SIEMENS

SIMATIC NET

Industrial Wireless LAN Performance data SCALANCE W700 802.11ax

Reference Manual

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Legal information

Warning notice system

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.

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠ WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

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Disclaimer of Liability

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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Validity of the document

1

This documentation deals with the following products:

Product	Article number	Model
Access points		
SCALANCE WAM766-1	6GK5766-1GE00-7DA0 6GK5766-1GE00-7DB0 (US) 6GK5766-1GE00-7DC0 (ME)	MSAX65-W1-M12-E2
SCALANCE WAM766-1 EEC	6GK5766-1GE00-7TA0 6GK5766-1GE00-7TB0 (US) 6GK5766-1GE00-7TC0 (ME)	MSAX65-W1-M12-E2
SCALANCE WAM763-1	6GK5763-1AL00-7DA0 (DI/DO) 6GK5763-1AL00-7DB0 (US) (DI/DO) 6GK5763-1AL00-7DC0 (ME) (DI/DO)	MSAX-W1-RJ-E2
SCALANCE WAB762-1	6GK5762-1AJ00-6AA0	ELAX-W1-RJ-E1
Client		
SCALANCE WUM766-1	6GK5766-1GE00-3DA0 6GK5766-1GE00-3DB0 (US) 6GK5766-1GE00-3DC0 (ME)	MSAX65-W1-M12-E2
SCALANCE WUM763-1	6GK5763-1AL00-3AA0 6GK5763-1AL00-3AB0 (US)	MSAX-W1-RJ-E2-NO
	6GK5763-1AL00-3DA0 (DI/DO) 6GK5763-1AL00-3DB0 (US) (DI/DO)	MSAX-W1-RJ-E2
SCALANCE WUB762-1	6GK5762-1AJ00-1AA0	ELAX-W1-RJ-E1
SCALANCE WUB762-1 iFeatures	6GK5762-1AJ00-2AA0	ELAX-W1-RJ-E1

Cybersecurity information 2

Siemens provides products and solutions with industrial cybersecurity functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial cybersecurity concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial cybersecurity measures that may be implemented, please visit
https://www.siemens.com/cybersecurity-industry (https://www.siemens.com/industrialsecurity).

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Cybersecurity RSS Feed under
https://new.siemens.com/cert (https://www.siemens.com/cert).

Frequency / modulation

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Frequency range

- 11b/g/n/ax center frequencies: 2412 - 2472 MHz
- 11a/n/ac/ax center frequencies: 4920 - 5865 MHz

Observe the country-specific restrictions. You can find more information on currently available country approvals in the "Approvals SCALANCE W700 802.11ax" document on the Internet under (https://support.industry.siemens.com/cs/ww/en/ps/28575/man).

Modulation

- 802.11a: OFDM (BPSK, QPSK, 16-QAM, 64-QAM)
- 802.11b: DSSS (BPSK, DQPSK, CCK)
- 802.11g: OFDM (BPSK, QPSK, 16-QAM, 64-QAM)
- 802.11n: OFDM (BPSK, QPSK, 16-QAM, 64-QAM)
- 802.11ac: OFDM (BPSK, QPSK, 16-QAM, 64-QAM, 128-QAM, 256-QAM)
- 802.11ax: OFDM (BPSK, QPSK, 16-QAM, 64-QAM, 128-QAM, 256-QAM, 1024-QAM)

Transmission speed

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4.1 IEEE 802.11abg

The following table shows the transmission speeds with 802.11a, 802.11b and 802.11g.

Protocol	Transmission speed in Mbps
802.11a	6 9 12 18 24 36 48 54
802.11b	1 2 5,5 11
802.11g	6 9 12 18 24 36 48 54

All transmission types support the automatic fallback function.

4.2 IEEE 802.11n

The following table shows the transmission speeds with 802.11n.

Note

SCALANCE WAB762-1/WUM762-1 only support one spatial stream.

HT(1) MCS index (2)	Spatial streams	Transmission speed in Mbps			
		20 MHz channel		40 MHz channel	
		800 ns GI (3)	400 ns GI (3)	800 ns GI (3)	400 ns GI (3)
0	1	6,5	7,2	13,5	15,0
1	1	13,0	14,4	27,0	30,0
2	1	19,5	21,7	40,5	45,0
3	1	26,0	28,9	54,0	60,0

HT[1] MCS index [2]	Spatial streams	Transmission speed in Mbps			
		20 MHz channel		40 MHz channel	
		800 ns GI [3]	400 ns GI [3]	800 ns GI [3]	400 ns GI [3]
4	1	39,0	43,3	81,0	90,0
5	1	52,0	57,8	108,0	120,0
6	1	58,5	65,0	121,5	135,0
7	1	65,0	72,2	135,0	150,0
8	2	13,0	14,4	27,0	30,0
9	2	26,0	28,9	54,0	60,0
10	2	39,0	43,3	81,0	90,0
11	2	52,0	57,8	108,0	120,0
12	2	78,0	86,7	162,0	180,0
13	2	104,0	115,6	216,0	240,0
14	2	117,0	130,0	243,0	270,0
15	2	130,0	144,4	270,0	300,0

[1] High Throughput data field

[2] Modulation and Coding Scheme index

[3] Guard Interval

All transmission types support the automatic fallback function.

4.3 IEEE 802.11ac

The following table shows the transmission speeds with 802.11ac:

Note

SCALANCE WAB762-1/WUM762-1 only support one spatial stream.

VHT[1] MCS index [2]	Spatial streams	Transmission speed in Mbps					
		20 MHz channel		40 MHz channel		80 MHz channel	
		Guard interval		Guard interval		Guard interval	
		800 ns	400 ns	800 ns	400 ns	800 ns	400 ns
0	1	6,5	7,2	13,5	15,0	29,3	32,5
1	1	13,0	14,4	27,0	30,0	58,5	65,0
2	1	19,5	21,7	40,5	45,0	87,8	97,5
3	1	26,0	28,9	54,0	60,0	117,0	130,0
4	1	39,0	43,3	81,0	90,0	175,5	195,0
5	1	52,0	57,8	108,0	120,0	234,0	260,0
6	1	58,5	65,0	121,5	135,0	263,3	292,5
7	1	65,0	72,2	135,0	150,0	292,5	325,0
8	1	78,0	86,7	162,0	180,0	351,0	390,0

VHT[1] MCS index [2]	Spatial streams	Transmission speed in Mbps					
		20 MHz channel		40 MHz channel		80 MHz channel	
		Guard interval		Guard interval		Guard interval	
		800 ns	400 ns	800 ns	400 ns	800 ns	400 ns
9	1	-	-	180,0	200,0	390,0	433,3
0	2	13,0	14,4	27,0	30,0	58,5	65,0
1	2	26,0	28,9	54,0	60,0	117,0	130,0
2	2	39,0	43,3	81,0	90,0	175,5	195,0
3	2	52,0	57,8	108,0	120,0	234,0	260,0
4	2	78,0	86,7	162,0	180,0	351,0	390,0
5	2	104,0	115,6	216,0	240,0	468,0	520,0
6	2	117,0	130,0	243,0	270,0	526,5	585,0
7	2	130,0	144,4	270,0	300,0	585,0	650,0
8	2	156,0	173,3	324,0	360,0	702,0	780,0
9	2	-	-	360,0	400,0	780,0	866,7

[1] Very High Throughput data field

[2] Modulation and Coding Scheme index

All transmission types support the automatic fallback function.

4.4 IEEE 802.11ax

The following table shows the transmission speeds with 802.11ax.

Note

SCALANCE WAB762-1/WUM762-1 only support one spatial stream.

HE[1] MCS index [2]	Spatial streams	Transmission speed in Mbps								
		20 MHz channel			40 MHz channel			80 MHz channel		
		Guard interval			Guard interval			Guard interval		
		0.8 µs	1.6 µs	3.2 µs	0.8 µs	1.6 µs	3.2 µs	0.8 µs	1.6 µs	3.2 µs
0	1	8.6	8.1	7.3	17.2	16.3	14.6	36.0	34.0	30.6
1	1	17.2	16.3	14.6	34.4	32.5	29.3	72.1	68.1	61.3
2	1	25.8	24.4	21.9	51.6	48.8	43.9	108.1	102.1	91.9
3	1	34.4	32.5	29.3	68.8	65.0	58.5	144.1	136.1	122.5
4	1	51.6	48.8	43.9	103.2	97.5	87.8	216.2	204.2	183.8
5	1	68.8	65.0	58.5	137.6	130.0	117.0	288.2	272.2	245.0
6	1	77.4	73.1	65.8	154.9	146.3	131.6	324.3	306.3	275.6
7	1	86.0	81.3	73.1	172.1	162.5	146.3	360.3	340.3	306.3
8	1	103.2	97.5	87.8	206.5	195.0	175.5	432.4	408.3	367.5
9	1	114.7	108.3	97.5	229.4	216.7	195.0	480.4	453.7	408.3

Transmit power

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Note

Observe the country-specific guidelines

The following data on the transmit power represent maximum achievable values. Operate the device within the transmit power ranges permitted in your country.

5.1 Frequency band 2.4 GHz

The table below shows the maximum values that are possible for each sending antenna connector.

- Tolerance ± 2 dBm

Max. conducted power

The value is the cumulative transmit power of all active antenna connectors.

The calculation is made according to the following scheme:

- 1 antenna connector
  Max. transmit power = Max. conducted power
- 2 Antenna connectors (SCALANCE WxM766-1 / WxM763-1 only)
  Max. transmit power + 3 dBm = Max. conducted power

Protocol	Transmission speed	Max. transmit power (dBm)			Receiver sensitivity (dBm)
		2.412 GHz	2.442 GHz	2.472 GHz	2.442 GHz
802.11g	6 Mbit/s	20	20	20	-92
	12 Mbit/s	20	20	20	-89
	54 Mbit/s	20	20	20	-75
802.11n HT20	MCS 0	20	20	20	-90
	MCS 7	20	20	20	-73
802.11n HT40	MCS 0	20	20	20	-88
	MCS 7	20	20	20	-70
802.11ax HE20	MCS 0	20	20	20	-90
	MCS 7	20	20	20	-62
802.11ax HE40	MCS 0	20	20	20	-88
	MCS 7	20	20	20	-60

5.2 Frequency band 5 GHz

The table below shows the maximum values that are possible for each sending antenna connector.

Tolerance ± 2 dBm

Max. conducted power

The value is the summed transmit power of all active antenna connections.

The calculation is made according to the following scheme:

- 1 antenna connection
  max. transmit power = Max. conducted power
- 2 Antenna connectors (SCALANCE WxM766-1 / WxM763-1 only)
  max. transmit power + 3 dBm = Max. conducted power

Protocol	Transmission speed	Max. transmit power (dBm)			Receiver sensitivity (dBm)
		5.18 GHz	5.5 GHz	5.745 GHz	5.5 GHz
802.11a	6 Mbit/s	20	20	20	-90
	12 Mbit/s	20	20	20	-87
	54 Mbit/s	20	20	17	-74
802.11n HT20	MCS0	20	20	20	-90
	MCS7	20	20	17	-71
802.11n HT40	MCS0	20	20	20	-87
	MCS7	20	20	17	-68
802.11ac VHT20	MCS0	20	20	20	-90
	MCS8	20	20	16	-69
802.11ac VHT40	MCS0	20	20	20	-87
	MCS9	20	19	16	-65
802.11ac VHT80	MCS0	20	20	20	-85
	MCS9	20	18	16	-60
802.11ax HE20	MCS0	20	20	20	-90
	MCS11	20	18	15	-60
802.11ax HE40	MCS0	20	20	20	-87
	MCS11	20	18	15	-57
802.11ax HE80	MCS0	20	20	20	-84
	MCS11	20	17	15	-51