a signal at both ends, the signals are partially reflected by a frequency-dependent input impedance at the ends of the RCoax cable.

These reflections impair the quality of the communication. This is noticeable due to the increased CRC and ACK error rates. The retry rate also increases.

When feeding a signal into both ends of the RCoax cable, it can be expected that the maximum possible data throughput will be considerably reduced.

Possible solutions

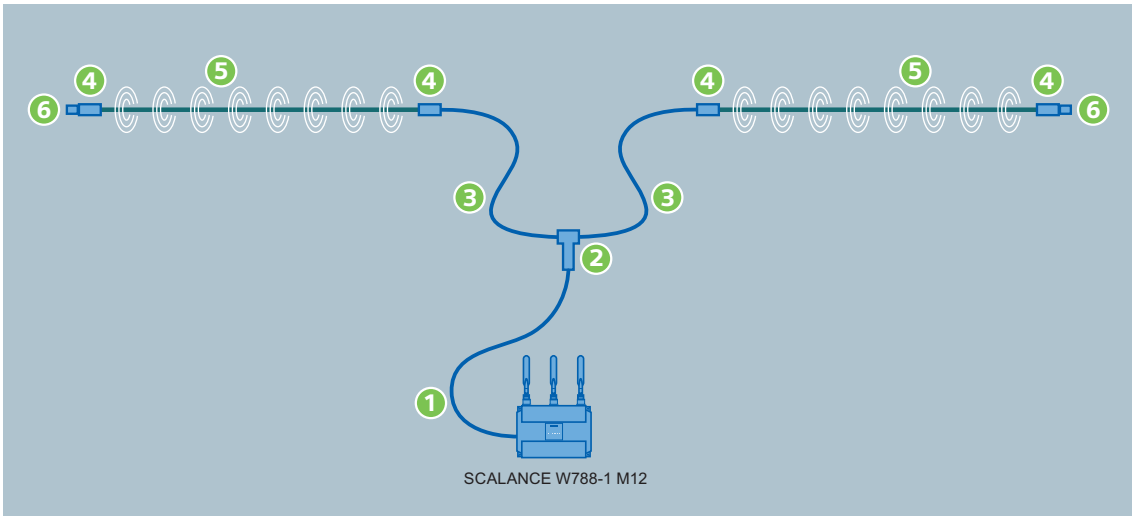
The effects of the signal reflections at the ends of the cable can be reduced by including an attenuator at the cable ends but they cannot be prevented entirely.

Remember that by including attenuators, you further reduce the coverable distance.

5.3 Supplying two sections of cable

Configuration example

The range of an RCoax wireless segment can be increased by connecting a power splitter in the center of the RCoax cable. The following example shows how the individual components are used.



① N-Connect male/R-SMA male flexible antenna cable 6XV1875-5C**0

② Power splitter. 6GK5798-0SN00-0EA0

③ N-connect/R-SMA male/male flexible connecting cable 6XV1875-5A**0

④ RCoax N-connector female connector 6GK5798-0CN00-0AA0

⑤ RCoax cable 6XV1875-2*

⑥ RCoax N-connect male termination 50 Ω 6GK5795-1TN00-1AA0

Note

In a concrete situation, the wildcards ** and * would be replaced by specific article numbers depending on the cable length and/or the frequency range you are using.

5.4 Connecting mobile nodes

Mobile nodes can be the following client modules of the SCALANCE W series:

SCALANCE W721-1 RJ45

SCALANCE W722-1 RJ45

SCALANCE W734-1 RJ45

Designing and calculating RCoax systems

6

Note

Technical specifications

You will find technical information on these products in the section "Technical specifications (Page 41)".

6.1 Calculating in decibels

Decibels as a logarithmic unit of measure

In wireless engineering, calculations are normally made in decibels (dB) to simplify the calculation of the transmission behavior of a series of transmission elements. Decibel means the logarithm of a ratio. Formulated mathematically, this can be shown by the following equation:

Decibel value = 10 * log (ratio)

Using sample calculations, the following decibel values are obtained:

Ratio	Decibel value
0.001	-30 dB
0.1	-10 dB
0.2	-7 dB
0.4	-4 dB
0.5	-3 dB
1	0 dB
2	3 dB
4	6 dB

As can be seen in the example, halving a value reduces the decibel value by 3 dB. This remains true regardless of the selected reference variable because only the ratio counts. Which reference variable is used can be recognized by the additional letters or numbers following the dimension dB. In acoustics, for example, the threshold of audibility is the reference variable for a value in dB(A).

6.2 Power specifications

Explanation of the power specifications

Specifying power in dBi

If power is specified in dBi, the reference variable is the transmit power of an isotropic antenna or unipole. Such a (hypothetical) antenna radiates energy from a central point uniformly in all directions.

From the directional radiation of a real antenna, a dBi value is obtained known as the antenna gain. This term is misleading in as far as no energy is gained by an antenna in the physical sense. The higher radiation of a passive antenna results solely from the concentration of radiation in a certain direction. In other spatial segments, there is accordingly less power.

You will find the antenna gain in the compact operating instructions of the relevant antenna.

Specifying power in dBm

A commonly used reference variable in wireless technology is a power of 1 mW. Power can then be specified in the decibel milliwatt unit (dBm). The following formula is used:

P [dBm] = 10 * log (P [mW] / 1 mW)

This results in the following power specifications in dBm:

0.5 mW	≈	-3 dBm
1 mW	=	0 dBm
2 mW	≈	3 dBm
4 mW	≈	6 dBm
10 mW	≈	10 dBm
100 mW	≈	20 dBm
200 mW	≈	23 dBm
1000 mW	≈	30 dBm

Using power specifications, it is simple to calculate gain and attenuation. To calculate an entire system, the individual values for gain and attenuation must simply be added.

Receiver sensitivity according to receive level

The receiver sensitivity is the minimum power that must be fed to a receiver to allow communication to take place. The receiver sensitivity is a device-specific property and depends on the transmission technique and data rate.

You will find detailed information on the transmit power and receiver sensitivity in the document "Leistungsdaten 802.11abgn PCIe Minicard / Performance data 802.11abgn PCIe Minicard" on the supplied data medium (REF_W700-RadioInterface_xx.pdf).

Transmit power P_0 in dBm

This power is input into the RCoax cable by a transmitter, for example a SCALANCE W700 access point.

You will find detailed information on the transmit power and receiver sensitivity in the document "Leistungsdaten 802.11abgn PCIe Minicard / Performance data 802.11abgn PCIe Minicard" on the supplied data medium (REF_W700-RadioInterface_xx.pdf).

Received power P_e in dBm

This power is usable for a receiver. It corresponds to the input power reduced by the losses such as longitudinal attenuation and coupling loss.

Note

Values for the coupling loss are often specified according to IEC 61196-4. The measurement according to this standard is made at a distance of 2 m and with a λ/2 radiator. Such measurements therefore also include part of the free space attenuation (loss between RCoax cable and communication partner).

6.3 Losses with RCoax cables

Longitudinal loss

The transmission of energy within the cable is also subject to loss. This loss is known as longitudinal attenuation (a_{rc}) and is calculated from the attenuation coefficient and length of the cable:

$a_{rc} = \alpha_{rc} * l$

a_{rc} Longitudinal attenuation of the cable in dB
α_{rc} Attenuation coefficient in dB/m as specified in the technical specifications of the cable
l Total length of the cable in m

The attenuation coefficient (a_{rc}) depends on the following parameters:

- Frequency of the electromagnetic wave in the cable. The higher the frequency, the higher the longitudinal attenuation.
- Dielectric and structure of the cable
- Number, size and shape of the slots in the shield
- Surroundings of the cable since the electromagnetic wave in a leaky feeder cable also radiates outside the cable.

Coupling loss

The transmission of energy from the inner cable to the outside of the leaky feeder cable is not free of loss. A measure of the efficiency of this transmission is the coupling loss C_d.

The coupling loss is the ratio of the power inside the leaky feeder cable at the point at which the power is coupled out to the power available at the point of measurement outside the cable, for example for a wireless receiver. It is made up of the actual coupling out loss (power in the

interior to power on the jacket) and the spatial loss between the cable and the measurement location. The coupling loss depends on the following parameters:

- Distance between cable and device
- Number, size and shape of the slots in the shield
- Environment of the cable (reflection, interference)

C_{95} and C_{50}

The actual signal strength at a measuring point fluctuates along the leaky feeder cable.

When designing wireless systems, the line of the 95% level or 50% level is normally taken as the basis. This line is an idealized characteristic of the received power for which more than 95% (C_{95}) or 50% (C_{50}) of the measured values are above the idealized line. This means that C_{95} is always higher than C_{50}.

Since the received power and therefore the possible segment lengths depends on the value of the coupling loss, only the value actually required for a system should be used. What is necessary depends on the type of communication.

C_{95} for safety-related communication

For communication involving the safety of persons or equipment, the coupling loss must be calculated using the C_{95} value.

C_{50} for standard communication

When exchanging data that is not relevant to safety and in which the loss of a frame or the repetition of a frame can be tolerated, it is adequate to use the lower C_{50} value.

Note

No distinction in the near field

Due to the physical properties in the immediate surroundings of the cable (up to 0.5 m distance), the C_{95} and C_{50} values do not differ in the near field.

Near and far field

Near field

In the immediate surroundings of the radiating cable, various physical effects influence the propagation of the electromagnetic waves so that a mathematical calculation of measured values is not possible. Information about coupling losses for this area is only possible as discrete values for distances actually measured in realistic surroundings.

In practice, with RCoax cables, the near field is assumed to be up to a distance of 0.5 m from the cable. This is therefore the range in which the receiving antenna is normally positioned for RCoax applications.

Far field

As of a distance of approximately 0.5 m, the propagation of the electromagnetic waves and therefore the associated measured variables can be described mathematically. This means,

for example, that coupling losses can be calculated using a formula depending on the distance from the cable as is specified in IEC 61196-4.

IEC 61196-4

Values for the coupling loss in the far field are often specified according to IEC 61196-4. The measurement according to this standard is made at a distance of 2 m and with a λ/2 radiator. Such measurements therefore also include part of the free space attenuation (loss between RCoax cable and communication partner).

To calculate the actual coupling loss, a spatial attenuation must therefore be deducted from this value for the distance of 2 m. The coupling loss C_{50} and C_{95} for a specified distance between the RCoax cable and the antenna of the communications partner is therefore calculated according to the following formulas:

$C_d = C_{50}+10*\log*(d/2)$

$C_d = C_{95}+20*\log*(d/2)$

C_d	Coupling loss of the cable in dB for a specified distance (>0.5 m) between RCoax cable and antenna
$C_{50/}$ C_{95}	$C_{50/}$ C_{95} value of the coupling loss at a distance of 2 m. (For $C_{50/}$ C_{95} values, see the section "Technical specifications (Page 41)")
d	Distance between RCoax cable and antenna in m

For the calculation according to the specified formula, d must be > 0.5 m (far field).

Losses due to power splitters and feed cables

The feed cables (a_{fe}) and power splitters (a_{PS}) cause losses. The values of these losses can be found in the section "Technical specifications" of the system manual "Passive network components IWLAN".

6.4 System calculation

Procedure

The calculation of the entire system shows whether communication is possible at the desired transmission rate using the desired components. All losses (longitudinal attenuation, spatial attenuation, power splitters etc.) are deducted from the transmit power. An antenna gain is added. The result is the power fed to a receiver. This power must be higher than the minimum necessary input power at the receiver so that a wireless link can exist.
The calculation can be made with the following formula:

$P_e = P_0 - a_{rc} - a_{fe} - c_d - a_{ps} + G_{ANT} - \Delta_{Sys} > P_{e\ min}$

P_e	Receiver input power in dBm
P_0	Transmit power dBm
a_{rc}	Longitudinal attenuation of the RCoax cable in dB
a_{fe}	Longitudinal attenuation of the feed cable in dB

c_d	Coupling loss for the distance between RCoax cable and communication partner (see Section "Losses with RCoax cables (Page 35)")
a_{ps}	Power splitter losses in dB
G_{ANT}	Antenna gain in dB
Δ_{Sys}	Link budget in dB. Depending on the field strength fluctuations, losses due to plug-in connections and the concrete operating conditions are between 10 and 20 dB.
$P_{e\ min}$	Minimum necessary receiver input power in dBm

6.5 Segment lengths

The following tables show the results of segment length calculations. For the calculation, the formula from the section "System calculation (Page 37)" is used.

The following constraints apply to the calculations:

- One-ended feed in to RCoax cable with terminator
- Between the access point and RCoax cable or client and RCoax antenna, a flexible connecting cable of 1 m is used
- Distance of 10 cm between RCoax cable and RCoax antenna of the client
- Installation of the RCoax cable 15 mm above an aluminum rail
- Antenna gain (G_{ANT}) for
  - RCoax cable: 0 dB
  - RCoax antenna: 4 dB at 2.4 GHz and 6 dB at 5 GHz
- -65 dBm is taken as the minimum necessary input power at the receiver ($P_{e\ min}$).
- Transmit power (P_0) according to the information in the document "Leistungsdaten 802.11abgn PCIe Minicard / Performance data 802.11abgn PCIe Minicard" on the supplied data medium (REF_W700-RadioInterface_xx.pdf)
- As the link budget (Δ_{Sys}), a value of 10 dB is assumed due to interference

In practice, environmental conditions mean that there may be considerable deviations from the values in the table.

If, for example, you have other output values recalculate the values using the formula from the section "System calculation (Page 37)".

Segment lengths at 2.4 GHz

SCALANCE W 802.11n 2.4 GHz (IEEE 802.11g)

Data rate [Mbps]	Segment length [m]
1 - 24	246
54	234

SCALANCE W 802.11n 2.4 GHz (IEEE 802.11n – MCS 7)[1)]

Channel width	Segment length [m]
20 MHz	234

1) Guard Interval (GI) is 800ns

Segment length at 5 GHz

SCALANCE W 802.11n 5 GHz (IEEE 802.11a)

Data rate [Mbps]	Segment length [m]	
	5.2 GHz	5.8 GHz
1 - 36	137	126
54	125	112

SCALANCE W 802.11n 5 GHz (IEEE 802.11n – MCS 7)[1)]

Channel width	Segment length [m]	
	5.2 GHz	5.8 GHz
20 MHz	125	119
40 MHz	125	119

1) Guard Interval (GI) is 800ns

As can be seen in the tables, greater segment lengths can be achieved at lower transmission rates rather than at higher rates. The transmission rate should therefore only be set as high as necessary.

Note

You can increase the distances covered by your RCoax cables by feeding in at the center of the cable and using power splitters. Please remember the 3 dB attenuation properties of the splitter.

Note

Stable PNIO communication is only possible when it is guaranteed that a WLAN client is in a cell with more than 60% or -65 dBm signal strength at all times. This can be checked by activating and deactivating the various segments.

Technical data

7

Note

Further information

You will find information about further accessories for cabling in the Passive network components IWLAN system manual.

Note

The following tightening torques apply to the connectors:

- with N-Connect connectors: 1.7 Nm
- with SMA/R-SMA connectors: 1 Nm

7.1 RCoax cables

The information relates to both RCoax cables 2.4 GHz and 5 GHz.

Note

Laying cables outdoors

In terms of UV stability and provided the specified temperature range is not exceeded, the cables listed above are suitable for use outdoors. Correctly fitted connectors have degree of protection IP67/IP68 and form a unit with the cable that meets degree of protection IP65/IP67. Temporary exposure to rain, fog or snow is permitted. The cable segment must, however, not be used permanently under water because neither the cable jacket (limited steam permeability) nor the connector (not IP68) are suitable.

Technical specifications		
Article number	2.4 GHz	6XV1875-2A
	5 GHz	6XV1875-2D
Electrical data		
Impedance		50 +/- 3 Ω
Ratio of propagation speed		88%
Capacitance		76 pF/m
DC resistance at 20 °C	Inner conductor	1.48 Ω/km
	Outer conductor	2.8 Ω/km
Permitted ambient conditions		

Technical specifications				
Ambient temperature	During operation	-40 ... +85 °C		
	During operation according to UL performance	-40 ... +85 °C		
	During storage	-70 ... +85 °C		
	During installation	-25 ... +60 °C		
Resistance to fire				
Low corrosive gas emission		IEC 60754-2		
Flame retardant		IEC 60332-1 and IEC 60332-3 Cat. C		
Low smoke emission		IEC 61034		
Design, dimensions and weight				
Weight		0.232 kg/m		
Minimum bending radius (once)		20 cm		
Tensile strength		110 daN (1daN = 10 N)		
Recommended securing intervals		0.5 m		
Materials	Inner conductor	• Copper-clad aluminum • Diameter: 4.8 mm		
	Dielectric	• Polyethylene foam • Diameter: 12.4 mm		
	Outer conductor	Overlapping copper foil with openings in the coaxial shield of the RCoax cable bonded to the cable jacket.		
	Cable jacket	• Halogen-free polyolefin AM3, pale turquoise • Diameter: 15.5 mm • Jacket thickness: 1.3 mm		
Attenuation properties – 2.4 GHz				
Longitudinal attenuation (1) at 20 °C	f [MHz]	2400		
	α [dB/100 m] Cable installation 10 mm over concrete	15		
	α [dB/100 m] Cable installation15 mm over aluminum rail	17		
Coupling loss (2) at 20 °C	f [MHz]	2400		
	Distance between antenna and RCoax cable	C_{50}[dB]	C_{95}[dB]	
	2 cm	31	31	
	5 cm	32	32	
	10 cm	35	35	
	20 cm	37	37	
	50 cm	41	41	
	2 m	54	60	
Attenuation properties – 5 GHz				

Technical specifications					
Longitudinal attenuation (1) at 20 °C	f [MHz]			5150	5850
	α [dB/100 m]			22.5	24
	Cable installation 10 mm over concrete				
	α [dB/100 m]			24.2	27
	Cable installation15 mm over aluminum rail				
Coupling loss (2) at 20 °C	f [MHz]	5200		5700	
	Distance between antenna and RCoax cable	C_{50}[dB]	C_{95}[dB]	C_{50}[dB]	C_{95}[dB]
	2 cm	36	36	35	35
	5 cm	39	39	38	38
	10 cm	42	42	40	40
	20 cm	45	45	44	44
	50 cm	49	49	47	47
	2 m	62	71	55	59

(1) Nominal value, manufacturing tolerance +/- 5%

(2) Nominal value, manufacturing tolerance +/- 3 dB

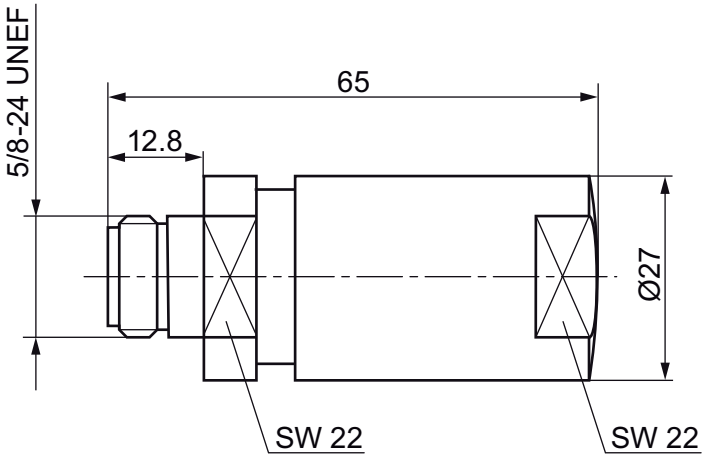
7.2 N-Connect for RCoax – female

Technical specifications			
Article number		6GK5798-0CN00-0AA0	
Electrical data			
Impedance		50 Ω	
Frequency range		6 GHz	
Contact resistance	Inner conductor:	< 2 mΩ	
	Outer conductor	< 0.5 mΩ	
Seal		NBR / EPDM, silicone-free	
Insulation		PTFE / PPO, silicone-free	
Connector torque		4 ... 6 Nm	
Max. number of insertion cycles		> 500	
Design, dimensions and weight			
Dimensions (length x diameter)		65 x 27 mm	
Materials		Spring contact	Other metal parts
	Core material	Copper alloy	Brass
	Coating	Cu2Ag5	CuSnZn3
Degree of protection		IP67	
Permitted ambient conditions			
Ambient temperature		-40 ... +85 °C	
Cables for 2.4 GHz and 5 GHz			

Technical specifications		
Lead	Type	RCoax cable PE 1/2"
	Resistance	Sun resistant

Dimension drawing

The dimensions are specified in mm.

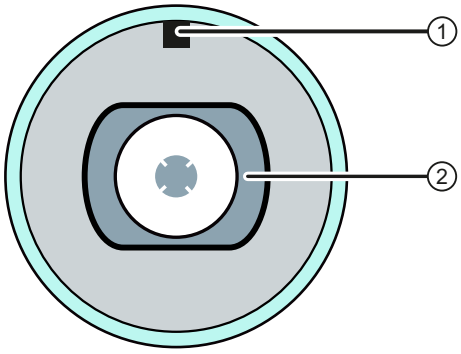


7.3 Antennas for RCoax application

Aid to orientation

To help you to read the data from the antenna diagram, the antenna is drawn in in the antenna diagrams.

On the rear of the antenna, there is a groove to aid with orientation. The groove is shown on the antenna drawing by this symbol ●.



① Groove
② N-Connect

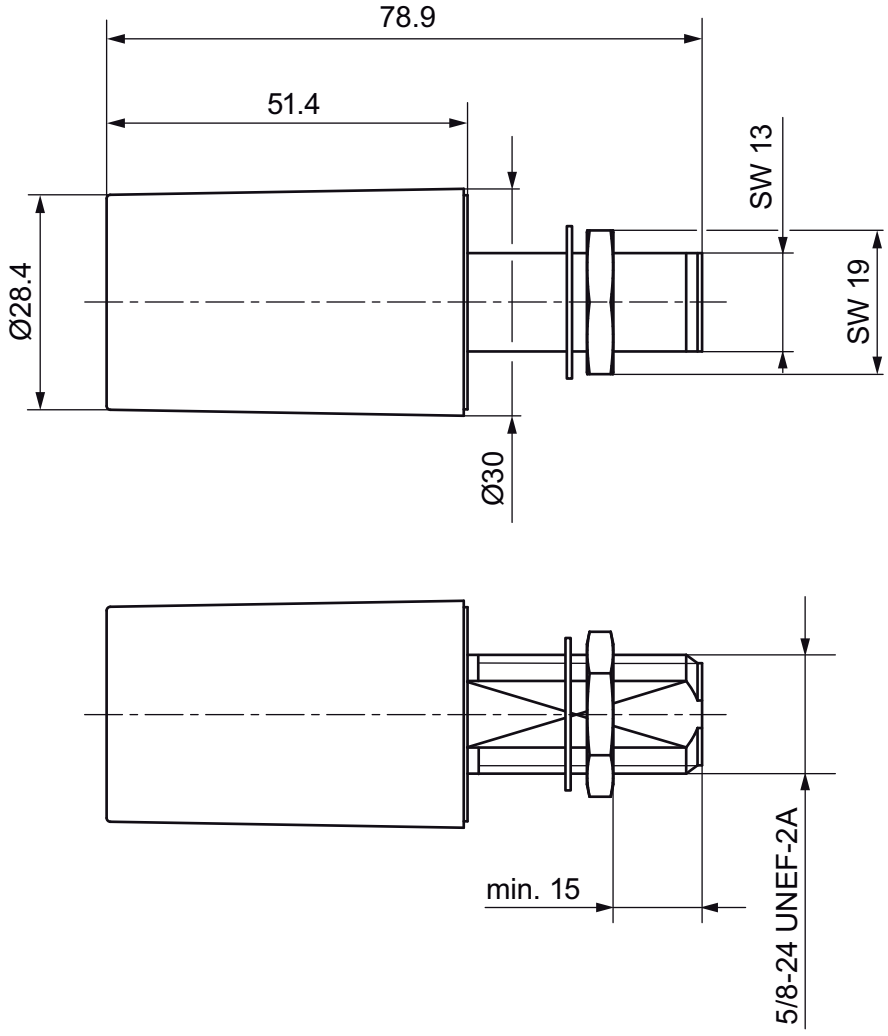
Figure 7-1 View from below

RCoax N-Connect Female ANT 792-4DN (2.4 GHz antenna, circular polarization)

Technical specifications	
Article number	6GK5792-4DN00-0AA6
Electrical data	
Frequency range	2.4 ~ 2.4835 GHz
Antenna gain	4 dB
Impedance	50 Ω
Polarization	Circular, clockwise
Standing wave ratio (VSWR)	≤1.8
Construction and dimensions	
Dimensions (length x diameter)	78.9 x 30 mm
Length of securing thread	27.5 mm
Connector	N connector, female
External material	Lexan
Degree of protection	IP65
Permitted ambient conditions	
Ambient temperature	-40 ... +70 °C

Dimension drawing

The dimensions are specified in mm.



Horizontal antenna diagram

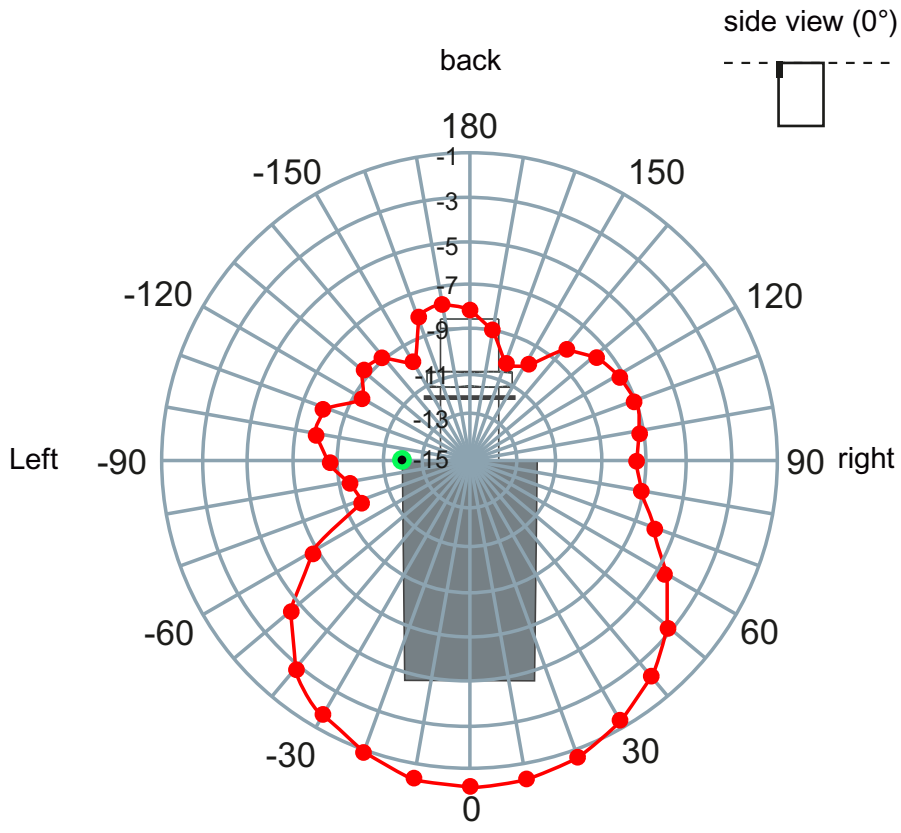


Figure 7-2 Horizontal directional characteristics of the helical antenna

Vertical antenna diagram

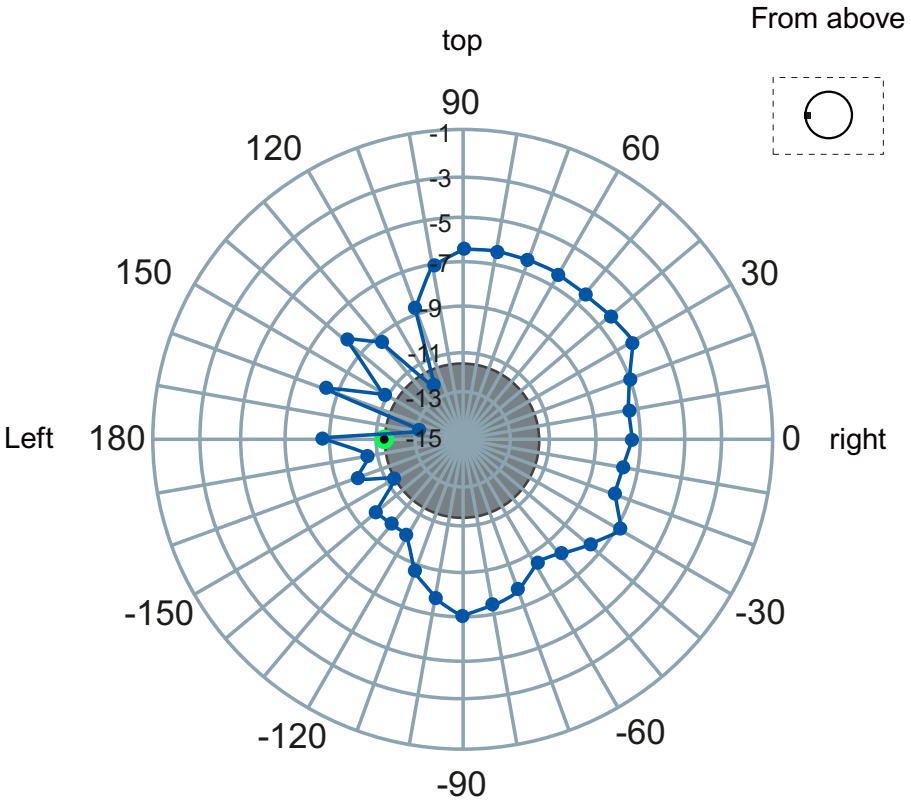


Figure 7-3 Vertical directional characteristics of the helical antenna

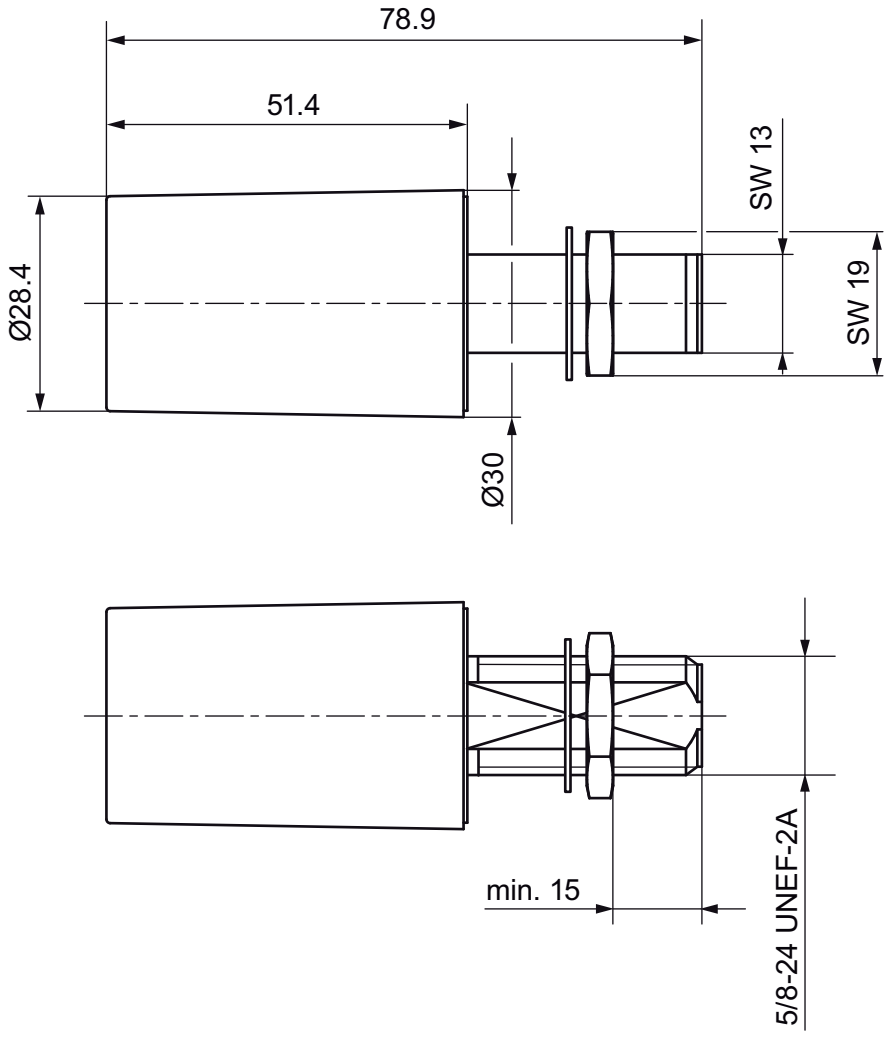
RCoax N-Connect Female ANT 793-4MN (antenna 5 GHz, λ5/8)

Technical specifications	
Article number	6GK5793-4MN00-0AA6
Electrical data	
Frequency range	5.725 ~ 5.85 GHz
Antenna gain	6 dB
Impedance	50 Ω
Polarization	Vertical (λ5/8 characteristic)
Standing wave ratio (VSWR)	≤2.0
Construction and dimensions	
Dimensions (length x diameter)	78.9 x 30 mm
Length of securing thread	27.5 mm
Connector	N connector, female
External material	Lexan
Degree of protection	IP65

Technical specifications	
Permitted ambient conditions	
Ambient temperature	-40 ... +70 °C

Dimension drawing

The dimensions are specified in mm.



Horizontal antenna diagram at 5.2 GHz in dB

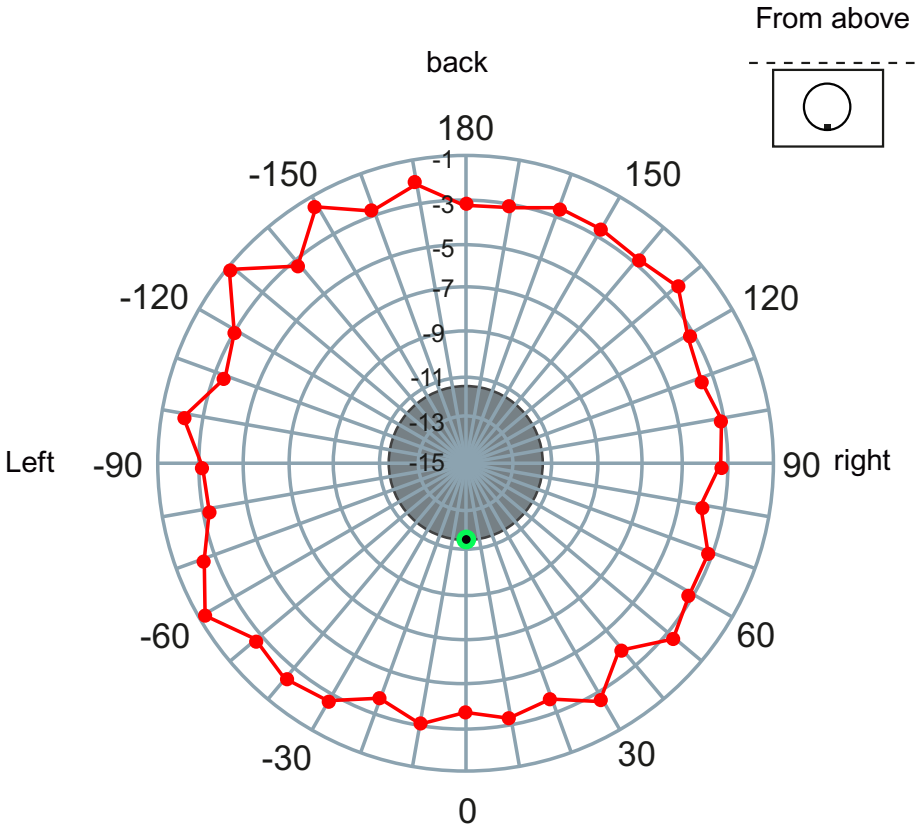


Figure 7-4 Horizontal radiation pattern ANT793-4MN

Vertical antenna diagram for different azimuth angles at 5.2 GHz in dB

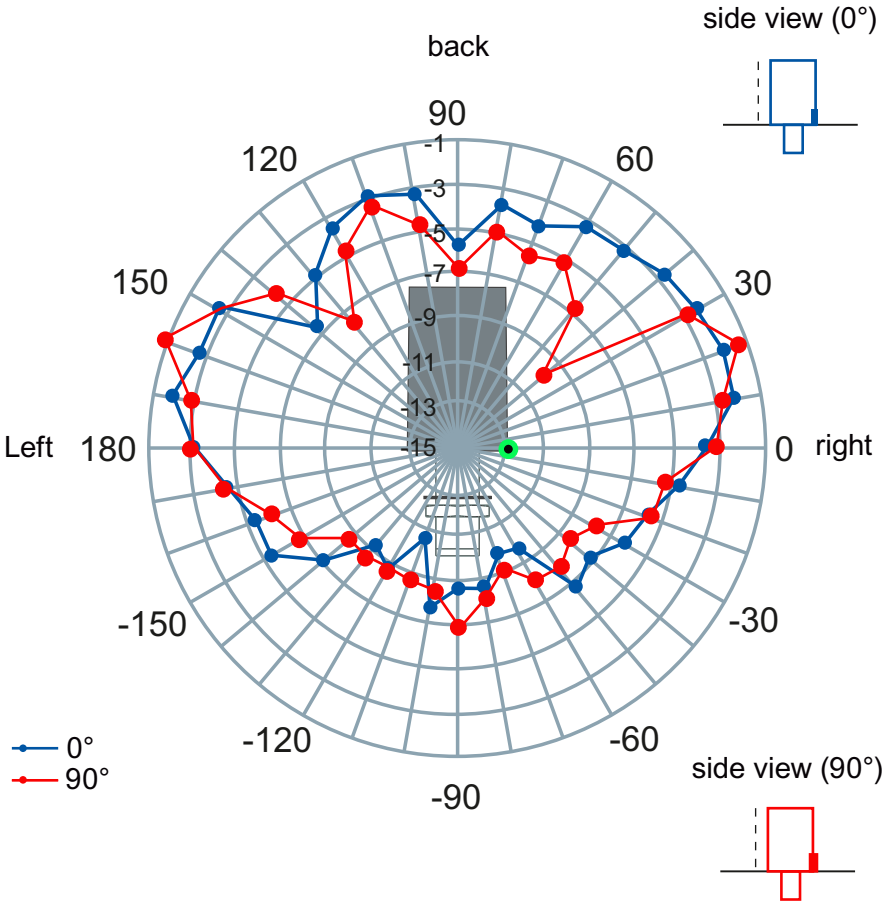


Figure 7-5 Vertical radiation pattern ANT793-4MN

Horizontal antenna diagram at 5.7 GHz in dB

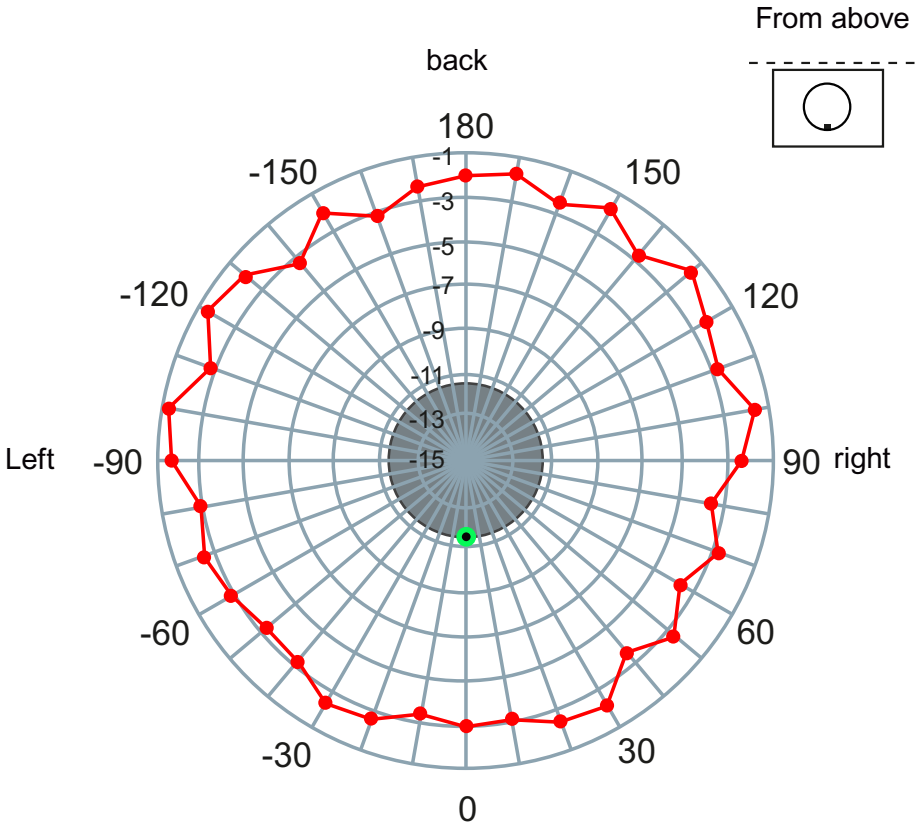


Figure 7-6 Horizontal radiation pattern ANT793-4MN at 5.7 GHz

Vertical antenna diagram for different azimuth angles at 5.7 GHz in dB

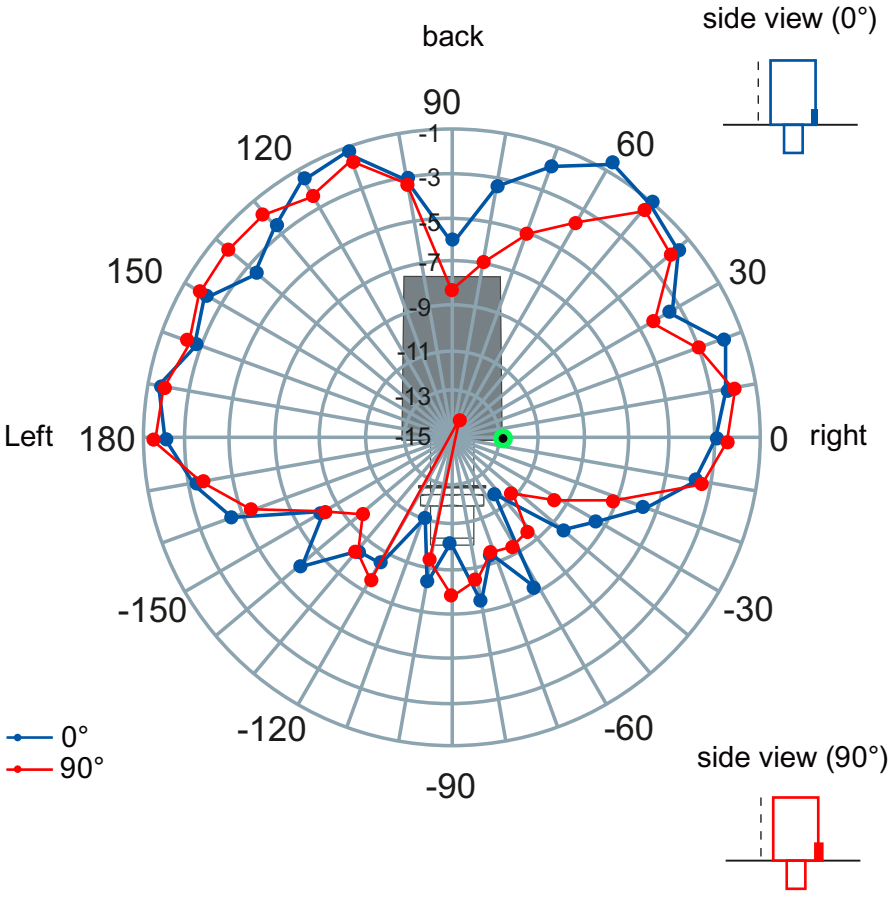


Figure 7-7 Vertical radiation pattern ANT793-4MN at 5.7 GHz

7.4 Wall mounting

RCoax securing clip ½"

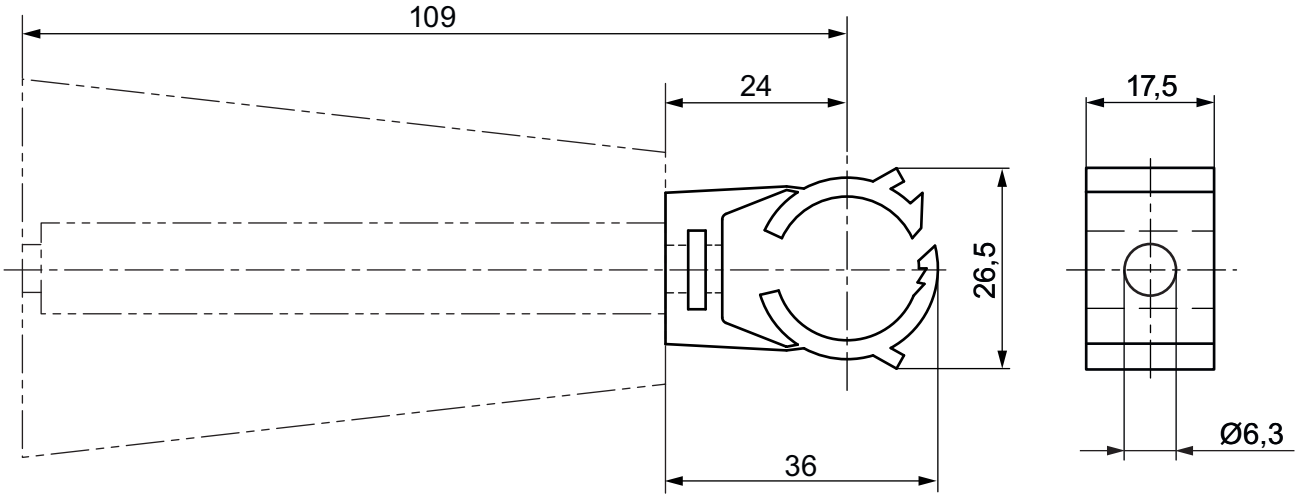
Technical specifications		
Article number	Pack of 10	6GK5798-8MB00-0AC1
	Pack of 100	6GK5798-8MB00-0AM1
Resistance to fire		
Flame class		UL 94HB
Construction and materials		
Materials		High-class polyamide (UV resistant): • Halogen-free • Chemical-resistant

Technical specifications	
Color	black
Permitted ambient conditions	
Ambient temperature	-40 ... +70 °C
Mechanical data	
Stress	max. 600 N
Securing range (cable diameter ∅)	14.3 ... 16.8 mm

Figure 7-8 RCoax securing clip ½" with threaded washer M6 and spacer 85 mm

Dimension drawing RCoax securing clip ½"

The dimensions are specified in mm.

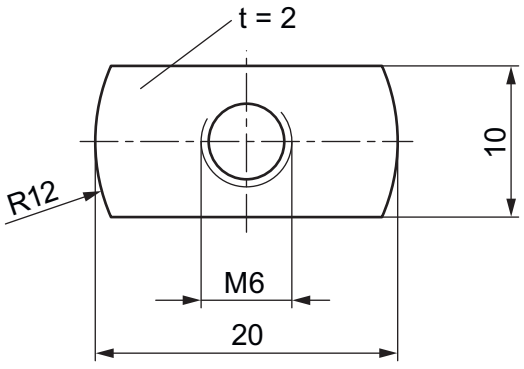


RCoax threaded washer M6 for securing clip ½"

Technical specifications		
Article number	Pack of 10	6GK5798-8MC00-0AC1
	Pack of 100	6GK5798-8MC00-0AM1
Construction and materials		
Materials		Stainless steel
Thread		M6

Dimension drawing RCoax threaded washer 85 mm for securing clip ½ "

The dimensions are specified in mm.

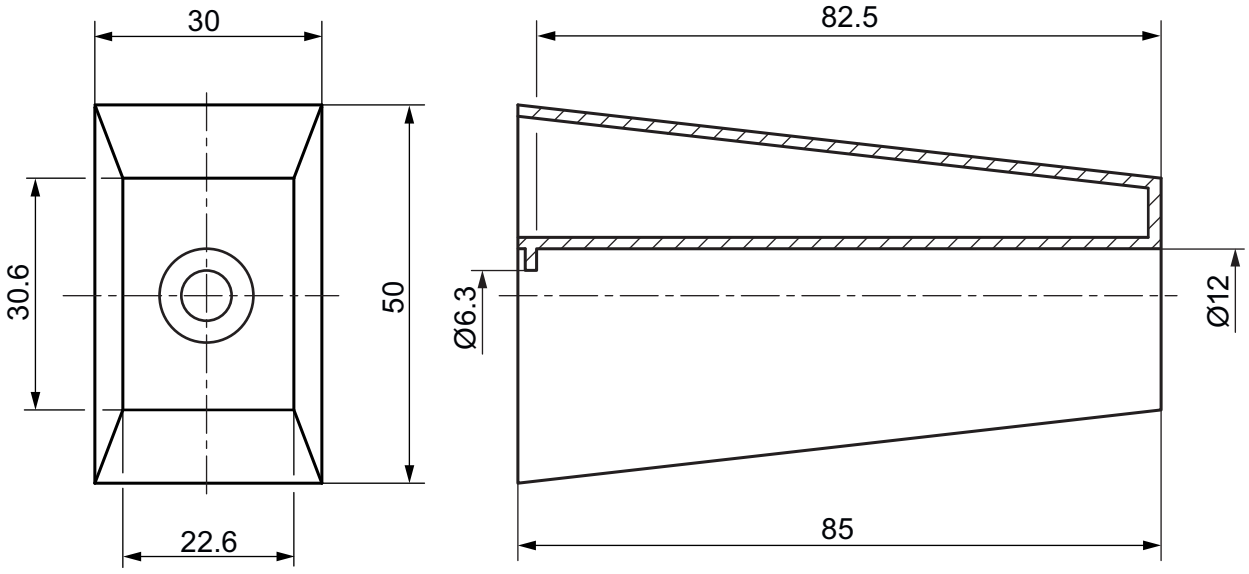


RCoax spacer 85 mm

Technical specifications		
Article number	Pack of 10	6GK5798-8MD00-0AC1
	Pack of 100	6GK5798-8MD00-0AM1
Dimensions and materials		
Dimensions (W x H x D)		50 x 30 x 85 mm
Materials		Polyamide (halogen-free, resistant to UV light)

Dimension drawing RCoax spacer 85 mm

The dimensions are specified in mm.



Index