Alignment

The following diagram shows the optimum alignment of the RF600 transponders to the RF642A antenna.

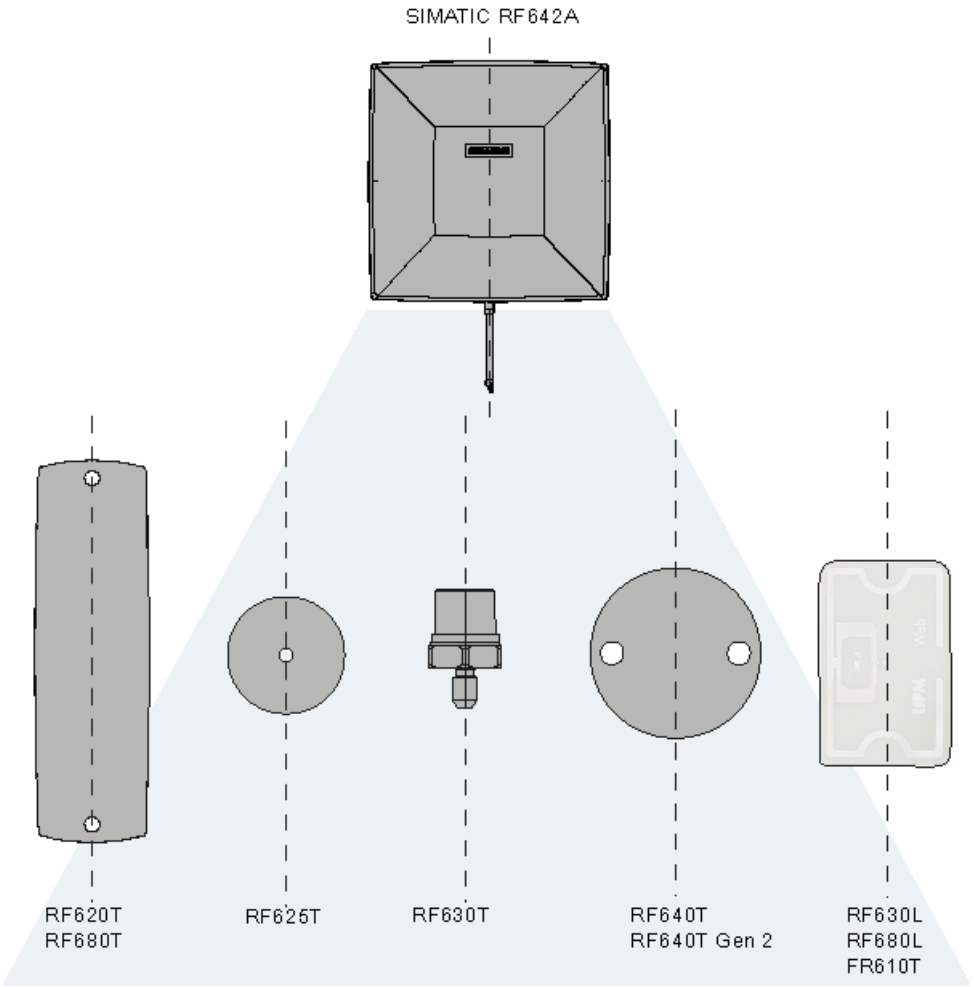

Figure 6-22 Antenna/transponder alignment

REVIEW

Angle deviation diagram for alignment

The following diagram shows the dependence of the following factors.

- Alignment angle of transponder to antenna
- Maximum range of antenna

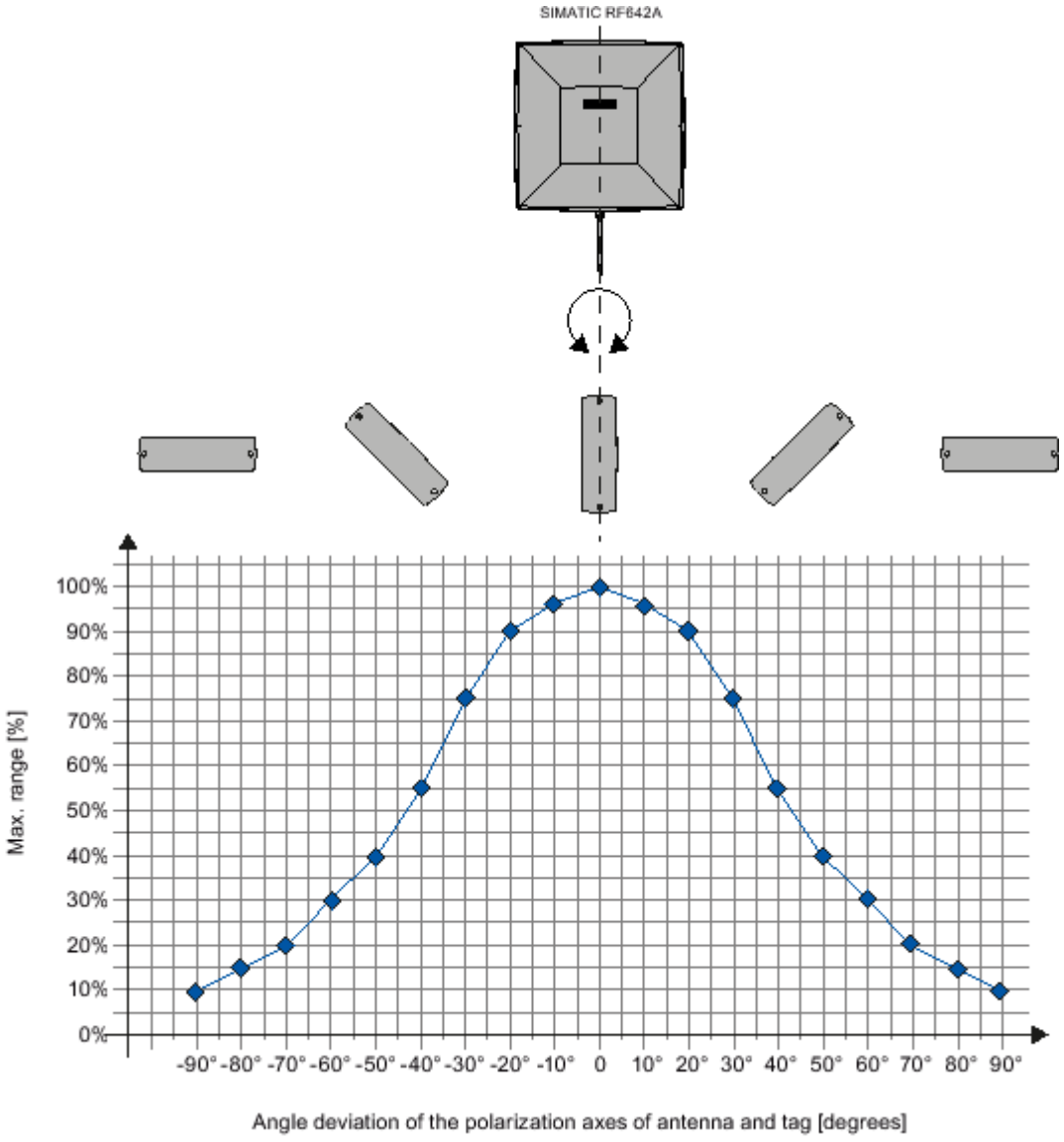

Figure 6-23 Angle deviation diagram for alignment

6.4.6 Parameter settings of RF642A for RF620R/RF630R

Operation within the EU, EFTA, or Turkey according to DIN EN 302208 V1.4.1

Note

Limitation of the radiated power according to DIN EN 302208 V1.4.1

RF600 systems that are put into operation within the EU, EFTA, or Turkey (ETSI) can be operated with an RF642A antenna with a maximum radiated power of up to 2000 mW ERP (or 33 dBm ERP, 3250 mW EIRP, 35 dBm EIRP).

By adjusting the transmit power of up to 500 mW ERP (or 27 dBm ERP, 800 mW EIRP, 29.15 dBm EIRP) and taking into account the RF642A antenna gain of 6 dBi and the cable loss associated with the antenna cable (see table), the radiated power of the antenna cannot be exceeded. You can make the power settings using the "distance_limiting" parameter. You will find more detailed information on the parameters in the section Parameter assignment manual RF620R/RF630R (http://support.automation.siemens.com/WW/view/en/33287195).

Operation in China

The national approval for RF600 systems in China means a restriction to 2000 mW ERP (or 33 dBm ERP, 3250 mW EIRP, 35 dBm EIRP). The possible combination of antenna gain (7 dbi), cable loss, and max. 500 mW transmit power of the RF630R reader means it is not possible to exceed 2000 mW ERP (or 33 dBm ERP, 3250 mW EIRP, 35 dBm EIRP).

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Operation in the USA, Canada

Note

Limitation of the radiated power to 4000 mW EIRP (36 dBm EIRP) with an antenna gain of 7 dBi

The antenna must be commissioned by qualified personnel. Antennas with a gain >6 dBi can be put into operation, as long as the radiated power of 4000 mW EIRP (36 dBm EIRP) is not exceeded.

To comply with FCC and IC-FCB requirements, the system must satisfy the following relation:

- Conducted power P dBm of the RF600 reader (< 30 dBm)
- Antenna gain G_i dBi in the FCC frequency band (≤ 7 dBi)
- Cable loss a_k dB (≥ 1 dB)

$P(dBm) \leq 30\ dBm - (G_i - 6\ dBi) + a_k$

6.4.7 Parameter settings of RF642A for RF640R/RF670R

Operation within the EU, EFTA, or Turkey according to DIN EN 302208 V1.4.1

Note

Limitation of the radiated power according to DIN EN 302208 V1.4.1

RF600 systems that are put into operation within the EU, EFTA, or Turkey (ETSI) can be operated with an RF642A antenna with a maximum radiated power of 2000 mW ERP (or 33 dBm ERP, 3250 mW EIRP, 35 dBm EIRP).

By setting the radiated power of up to 2000 mW ERP (or 33 dBm ERP, 3250 mW EIRP, 35 dBm EIRP), an RF642A antenna gain of 6 dBi and taking into account the cable loss associated with the antenna cable (see table), the radiated power of the reader is correctly configured and the radiated power at the antenna is not exceeded.

Operation in China

By setting a max. radiated power of 2000 mW ERP (or 33 dBm ERP, 3250 mW EIRP, 35 dBm EIRP), an RF642A antenna gain of 7 dBi and taking into account the cable loss associated with the antenna cable (see table), the reader's radiated power is correctly configured.

REVIEW

Operation in the USA, Canada

Note

Limitation of the radiated power to 4000 mW EIRP (36 dBm EIRP) with an antenna gain of 7 dBi

The antenna must be commissioned by qualified personnel. Antennas with a gain >6 dBi can be put into operation, as long as the radiated power of 4000 mW EIRP (36 dBm EIRP) is not exceeded.

To comply with FCC and IC-FCB requirements, the system must satisfy the following relation:

- Conducted power P dBm of the RF600 reader (< 30 dBm)
- Antenna gain G_i dBi in the FCC frequency band (≤ 7 dBi)
- Cable loss a_k dB (≥ 1 dB)

$P(dBm) \leq 30\ dBm - (G_i - 6\ dBi) + a_k$

6.4.8 Setting RF642A parameters for RF650R

Operation within the EU according to DIN EN 302208 V1.4.1

Note

Limitation of the radiated power according to DIN EN 302208 V1.4.1

RF600 systems that are put into operation within the EU, EFTA, or Turkey (ETSI) can be operated with an RF642A antenna with a maximum radiated power of 2000 mW ERP (or 33 dBm ERP, 3250 mW EIRP, 35 dBm EIRP).

By setting the radiated power of up to 2000 mW ERP (or 33 dBm ERP, 3250 mW EIRP, 35 dBm EIRP), an RF642A antenna gain of 6 dBi and taking into account the cable loss associated with the antenna cable (see table (Page 299)), the radiated power of the reader is correctly configured and the radiated power at the antenna is not exceeded.

Operation in China

By setting a max. radiated power of 2000 mW ERP (or 33 dBm ERP, 3250 mW EIRP, 35 dBm EIRP), an RF642A antenna gain of 7 dBi and taking into account the cable loss associated with the antenna cable (see table (Page 299)), the reader's radiated power is correctly configured.

REVIEW

Operation in the USA, Canada

Note

Limitation of the radiated power to 4000 mW EIRP (36 dBm EIRP) with an antenna gain of 7 dBi

The antenna must be commissioned by qualified personnel. Antennas with a gain >6 dBi can be put into operation, as long as the radiated power of 4000 mW EIRP (36 dBm EIRP) is not exceeded.

To comply with FCC and IC-FCB requirements, the system must satisfy the following relation:

- Conducted power P dBm of the RF600 reader (< 30 dBm)
- Antenna gain G_i dBi in the FCC frequency band (≤ 7 dBi)
- Cable loss a_k dB (≥ 1 dB)

$P(dBm) \leq 30\ dBm - (G_i - 6\ dBi) + a_k$

6.4.9 Setting RF642A parameters for RF680R/RF685R

Operation within the EU according to DIN EN 302208 V1.4.1

Note

Limitation of the radiated power according to DIN EN 302208 V1.4.1

RF600 systems that are put into operation within the EU, EFTA, or Turkey (ETSI) can be operated with an RF642A antenna with a maximum radiated power of 2000 mW ERP (or 33 dBm ERP, 3250 mW EIRP, 35 dBm EIRP).

By setting the radiated power of up to 2000 mW ERP (or 33 dBm ERP, 3250 mW EIRP, 35 dBm EIRP), an RF642A antenna gain of 6 dBi and taking into account the cable loss associated with the antenna cable (see table (Page 299)), the radiated power of the reader is correctly configured and the radiated power at the antenna is not exceeded.

Operation in China

By setting a max. radiated power of 2000 mW ERP (or 33 dBm ERP, 3250 mW EIRP, 35 dBm EIRP), an RF642A antenna gain of 7 dBi and taking into account the cable loss associated with the antenna cable (see table (Page 299)), the reader's radiated power is correctly configured.

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Operation in the USA, Canada

Note

Limitation of the radiated power to 4000 mW EIRP (36 dBm EIRP) with an antenna gain of 7 dBi

The antenna must be commissioned by qualified personnel. Antennas with a gain >6 dBi can be put into operation, as long as the radiated power of 4000 mW EIRP (36 dBm EIRP) is not exceeded.

To comply with FCC and IC-FCB requirements, the system must satisfy the following relation:

- Conducted power P dBm of the RF600 reader (< 30 dBm)
- Antenna gain G_i dBi in the FCC frequency band (≤ 7 dBi)
- Cable loss a_k dB (≥ 1 dB)

$P(dBm) \leq 30\ dBm - (G_i - 6\ dBi) + a_k$

6.4.10 Antenna patterns

6.4.10.1 Antenna radiation patterns in the ETSI frequency band

Directional radiation pattern Europe (ETSI)

The directional radiation pattern is shown for nominal alignment and a center frequency of 866.3 MHz. The nominal antenna alignment is given when the antenna elevation is provided as shown in the following figure.

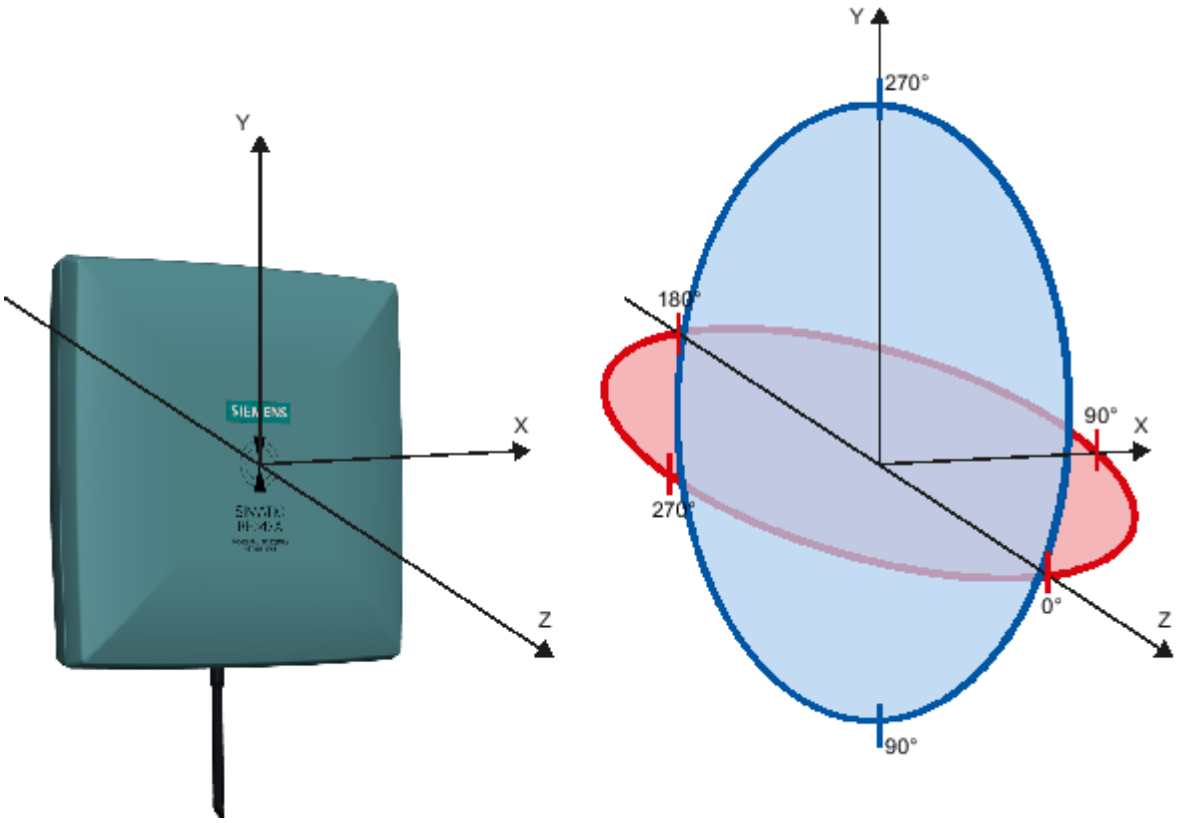


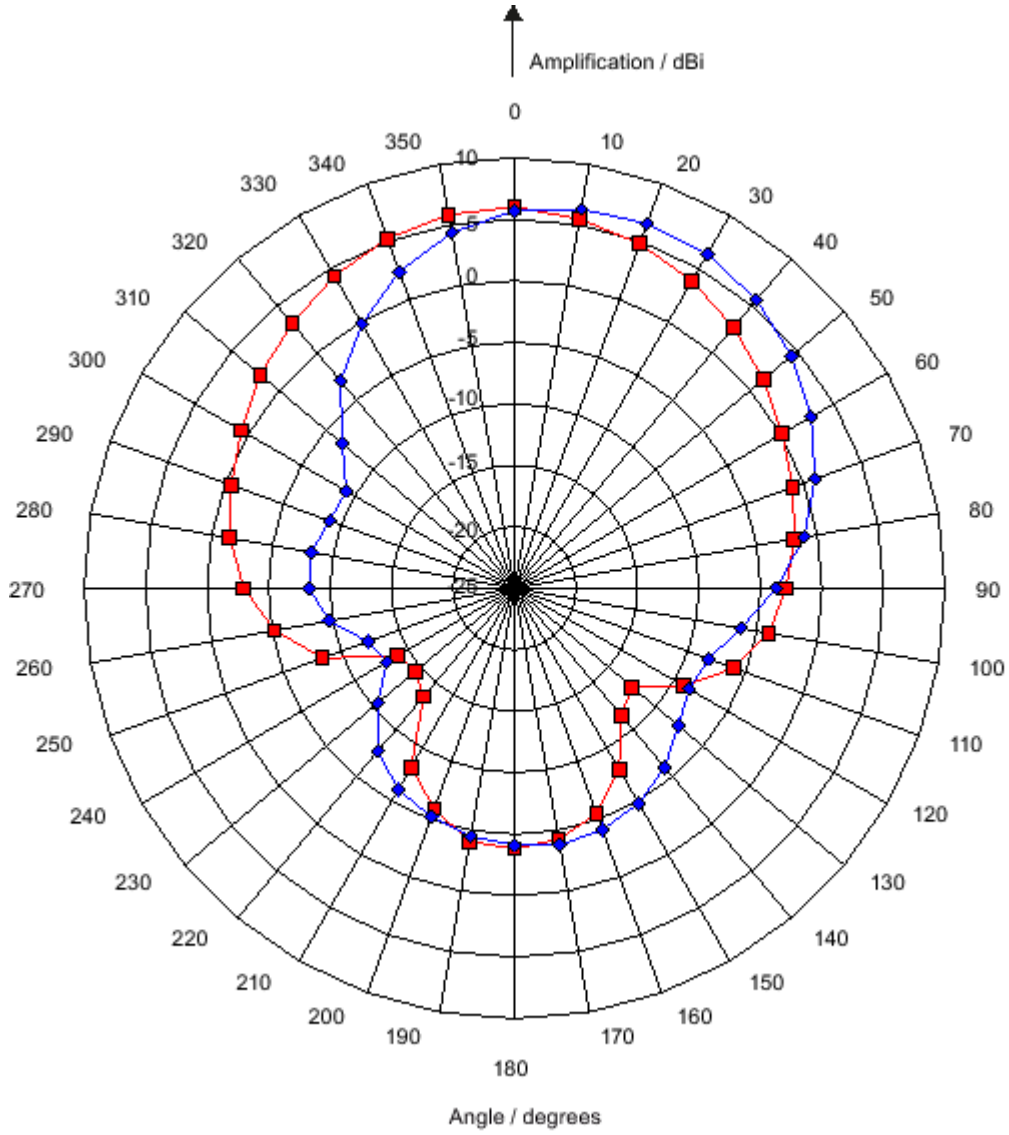
Figure 6-24 Reference system

The half-power beam width of the antenna is defined by the angle between the two -3 dB points. Which range (in %) corresponds to the dB values in the patterns can be obtained from this table .

Note that the measurements presented graphically below were carried out in a low-reflection environment. Deviations can therefore occur in a normally reflecting environment.

REVIEW

Directional radiation pattern in the ETSI frequency band



Pattern of the vertical plane of the antenna

Pattern of the horizontal plane of the antenna

Figure 6-25 Directional radiation pattern of RF642A in the ETSI frequency band

REVIEW

6.4.10.2 Antenna radiation patterns in the FCC frequency band

Directional radiation pattern USA (FCC)

The directional radiation pattern is shown for nominal alignment and a center frequency of 915 MHz.

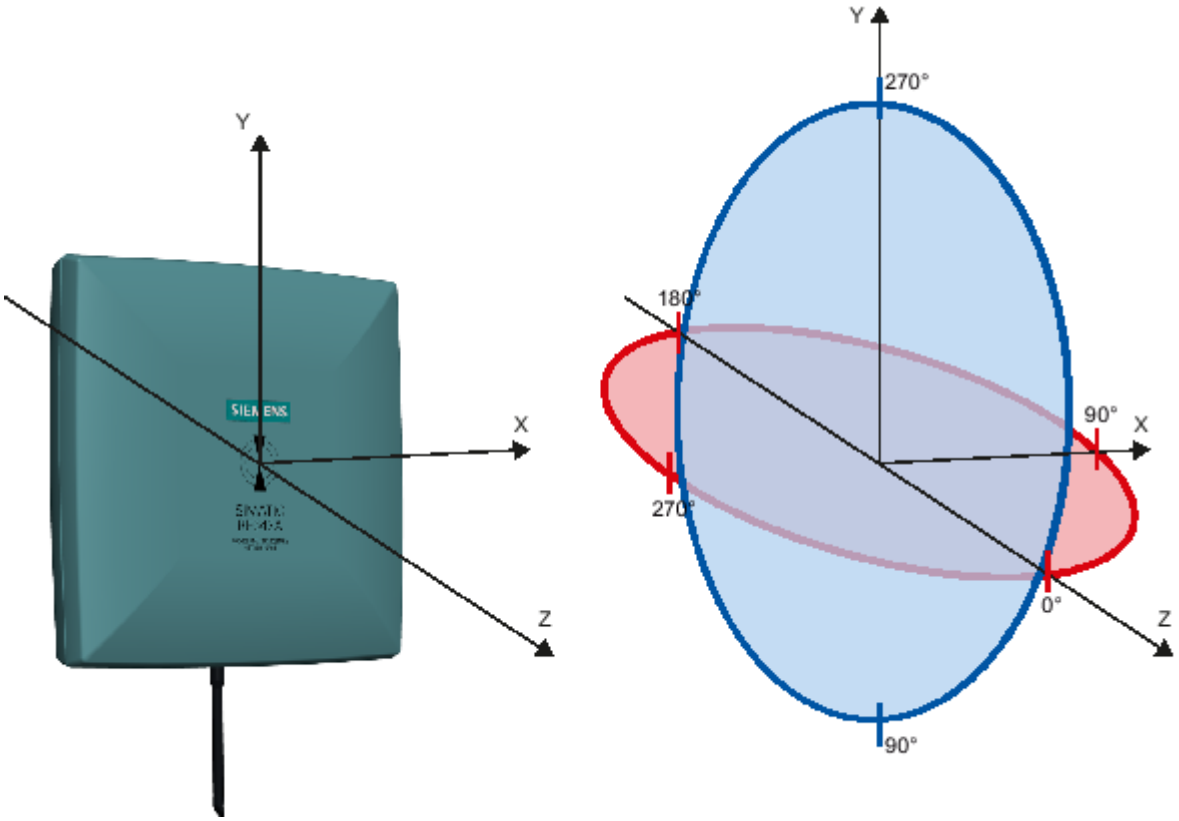


Figure 6-26 Reference system

The half-power beam width of the antenna is defined by the angle between the two -3 dB points (corresponding to half the power referred to the maximum power). Which range (in %) corresponds to the dB values in the patterns can be obtained from this table .

Note that the measurements presented graphically below were carried out in a low-reflection environment. Deviations can therefore occur in a normally reflecting environment.

REVIEW

Directional radiation pattern of the RF642A in the FCC frequency band

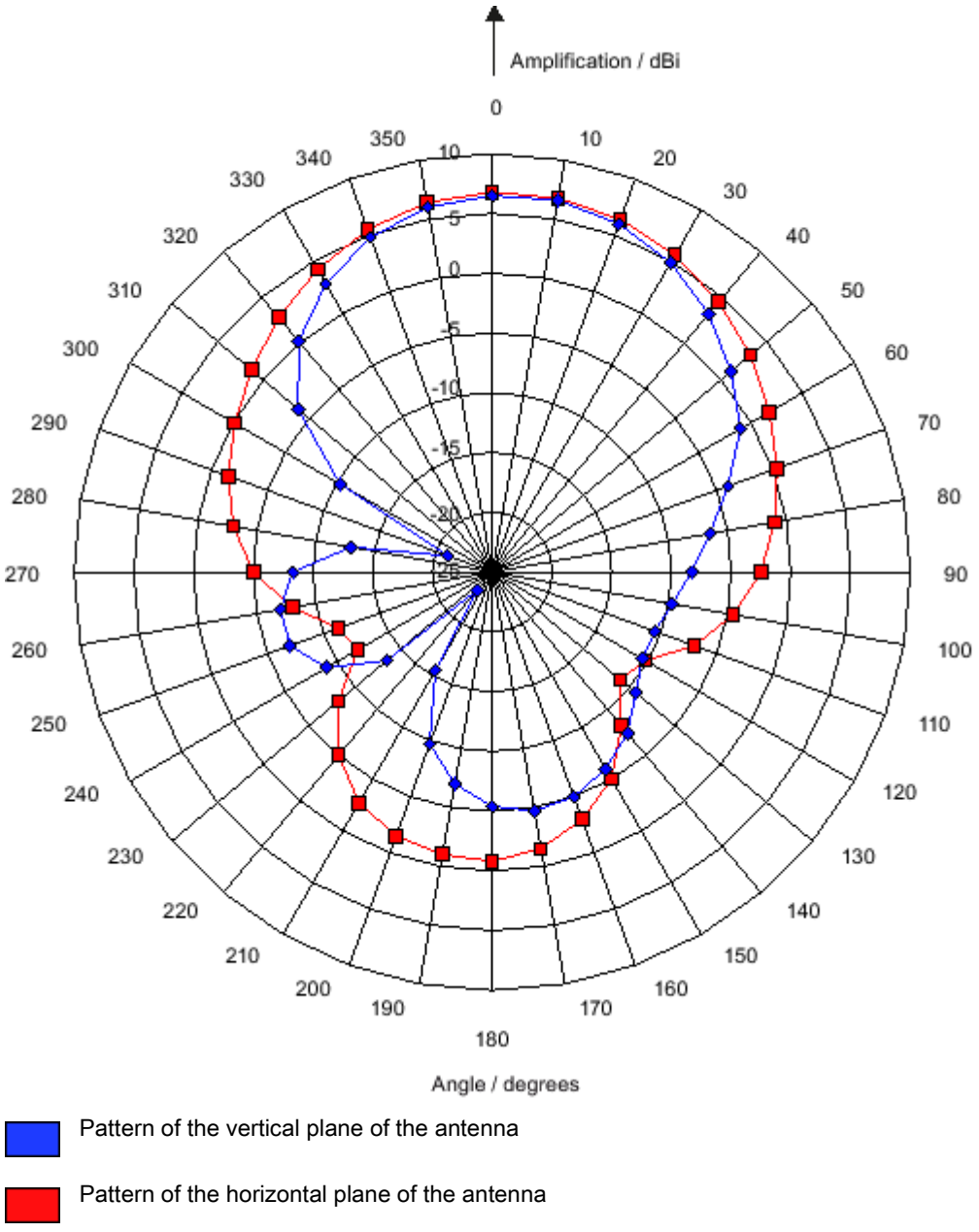


Figure 6-27 Directional radiation pattern of the RF642A in the FCC frequency band

REVIEW

6.4.10.3 Interpretation of directional radiation patterns

The following overview table will help you with the interpretation of directional radiation patterns.

The table shows which dBi values correspond to which read/write ranges (in %): You can read the radiated power depending on the reference angle from the directional radiation patterns, and thus obtain information on the read/write range with this reference angle with regard to a transponder.

The dBr values correspond to the difference between the maximum dBi value and a second dBi value.

Deviation from maximum antenna gain [dBr]	Read/write range [%]
0	100
-3	70
-6	50
-9	35
-12	25
-15	18
-18	13

Example

As can be seen in Directional radiation pattern in the ETSI frequency band (Page 308), the maximum antenna gain in the horizontal plane is 6 dBi. In this plane and with the parallel polarization axis at +70° or 300°, the antenna gain dropped to about 0 dBi. Therefore the dBr value is 6. The antenna range is only 70° of the maximum range at + 50° or +300° from the Z axis within the horizontal plane (see values shown in red in the directional radiation pattern: Characteristic of the vertical plane of the antenna (Page 307) and the associated representation of the reference system (Page 307)).

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6.4.11 Technical data

Table 6- 23 General technical specifications RF642A

	6GT2812-1GA08
Product type designation	SIMATIC RF642A
Dimensions (L x W x H)	185 x 185 x 45 mm
Color	Pastel turquoise
Material	PA 12 (polyamide 12)
	Silicone-free
Frequency band	865 to 928 MHz
Plug connection	30 cm coaxial cable with RTNC coupling An antenna cable is required for connection to the reader, e.g.: 6GT2815-0BH30
Max. radiated power according to ETSI	• RF620R, RF630R: < 970 mW ERP • RF640R, RF670R: ≤ 1900 mW ERP • RF650R: ≤ 1900 mW ERP • RF680R/RF685R: ≤ 2000 mW ERP
Max. radiated power according to CMIIT	• RF620R, RF630R: < 1200 mW ERP • RF640R, RF670R: ≤ 2000 mW ERP • RF650R: ≤ 1900 mW ERP • RF680R/RF685R: ≤ 2000 mW ERP
Max. radiated power according to FCC	• RF620R, RF630R: ≤2000 mW EIRP • RF640R, RF670R: ≤4000 mW EIRP • RF650R: ≤ 3160 mW ERP • RF680R/RF685R: ≤ 4000 mW ERP
Max. power	2000 mW
Impedance	50 ohms
Antenna gain	ETSI frequency band: 6 dBi
	FCC frequency band: 7 dBi
VSWR (standing wave ratio)	max.: 1.4
Polarization	Linear polarization
Aperture angle for transmitting/receiving	ETSI frequency band: • Horizontal plane: 75° • Vertical plane: 70° See ETSI antenna pattern
	FCC frequency band: • Horizontal plane: 80° • Vertical plane: 70° See FCC antenna pattern
Front-to-back ratio	ETSI frequency band: 10 dB
	FCC frequency band: 9.8 dB ± 2.2 dB

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	6GT2812-1GA08
Shock resistant to EN 60068-2-27	30 g
Vibration resistant to EN 60068-2-6	10 g
Attachment of the antenna	4 screws M4 (VESA 100 fastening system)
Tightening torque (at room temperature)	≤ 2 Nm
Ambient temperature	
• Operation	• -25 °C to +75 °C
• Transport and storage	• -40 °C to +85 °C
MTBF in years	16880
Degree of protection according to EN 60529	IP65
Weight, approx.	600 g

1) The values differ for different dimensions/materials of the mounting surface.

6.4.12 Dimension drawing

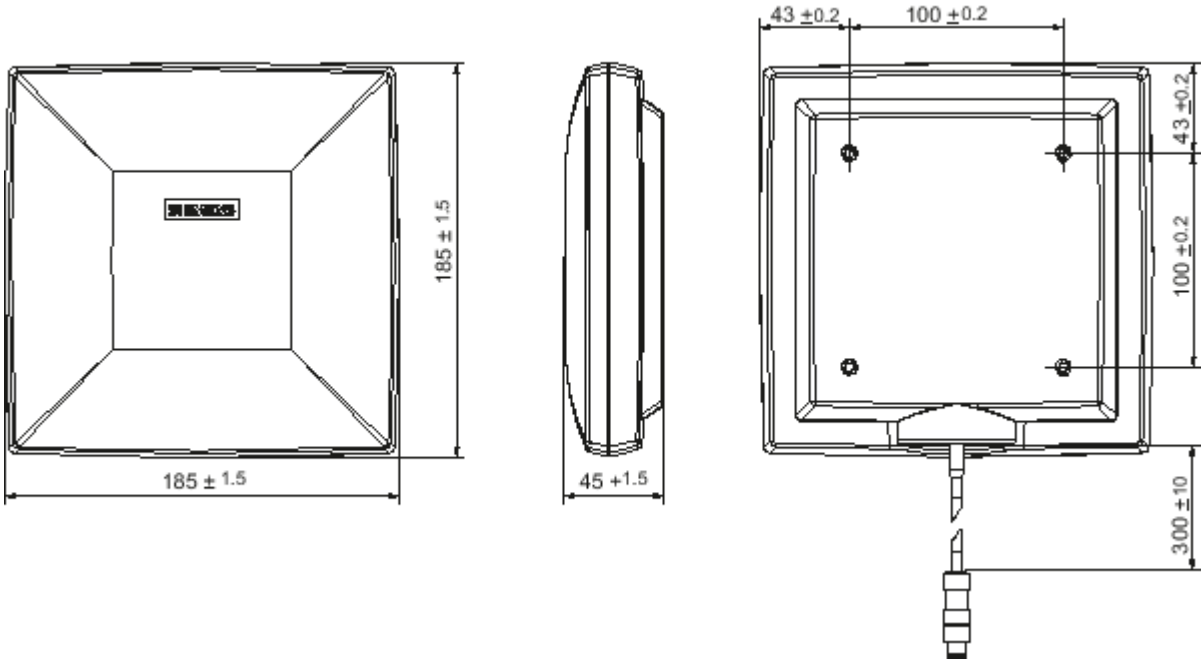

Figure 6-28 Dimensional drawing of RF642A

All dimensions in mm

REVIEW

6.4.13 Approvals & certificates

Table 6- 24 6GT2812-1GA08

Certificate	Description
CE	Conformity in accordance with R&TTE directive in association with the readers and accessories used

Table 6- 25 6GT2812-1GA08

Standard	
FC Federal Communications Commission	FCC CFR 47, Part 15 sections 15.247 Radio Frequency Interference Statement This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. The FCC approval is granted in association with the FCC approval of the following RF600 readers: • FCC ID: NXW-RF600R (for RF620R: 6GT2811-5BA00-1AA1, RF630R: 6GT2811-4AA00-1AA1, RF640R: 6GT2811-3BA00-1AA0, RF670R as of FS C1: 6GT2811-0AB00-1AA0) • FCC ID: NXW-RF630R (for 6GT2811-4AA00-1AA0) • FCC ID: NXW-RF670 (for RF670R as of FS A1: 6GT2811-0AB00-1AA0)
Industry Canada Radio Standards Specifications	RSS-210 Issue 7, June 2007, Sections 2.2, A8 The approval for Industry Canada is granted in association with the Industry Canada approval of the following RF600 readers: • IC: 267X-RF630 (for 6GT2811-4AA00-1AA0) • IC: 267X-RF670, RF670R FS A1 (for 6GT2811-0AB00-1AA0) • IC: 267X-RF600R, Model RF620R-2 (for 6GT2811-5BA00-1AA1) • IC: 267X-RF600R, Model RF630R-2 (for 6GT2811-4AA00-1AA1) • IC: 267X-RF600R, Model RF640R (for 6GT2811-3BA00-1AA0) • IC: 267X-RF600R, model RF670R-2 as of FS C1 (for 6GT2811-0AB00-1AA0)
c UL us	This product is UL-certified for the USA and Canada. It meets the following safety standard(s): UL 60950-1 - Information Technology Equipment Safety - Part 1: General Requirements CSA C22.2 No. 60950 -1 - Safety of Information Technology Equipment UL Report E 205089

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6.5 RF660A antenna

6.5.1 Description

SIMATIC RF660A	Features	
	Field of application	The SIMATIC RF660A is a universal medium range UHF antenna with a compact design suitable for use in industry.
	Frequency ranges	• 865 to 928 MHz (ETSI) • 902 to 928 MHz (FCC)
	Polarization	RH circular Suitable for RF600 transponders that can pass in parallel with the antenna regardless of their orientation.
	Writing/reading range	max. X m
	Mounting	4 x M4 (VESA 100 mounting system)
	Connector	RTNC
	Readers that can be connected	All RF600 readers with external antenna connectors
	Dimensions in mm	313 x 313 x 80
	Degree of protection	IP67

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Frequency ranges

The antenna is available for broadband. It can therefore be used for two different frequency ranges that have been specified for the regions of Europe and China/USA respectively.

- The antenna for Europe (EU, EFTA countries) operates in the frequency range of 865 to 868 MHz.
- The antenna for China, the USA, and Canada operates in the frequency range of 902 to 928 MHz.

Function

The SIMATIC RF660A is used to transmit and receive RFID signals in the UHF range. The antennas are connected to the SIMATIC RF600 readers via antenna cables that are available in different lengths.

Ordering data

Description	Article number
RF660A antenna for Europe (865-868)	6GT2812-0AA00
RF660A antenna for China and the USA (902-928)	6GT2812-0AA01

Ordering data accessories

Description		Article number
Antenna mounting kit		6GT2890-0AA00
Connecting cable between reader and antenna	3 m (1 dB cable attenuation)	6GT2815-0BH30
	5 m, suitable for drag chains (cable loss 1.25 dB)	6GT2815-2BH50
	10 m (2 dB cable attenuation)	6GT2815-1BN10
	10 m (4 dB cable attenuation)	6GT2815-0AN10
	15 m, suitable for drag chains (cable loss 4.0 dB)	6GT2815-2BN15
	20 m (4 dB cable attenuation)	6GT2815-0AN20

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6.5.2 Installation and assembly

6.5.2.1 RF660A mounting types

VESA 100 mounting system

A standardized VESA 100 mounting system is provided to mount the antenna. The mounting system consists of four fixing holes for M4 screws at intervals of 100 mm.

This is therefore suitable for:

- Mounting on metallic and non-metallic backgrounds

Note

To achieve optimum wave propagation, the antenna should not be surrounded by conducting objects. The area between antenna and transponder should also allow wave propagation without interference.

Antenna Mounting Kit

The Antenna Mounting Kit allows the fine adjustment of the antenna field by setting the solid angle (see "RF600 System Manual", chapter "Antennas" > "Mounting types").

6.5.3 Connecting an antenna to a reader

The SIMATIC RF660A antenna must be connected to the reader using an antenna cable.

Requirement

Note

Use of Siemens antenna cable

To ensure optimum functioning of the antenna, it is recommended that a Siemens antenna cable is used in accordance with the list of accessories.

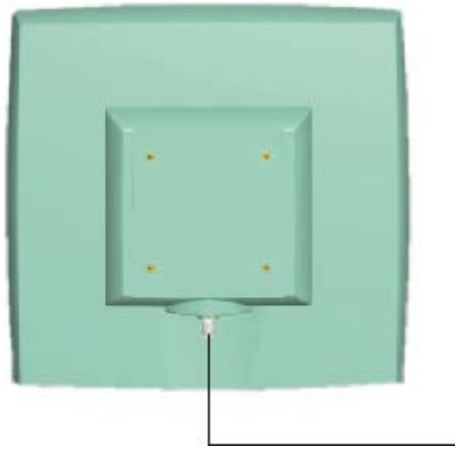

Figure 6-29 Rear of antenna with RTNC connection

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Connecting RF660A to RF640R/RF670R

Preassembled standard cables in lengths of 3 m, 10 m and 20 m are available for connection.

The cable between antenna and reader can be up to 20 m in length.

When less than four antennas are used, we recommend that the antennas are connected to the reader as follows:

Number of antennas	Connections on the reader
2 antennas	ANT 1, ANT 2
3 antennas	ANT 1, ANT 2, ANT 3

Connecting RF660A to RF630R

Preassembled standard cables in lengths of 3 m, 10 m and 20 m are available for connection.

The cable between antenna and reader can be up to 20 m in length.

When one antenna is used, it is recommended that the remaining antenna connection is sealed using the supplied protective cap.

6.5.3.1 Bending radii and bending cycles of the cable

Cable designation	Order No.	Length [m]	Cable loss [dB]	Bending radius [mm]	Bending cycle
Antenna cable	6GT2815-0BH30	3	1	51	1 Mal
Antenna cable (suitable for drag chains)	6GT2815-2BH50	5	1,25	1)	1)
Antenna cable	6GT2815-1BN10	10	2	77	1 Mal
Antenna cable	6GT2815-0BN10	10	4	51	1 Mal
Antenna cable (suitable for drag chains)	6GT2815-0BN20	15	4	1)	1)
Antenna cable	6GT2815-0BN20	20	4	77	1 Mal

1) With cables suitable for drag chains, 3 million bending cycles at a bending radius of 6.5 mm and bending through ± 180° are permitted.

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6.5.4 Parameter settings of RF660A for RF620R/RF630R

Operation within the EU, EFTA, or Turkey according to DIN EN 302208 V1.4.1

Note

Limitation of the radiated power according to EN 302 208 V1.4.1

RF600 systems that are put into operation within the EU, EFTA, or Turkey (ETSI) can be operated with an RF660A antenna with a maximum radiated power of up to 2000 mW ERP (or 33 dBm ERP, 3250 mW EIRP, 35 dBm EIRP).

By adjusting the transmit power of up to 500 mW ERP (or 27 dBm ERP, 800 mW EIRP, 29.15 dBm EIRP) and taking into account the RF660A antenna gain of 7 dBi (10 dBic) and the cable loss associated with the antenna cable (see table (Page 318)), the radiated power of the antenna cannot be exceeded. You can make the power settings using the "distance_limiting" parameter. You will find more detailed information on the parameters in

the section Parameter assignment manual RF620R/RF630R (http://support.automation.siemens.com/WW/view/en/33287195).

Operation in China

The national approval for RF600 systems in China means a restriction to 2000 mW ERP (or 33 dBm ERP, 3250 mW EIRP, 35 dBm EIRP). The possible combination of antenna gain, cable loss, and max. 500 mW radiated power of the RF620R/RF630R reader means it is not possible to exceed 2000 mW ERP (or 33 dBm ERP, 3250 mW EIRP, 35 dBm EIRP).

Operation in the USA, Canada

Note

Limitation of the radiated power to 4000 mW EIRP (36 dBm EIRP)

To meet the FCC and IC-FCB requirements, the radiated power may not exceed 4000 mW EIRP (36 dBm EIRP). Therefore the system must satisfy the following relation:

- Conducted power P dBm of the RF600 reader (< 30 dBm)
- Antenna gain G_i dBi in the FCC frequency band (≤ 6 dBi)
- Cable loss a_k dB (≥ 1 dB)

$P(dBm) \leq 30\ dBm - (G_i - 6\ dBi) + a_k$

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6.5.5 Parameter settings of RF660A for RF640R/RF670R

Operation within the EU, EFTA, or Turkey according to DIN EN 302208 V1.4.1

Note

Limitation of the radiated power according to DIN EN 302208 V1.4.1

RF600 systems that are put into operation within the EU, EFTA, or Turkey (ETSI) can be operated with an RF660A antenna with a maximum radiated power of 2000 mW ERP (or 33 dBm ERP, 3250 mW EIRP, 35 dBm EIRP).

By adjusting the radiated power of up to 1300 mW ERP (or 31.15 dBm ERP, 2140 mW EIRP, 33.3 dBm EIRP), the RF660A antenna gain of 7 dBi (10 dBic) and the cable loss associated with the antenna cable (see table (Page 318)), the radiated power of the reader is correctly configured and the radiated power at the antenna is not exceeded.

Operation in China

By setting a max. radiated power of 1300 mW ERP (or 31.15 dBm ERP, 2140 mW EIRP, 33.3 dBm EIRP), the RF660A antenna gain of 6 dBi (9 dBic) and the cable loss associated with the antenna cable (see table (Page 318)), the radiated power of the reader is correctly configured.

Operation in the USA, Canada

Note

Limitation of the radiated power to 4000 mW EIRP (36 dBm EIRP)

To meet the FCC and IC requirements, the radiated power may not exceed 4000 mW EIRP (36 dBm EIRP). Therefore the system must satisfy the following relation:

- Conducted power P dBm of the RF600 reader (< 30 dBm)
- Antenna gain G_i dBi in the FCC frequency band (≤ 6 dBi)
- Cable loss a_k dB (≥ 1 dB)

$P(dBm) \leq 30\ dBm - (G_i - 6\ dBi) + a_k$

6.5.6 Setting RF660A parameters for RF650R

Operation within the EU according to DIN EN 302208 V1.4.1

Note

Limitation of the radiated power according to DIN EN 302208 V1.4.1

RF600 systems that are put into operation within the EU, EFTA, or Turkey (ETSI) can be operated with an RF660A antenna with a maximum radiated power of 2000 mW ERP (or 33 dBm ERP, 3250 mW EIRP, 35 dBm EIRP).

By adjusting the radiated power of up to 1300 mW ERP (or 31.15 dBm ERP, 2140 mW EIRP, 33.3 dBm EIRP), the RF660A antenna gain of 7 dBi (10 dBic) and the cable loss associated with the antenna cable (see table (Page 318)), the radiated power of the reader is correctly configured and the radiated power at the antenna is not exceeded.

Operation in China

By setting a max. radiated power of 1300 mW ERP (or 31.15 dBm ERP, 2140 mW EIRP, 33.3 dBm EIRP), the RF660A antenna gain of 6 dBi (9 dBic) and the cable loss associated with the antenna cable (see table (Page 318)), the radiated power of the reader is correctly configured.

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Operation in the USA, Canada

Note

Limitation of the radiated power to 4000 mW EIRP (36 dBm EIRP)

To meet the FCC and IC requirements, the radiated power may not exceed 4000 mW EIRP (36 dBm EIRP). Therefore the system must satisfy the following relation:

- Conducted power P dBm of the RF600 reader (< 30 dBm)
- Antenna gain G_i dBi in the FCC frequency band (≤ 6 dBi)
- Cable loss a_k dB (≥ 1 dB)

$P(dBm) \leq 30\ dBm - (G_i - 6\ dBi) + a_k$

6.5.7 Setting RF660A parameters for RF680R/RF685R

Operation within the EU according to DIN EN 302208 V1.4.1

Note

Limitation of the radiated power according to DIN EN 302208 V1.4.1

RF600 systems that are put into operation within the EU, EFTA, or Turkey (ETSI) can be operated with an RF660A antenna with a maximum radiated power of 2000 mW ERP (or 33 dBm ERP, 3250 mW EIRP, 35 dBm EIRP).

REVIEW

By adjusting the radiated power of up to 1300 mW ERP (or 31.15 dBm ERP, 2140 mW EIRP, 33.3 dBm EIRP), the RF660A antenna gain of 7 dBi (10 dBic) and the cable loss associated with the antenna cable (see table (Page 318)), the radiated power of the reader is correctly configured and the radiated power at the antenna is not exceeded.

Operation in China

By setting a max. radiated power of 2000 mW ERP (or 33 dBm ERP, 3250 mW EIRP, 35 dBm EIRP), the RF660A antenna gain of 6 dBi (9 dBic) and the cable loss associated with the antenna cable (see table (Page 318)), the radiated power of the reader is correctly configured.

Operation in the USA, Canada

Note

Limitation of the radiated power to 4000 mW EIRP (36 dBm EIRP)

To meet the FCC and IC requirements, the radiated power may not exceed 4000 mW EIRP (36 dBm EIRP). Therefore the system must satisfy the following relation:

- Conducted power P dBm of the RF600 reader (< 30 dBm)
- Antenna gain G_i dBi in the FCC frequency band (≤ 6 dBi)
- Cable loss a_k dB (≥ 1 dB)

$P(dBm) \leq 30\ dBm - (G_i - 6\ dBi) + a_k$

REVIEW

6.5.8 Antenna patterns

6.5.8.1 Antenna pattern

Spatial directional radiation pattern

The following schematic diagram shows the main and auxiliary fields of the RF660A antenna in free space in the absence of reflecting/absorbing materials. Please note that the diagram is not to scale.

The recommended working range lies within the main field that is shown in green.

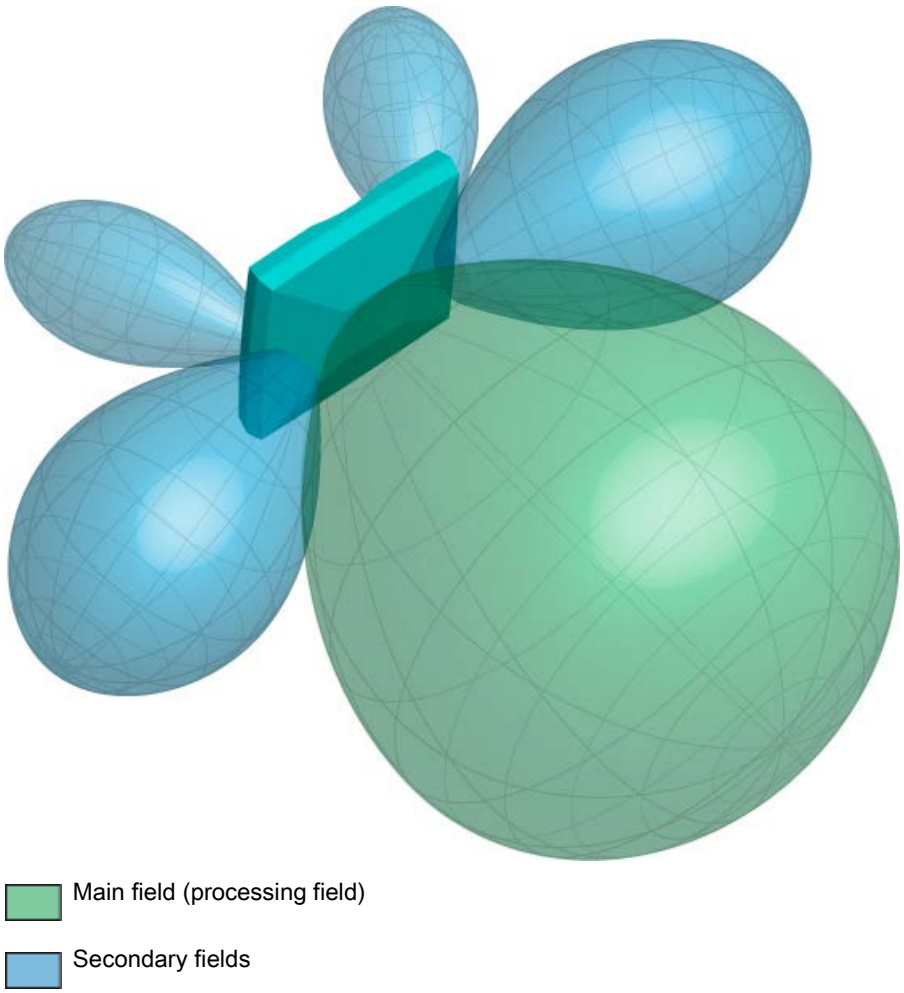


Figure 6-30 Main and auxiliary fields of the RF660A antenna

REVIEW

Radiation diagram (horizontal)

Europe (ETSI)

The radiation diagram is shown for horizontal alignment and for a center frequency of 865 MHz. Horizontal antenna alignment is provided when the TNC connection on the antenna points vertically up or down.

The radiating/receiving angle of the antenna is defined by the angle between the two -3 dB points (corresponding to half the power referred to the maximum performance at a 0° angle).

The optimum radiating/receiving angle is therefore approximately ±30 degrees.

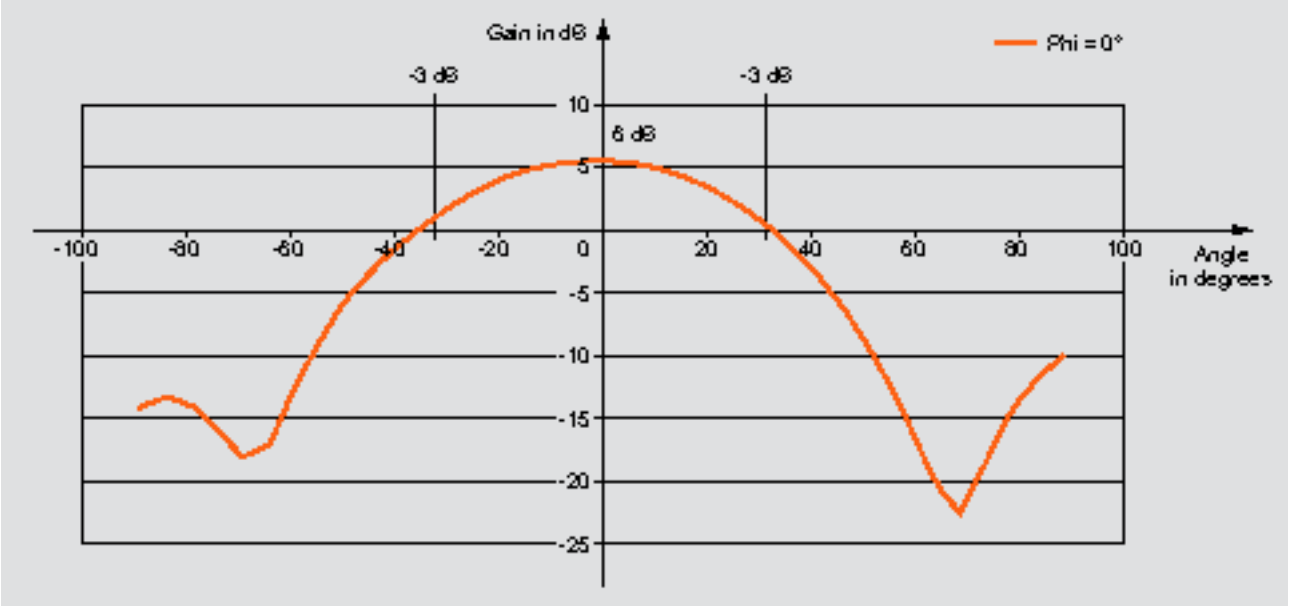


Figure 6-31 Directional radiation pattern of the antenna (at 865 MHz, horizontal alignment)

USA (FCC)

The radiation diagram is shown for horizontal alignment and for a center frequency of 915 MHz.

The radiating/receiving angle of the antenna is defined by the angle between the two -3 dB points (corresponding to half the power referred to the maximum performance at a 0° angle).

The optimum radiating/receiving angle is therefore approximately ±35 degrees.

REVIEW

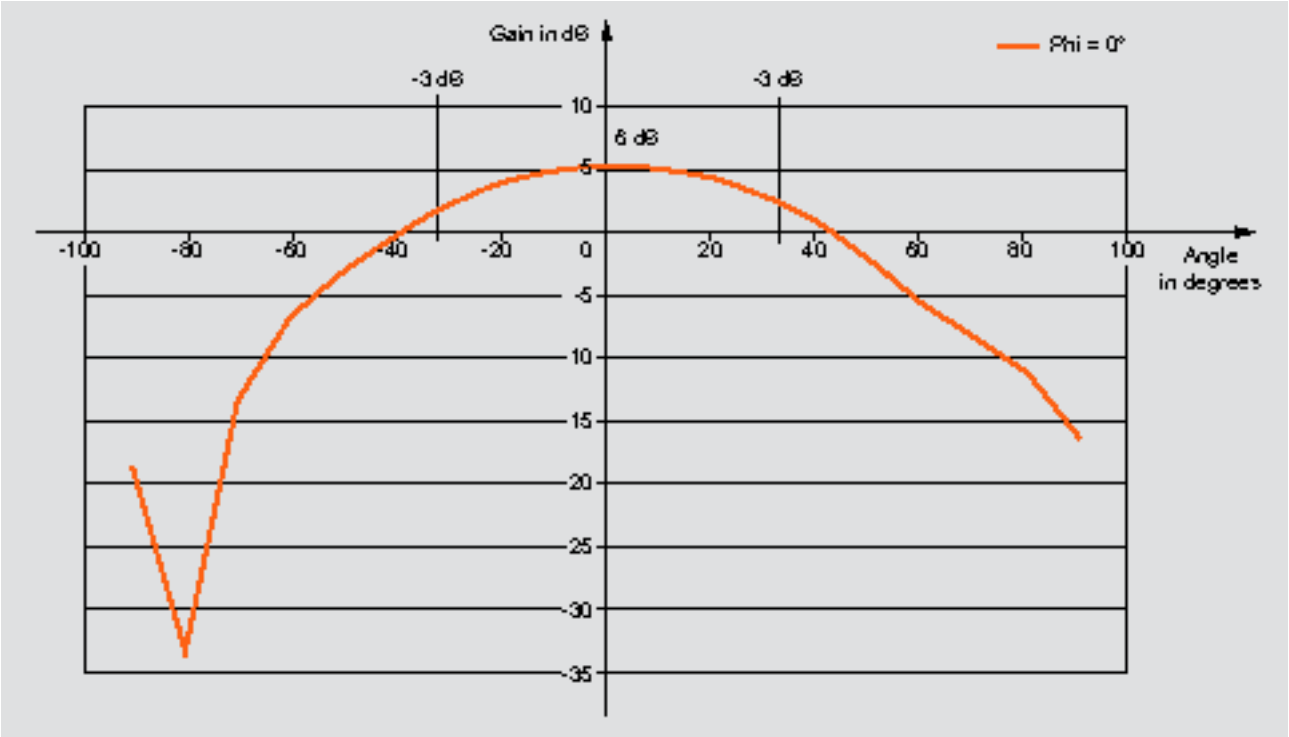


Figure 6-32 Directional radiation pattern of the antenna (at 915 MHz, horizontal alignment)

REVIEW

6.5.9 Interpretation of directional radiation patterns

The following overview table will help you with the interpretation of directional radiation patterns.

The table shows which dBi values correspond to which read/write ranges (in %): You can read the radiated power depending on the reference angle from the directional radiation patterns, and thus obtain information on the read/write range with this reference angle with regard to a transponder.

The dBr values correspond to the difference between the maximum dBi value and a second dBi value.

Deviation from maximum antenna gain [dBr]	Read/write range [%]
0	100
-3	70
-6	50
-9	35
-12	25
-15	18
-18	13

Example

As one can see from the section Antenna pattern (Page 323), the maximum antenna gain is 6 dBi. In the vertical plane, the antenna gain has dropped to approx. 3 dBi at +30°. Therefore the dBr value is -3. The antenna range is only 50% of the maximum range at ± 30° from the Z axis within the vertical plane.

6.5.10 Technical data

Table 6- 26 General technical specifications RF660A

	6GT2812-0AA00	6GT2812-0AA01
	ETSI	FCC, CMIIT
Product type designation	SIMATIC RF660A	
Dimensions (L x W x H)	313 x 313 x 80 mm	
Color	Pastel turquoise	
Material	PA 12 (polyamide 12)	
	Silicone-free	
Frequency band	865 to 868 MHz	902 to 928 MHz
Plug connection	RTNC	
Max. radiated power according to ETSI	• RF620R, RF630R: < 1200 mW ERP • RF640R, RF670R: < 2000 mW ERP • RF650R: < 2000 mW ERP • RF680R/RF685R: < 2000 mW ERP	-

REVIEW

	6GT2812-0AA00	6GT2812-0AA01
	ETSI	**FCC, CMIIT**
Max. radiated power according to CMIIT	-	• RF620R, RF630R: < 1000 mW ERP • RF640R, RF670R: < 2000 mW ERP • RF650R: < 2000 mW ERP • RF680R/RF685R: < 2000 mW ERP
Max. radiated power according to FCC	-	• RF620R, RF630R: < 1600 mW EIRP • RF640R, RF670R: < 4000 mW EIRP • RF650R: < 4000 mW EIRP • RF680R/RF685R: < 4000 mW EIRP
Max. power	2000 mW	
Impedance	50 ohms	
Antenna gain	7 dBi (5-7 dBic)	6 dBi (> 6 dBic)
VSWR (standing wave ratio)	Max. 2:1	
Polarization	RH circular	
Aperture angle for transmitting/receiving	55° - 60°	60° - 75°
Front-to-back ratio	-	-
Attachment of the antenna	4 screws M4 (VESA 100 mount system)	
Tightening torque (at room temperature)	≤ 2 Nm	
Ambient temperature		
• Operation	• -20 °C to +70 °C	
• Transport and storage	• -40 °C to +85 °C	
MTBF in years	2 x 10^9	
Degree of protection according to EN 60529	IP67	
Weight, approx.	1.2 kg	

REVIEW

6.5.11 Dimension drawing

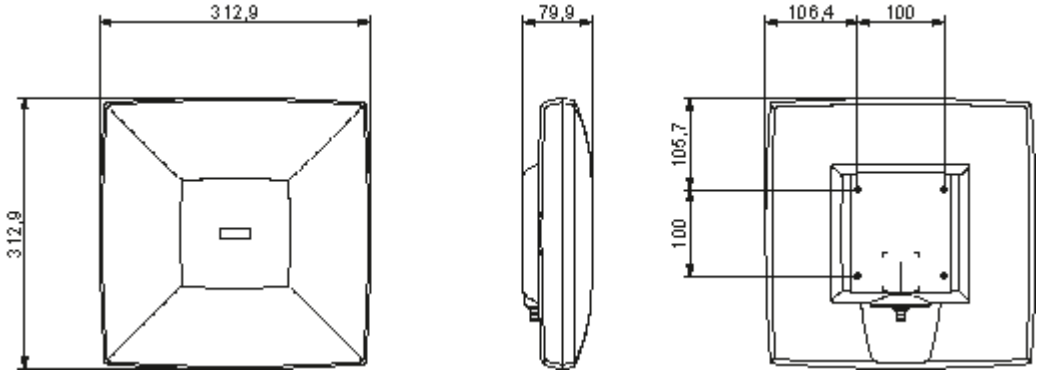


Figure 6-33 Dimension drawing RF660A

All dimensions in mm (± 0.5 mm tolerance)

REVIEW

6.5.12 Approvals & certificates

Table 6- 27 6GT2812-0AA00

Certificate	Description
CE	Conformity in accordance with R&TTE directive in association with the readers and accessories used

Table 6- 28 6GT2812-0AA01

Standard	
FC Federal Communications Commission	FCC CFR 47, Part 15 sections 15.247 Radio Frequency Interference Statement This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. The FCC approval is granted in association with the FCC approval of the following RF600 readers: • FCC ID: NXW-RF600R (for RF620R: 6GT2811-5BA00-1AA1, RF630R: 6GT2811-4AA00-1AA1, RF640R: 6GT2811-3BA00-1AA0, RF670R as of FS C1: 6GT2811-0AB00-1AA0) • FCC ID: NXW-RF630R (for 6GT2811-4AA00-1AA0) • FCC ID: NXW-RF670 (for RF670R as of FS A1: 6GT2811-0AB00-1AA0)
Industry Canada Radio Standards Specifications	RSS-210 Issue 7, June 2007, Sections 2.2, A8 The approval for Industry Canada is granted in association with the Industry Canada approval of the following RF600 readers: • IC: 267X-RF630 (for 6GT2811-4AA00-1AA0) • IC: 267X-RF670, RF670R FS A1 (for 6GT2811-0AB00-1AA0) • IC: 267X-RF600R, Model RF620R-2 (for 6GT2811-5BA00-1AA1) • IC: 267X-RF600R, Model RF630R-2 (for 6GT2811-4AA00-1AA1) • IC: 267X-RF600R, Model RF640R (for 6GT2811-3BA00-1AA0) • IC: 267X-RF600R, model RF670R-2 as of FS C1 (for 6GT2811-0AB00-1AA0)
c UL us	This product is UL-certified for the USA and Canada. It meets the following safety standard(s): UL 60950-1 - Information Technology Equipment Safety - Part 1: General Requirements CSA C22.2 No. 60950 -1 - Safety of Information Technology Equipment UL Report E 205089

REVIEW

6.6 Mounting types

6.6.1 Overview

The following readers and antennas feature a standardized VESA 100 fixing system (4 x M4):

- SIMATIC RF620R/RF630R/RF640R/RF670R
- SIMATIC RF640A
- SIMATIC RF660A

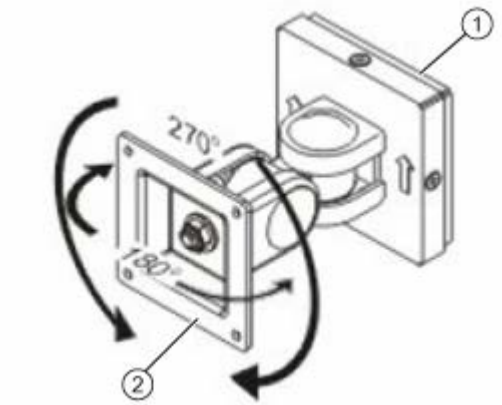
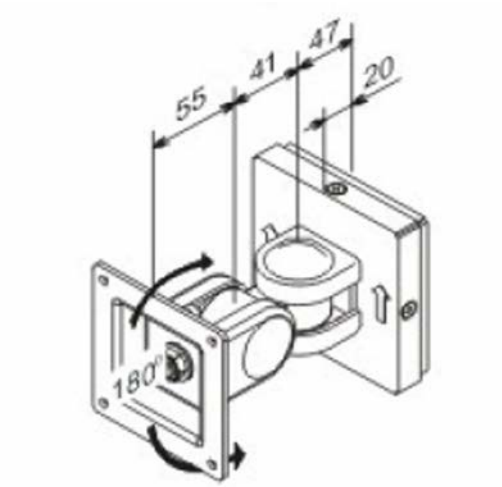
It is used to fix the above-mentioned antennas in place through a mounting plate or the antenna mounting kit.

6.6.2 Ordering data

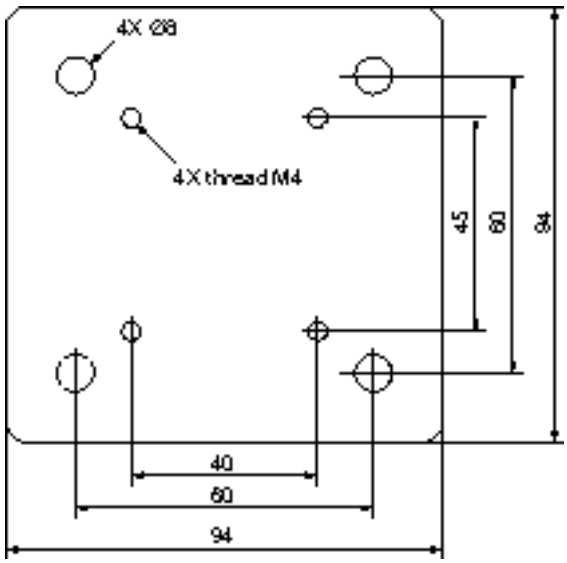
Description	Machine-Readable Product Code
Antenna mounting kit	6GT2890-0AA00

6.6.3 Mounting with antenna mounting kit

Flexible mounting is possible using the antenna mounting kit.
An antenna can then be rotated through any angle in space.

Antenna mounting kit	Description
	Swivel range of wall mounting (1) Wall side (2) Antenna side
	Distances for wall mounting

REVIEW

Antenna mounting kit	Description
	VESA adapter plate from VESA 75 x 75 to VESA 100 x 100 The VESA adapter plate is required for fixing the antenna to the antenna mounting kit.
	Hole drilling template for fixing the antenna mounting kit to the wall

REVIEW

Transponder/tags

7

7.1 Overview

7.1.1 Mode of operation of transponders/tags

The tag/transponder mainly comprises a microchip with an integral memory and a dipole antenna.

The principle of operation of a passive RFID transponder is as follows:

- Diversion of some of the high-frequency energy emitted by the reader to supply power to the integral chip
- Commands received from reader
- Responses are transmitted to the reader antenna by modulating the reflected radio waves (backscatter technique)

REVIEW

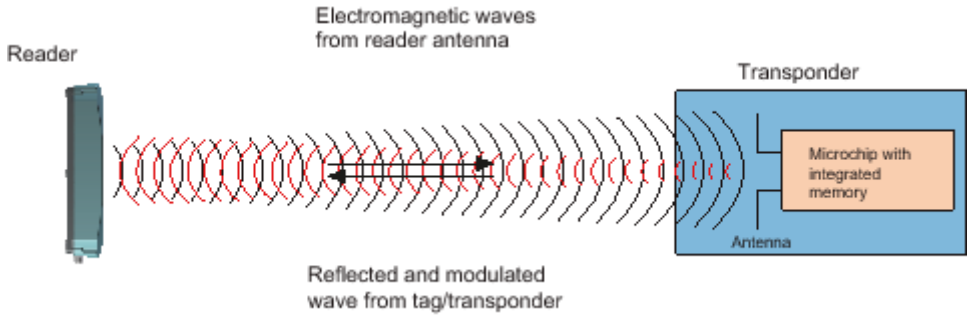


Figure 7-1 Mode of operation of transponders

The transmission ranges achieved vary in accordance with the size of the tag and the corresponding dipole antenna. In general the following rule applies: The smaller the tag and therefore the antenna, the shorter the range.

7.1.2 Transponder classes and generations

The transponder classes are distinguished by the different communication protocols used between the reader and transponder. Transponder classes are mostly mutually incompatible.

The following transponder classes are supported by the RF 600 system:

- EPC Global Class 1 Gen 2 with full EPC Global Profile (ISO 18000-6C)

Support for protocol types using the RF600

The definition of the transponders/tags according to ISO 18000-6 (corresponds to EPC Global Class 1 Gen 2) refers to implementation of the air-interface protocols.

EPC Global

RF600 supports the EPCglobal class 1. EPCglobal class 1 includes passive tags with the following minimum characteristics:

- EPC ID (Electronic Product Code IDentifier)
- Tag ID
- A function which permanently ensures that tags no longer respond.
- Optional use or suppression of tags
- Optional password-protected access control
- Optional USER memory area.

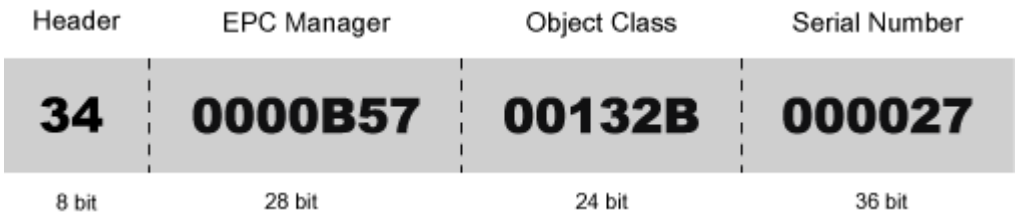
The programming is performed by the customer (cannot be reprogrammed after locking)

REVIEW

7.1.3 Electronic Product Code (EPC)

The Electronic Product Code (EPC) supports the unique identification of objects (e.g. retail items, logistical items or transport containers). This makes extremely accurate identification possible. In practical use, the EPC is stored on a transponder (tag) and scanned by the reader.

There are different EPC number schemes with different data lengths. Below is the structure of a GID-96-bit code (EPC Global Tag Data Standards V1.1 Rev. 1.27) :



- **Header:** This identifies the EPC identification number that follows with regard to length, type, structure and version of the EPC
- **EPC manager:** This identifies the company/corporation
- **Object class**: Corresponds to the article number
- **Serial number:** Consecutive number of the article

The Siemens UHF transponders are all suitable for working with EPC and other number schemes. Before a transponder can work with a number scheme, the relevant numbers must first be written to the transponder.

Allocation of the ECP ID by the tag manufacturer

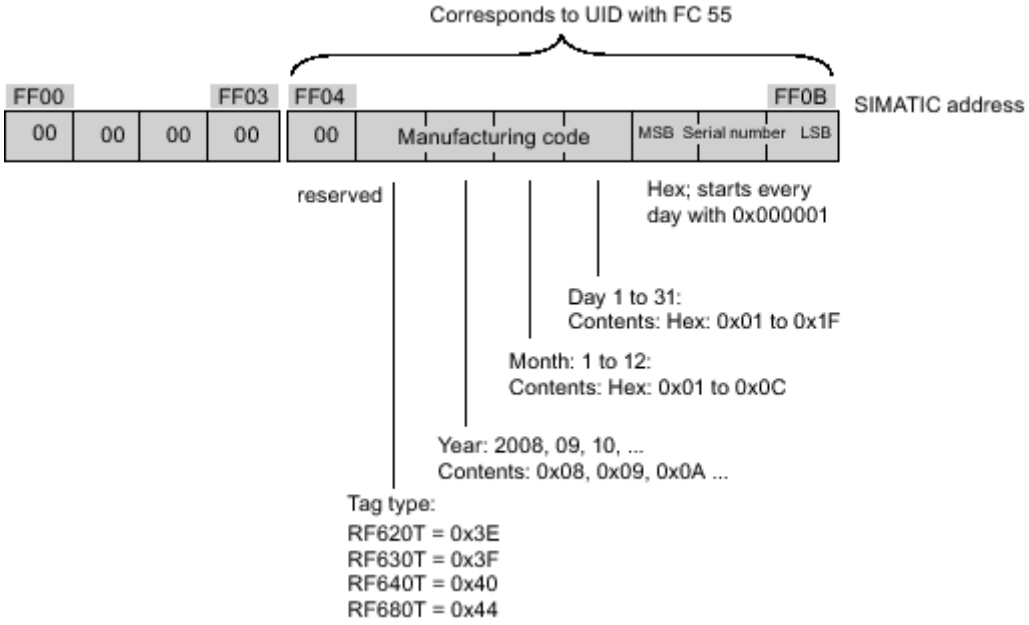


Figure 7-2 Allocation of the EPC ID on delivery of the tag

REVIEW

7.1.4 SIMATIC memory configuration of the RF600 transponders and labels

SIMATIC memory configuration

The following graphic shows the structure of the virtual SIMATIC memory for the RF620R/RF630R reader and explains the function of the individual memory areas. The SIMATIC memory configuration is based on the 4 memory banks, as they are defined in EPC Global.

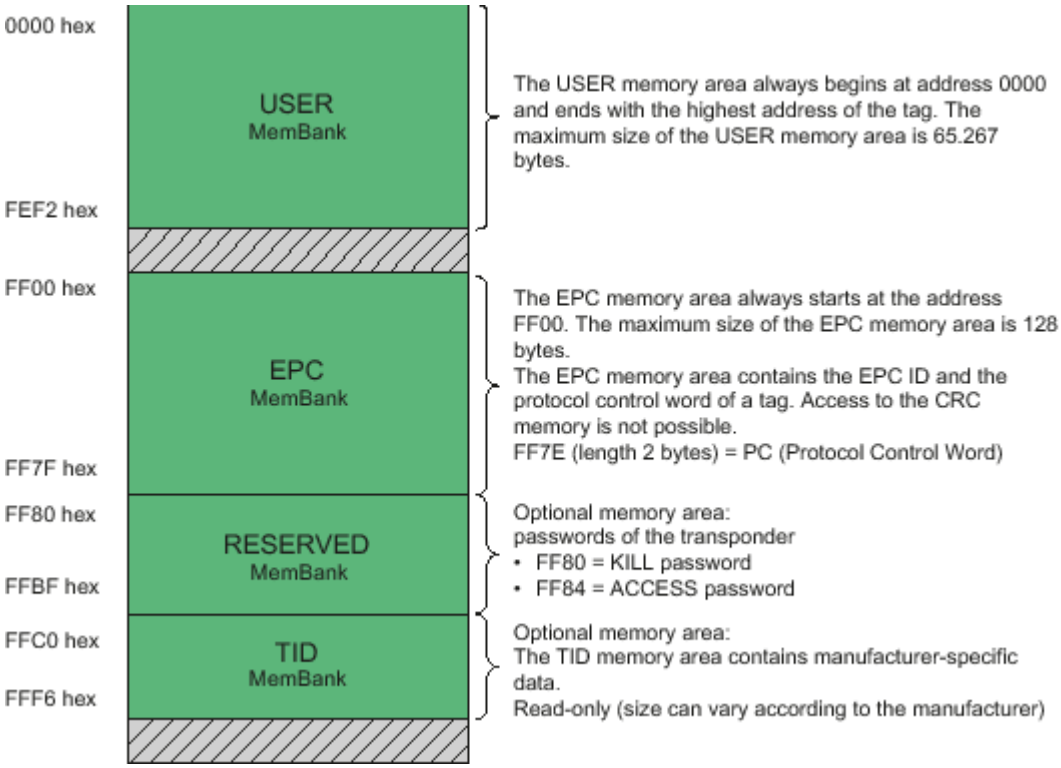


Figure 7-3 SIMATIC memory areas of the RF600 transponders

REVIEW

Special memory configuration of the RF600 transponders and labels

Tags	Chip type	User [hex]	EPC		TID	RESERVED (passwords)	Special	
			Range (preset length)	Access			KILL-PW	Lock function
RF630L (-2AB00, -2AB01)	Impinj Monza 2	-	FF00-FF0B (96 bits = FF00-FF0B)	read/ write	FFC0-FFC7	FF80-FF87	Yes	Yes
RF630L (-2AB02)	Impinj Monza 4QT [1)]	00 - 3F	FF00-FF0F (96 bits = FF00-FF0B)	read/ write	FFC0-FFC9	FF80-FF87	Yes	Yes
RF630L (-2AB03)	NXP G2XM	00 - 3F	FF00-FF1D (96 bits = FF00-FF0B)	read/ write	FFC0-FFC7	FF80-FF87	Yes	Yes
RF680L	NXP G2XM	00 - 3F	FF00-FF1D (96 bits = FF00-FF0B)	read/ write	FFC0-FFC7	FF80-FF87	Yes	Yes
RF610T	NXP G2XM	00 - 3F	FF00-FF1D (96 bits = FF00-FF0B)	read/ write	FFC0-FFC7	FF80-FF87	LOCKED	Yes
RF610T ATEX	NXP G2XM	00 - 3F	FF00-FF1D (96 bits = FF00-FF0B)	read/ write	FFC0-FFC7	FF80-FF87	LOCKED	Yes
RF620T	Impinj Monza 4QT [1)]	00 - 3F	FF00-FF0F (96 bits = FF00-FF0B)	read/ write	FFC0-FFC9	FF80-FF87	LOCKED	Yes
RF622T								
RF625T	Impinj Monza 4QT [1)]	00 - 3F	FF00-FF0F (96 bits = FF00-FF0B)	read/ write	FFC0-FFC9	FF80-FF87	LOCKED	Yes
RF630T	NXP G2XM	00 - 3F	FF00-FF1D (96 bits = FF00-FF0B)	read/ write	FFC0-FFC7	FF80-FF87	LOCKED	Yes
RF640T	NXP G2XM	00 - 3F	FF00-FF1D0B (96 bits = FF00-FF0B)	read/ write	FFC0-FFC7	FF80-FF87	LOCKED	Yes
RF680T	NXP G2XM	00 - 3F	FF00-FF1D (96 bits = FF00-FF0B)	read/ write	FFC0-FFC7	FF80-FF87	LOCKED	Yes

[1)] Uses User Memory Indicator (UMI).

REVIEW

Note

Default EPC ID

When an RF610T-RF680T transponder is supplied, a 12 byte long identifier is assigned by the manufacturer as the EPC ID according to a number scheme (see "Assignment of the ECP ID by the manufacturer").

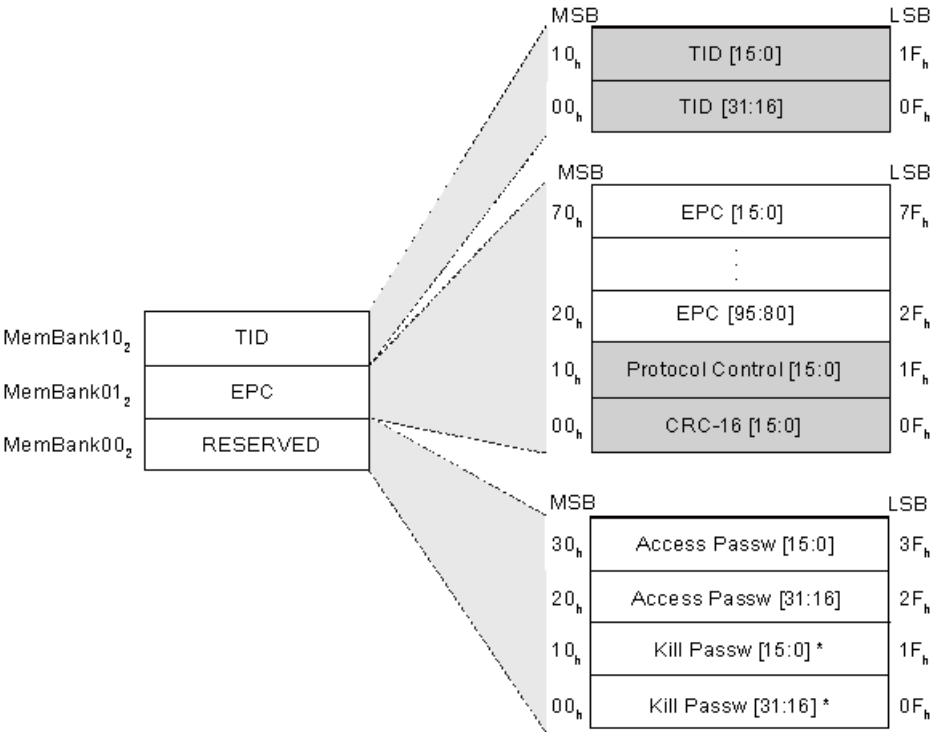
REVIEW

Memory map of the ISO 18000-6C Monza 2 chip according to EPC

The memory of the ISO 18000-6C Monza 2 chip is divided logically into four different memory banks:

Memory bank (decimal)	Memory type	Description
MemBank 11_2	USER	User-writable USER memory area
MemBank 10_2	TID	Is defined by the manufacturer, contains the class identifier and serial number of a transponder.
MemBank 01_2	EPC	Contains the EPC UID, the protocol and the CRC of a transponder. You can write to the EPC memory area. In the delivery condition, the memory contents can have the following states: • empty • containing the same data • containing different data
MemBank 00_2	RESERVED	Contains the access and kill password.

The graphic below illustrates the exact memory utilization. Each box in the right part of the graphic represents one word (16 bits) in the memory.



Color	Mode of access by RF600 reader
	Read
	Write / read * Can only be overwritten with RF6xxL transponders.

REVIEW

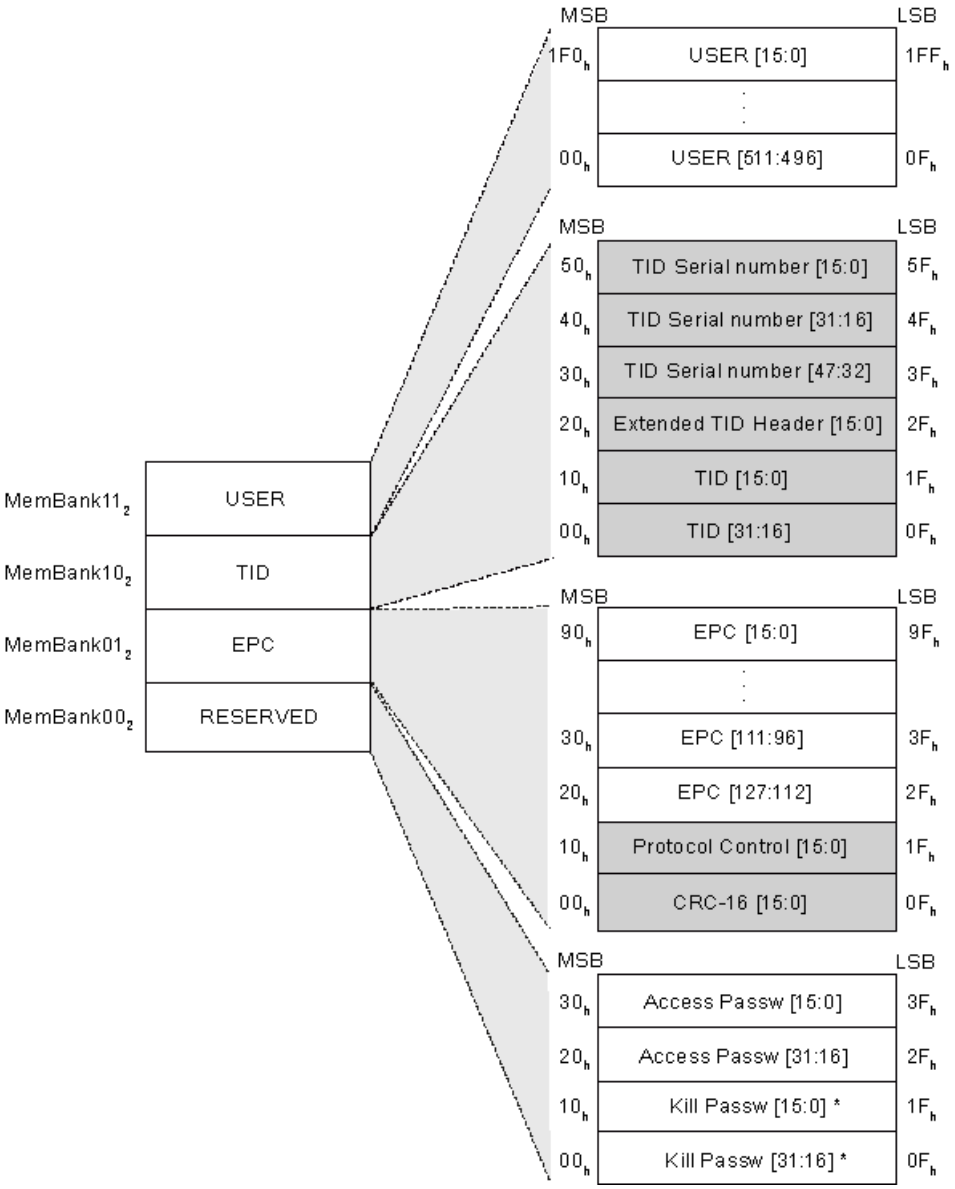
Memory map of the ISO 18000-6C Monza 4QT chip according to EPC

The memory of the ISO 18000-6C Monza 4QT chip is divided logically into four different memory banks:

Memory bank (decimal)	Memory type	Description
MemBank 11_2	USER	User-writable USER memory area
MemBank 10_2	TID	Is defined by the manufacturer, contains the class identifier and serial number of a transponder.
MemBank 01_2	EPC	Contains the EPC data, the protocol information and the CRC data of a transponder. You can write to the EPC memory area. In the delivery condition, the memory contents can have the following states: • containing the same data • containing different data
MemBank 00_2	RESERVED	Contains the access and kill password.

The graphic below illustrates the exact memory utilization. Each box in the right part of the graphic represents one word (16 bits) in the memory.

REVIEW



Color	Mode of access by RF600 reader
	Read
	Write / read

* Can only be overwritten with RF6xxL transponders.

REVIEW

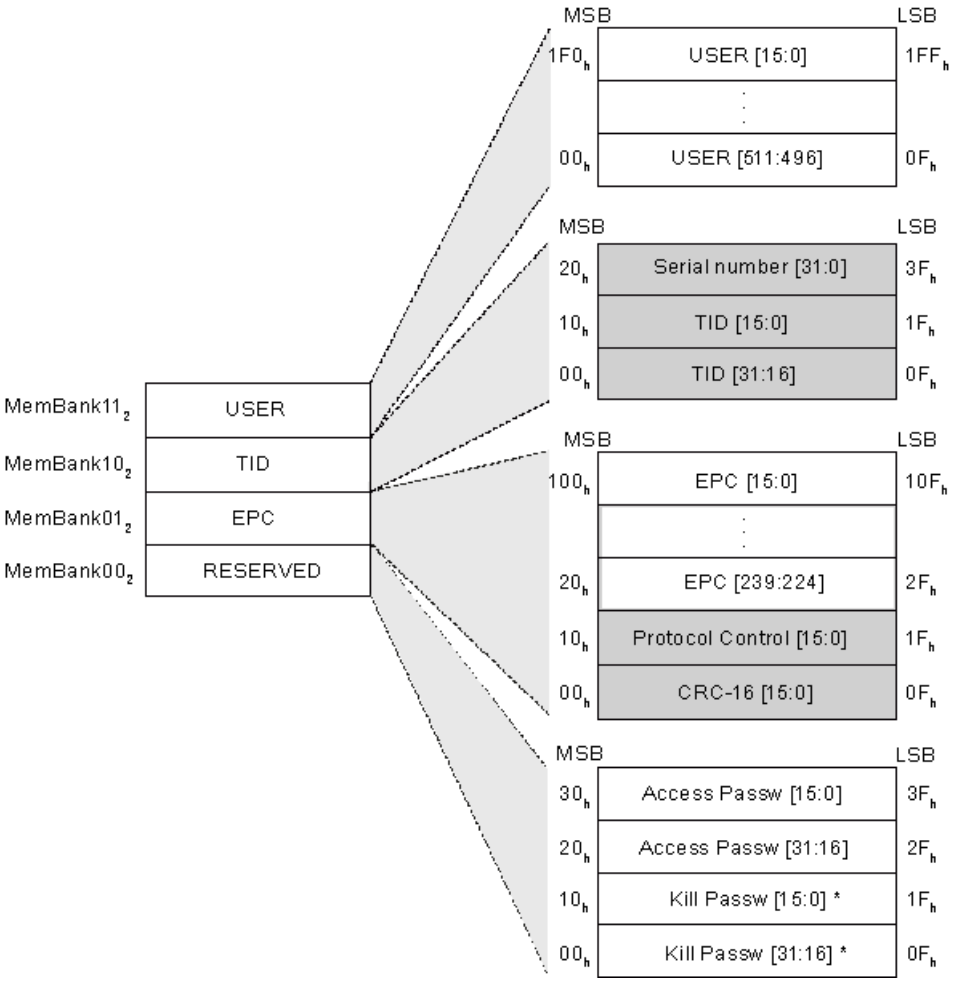
Memory map of the ISO 18000-6C G2XM chip according to EPC

The memory of the ISO 18000-6C G2XM chip is divided logically into four different memory banks:

Memory bank (decimal)	Memory type	Description
MemBank 11_2	USER	User-writable USER memory area
MemBank 10_2	TID	Is defined by the manufacturer, contains the class identifier and serial number of a transponder.
MemBank 01_2	EPC	Contains the EPC data, the protocol information and the CRC data of a transponder. You can write to the EPC memory area. In the delivery condition, the memory contents can have the following states: • containing the same data • containing different data
MemBank 00_2	RESERVED	Contains the access and kill password.

The graphic below illustrates the exact memory utilization. Each box in the right part of the graphic represents one word (16 bits) in the memory.

REVIEW



Color	Mode of access by RF600 reader
	Read
	Write / read * Can only be overwritten with RF6xxL transponders.

Parameter assignment

Which parameter assignment options available to you for which reader of the RF600 family is outlined in the section "Overview of parameterization of RF600 reader (Page 461)". Detailed information on parameter assignment as well as examples for describing and reading specific memory areas can be found in the referenced sections of the documentation.

REVIEW

7.1.5 Minimum distances and maximum ranges

The following section describes the configuration of the antenna and transponder relative to each other. The aim of the section is to help you achieve the maximum ranges listed here in a typical electromagnetic environment. One of the main focuses of the section is the effect of the mounting surface of the transponder on the write/read distance.

As the requirements for achieving the maximum distances specified here, note the following points:

- Operate the readers with the maximum possible and permitted transmit power.
- With external antennas, the antenna cable 6GT2815-0BH30 with a length of 3 m and 1 dB cable loss is used.
- The alignment of the transponder and antenna needs to be optimum (see section "Configurations of antenna and transponder (Page 344)").
- The optimum mounting surface for the transponder has been selected (see section "Effects of the materials of the mounting surfaces on the range (Page 346)")
- The maximum range shown in the section "Maximum read/write ranges of transponders (Page 347)" applies only to read operations.

  With write operations, the range is reduced as described in the section.
- Effects that reduce read/write ranges have been avoided (see section "Antenna configurations (Page 43)").

REVIEW

7.1.5.1 Configurations of antenna and transponder

Below, you will find several possible antenna-transponder configurations that are necessary to achieve the maximum range. With the RF620A and RF642A antennas, the polarization axes of the antenna and of the transponder must be aligned parallel to each other.

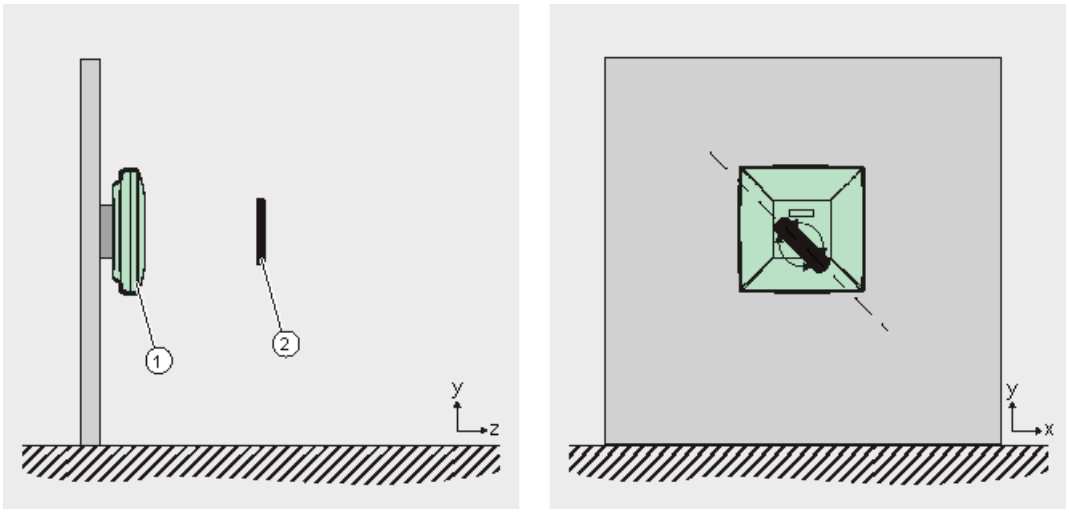
Note

Reduction of the maximum read/write range when using RF620A or RF642A antennas

If the alignment of the polarization axes between the RF620A or RF642A antennas and transponders is not parallel, this reduces the read/write range. The reduction in the range depends on the angular deviation between the polarization axes of the RF620A or RF642A antenna and the polarization axis of the transponder. You will find further details in the section "Alignment of transponders to the antenna (Page 254)" or "Alignment of transponders to the antenna (Page 300)".

Possible transponder alignments depending on the antenna type

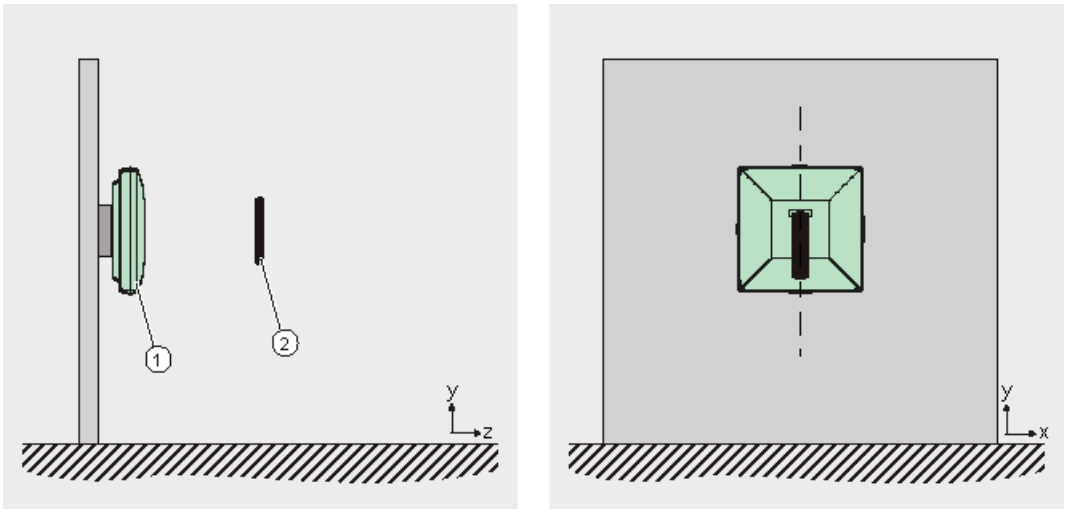
To achieve the maximum read/write range with RF640A or RF660A antennas, make sure that the planes of the polarization axes have the same alignment. Changing the transponder angle within the x-y plane has no effect on the range.



① Antenna RF640A or RF660A
② Transponder

Figure 7-4 Possible transponder alignment with RF640A or RF660A

To achieve the maximum range with RF620A or RF642A antennas, make sure that the polarization axes of the antenna and transponder are parallel to each other. Changing the transponder angle within the x-y plane leads to a reduction of the range.

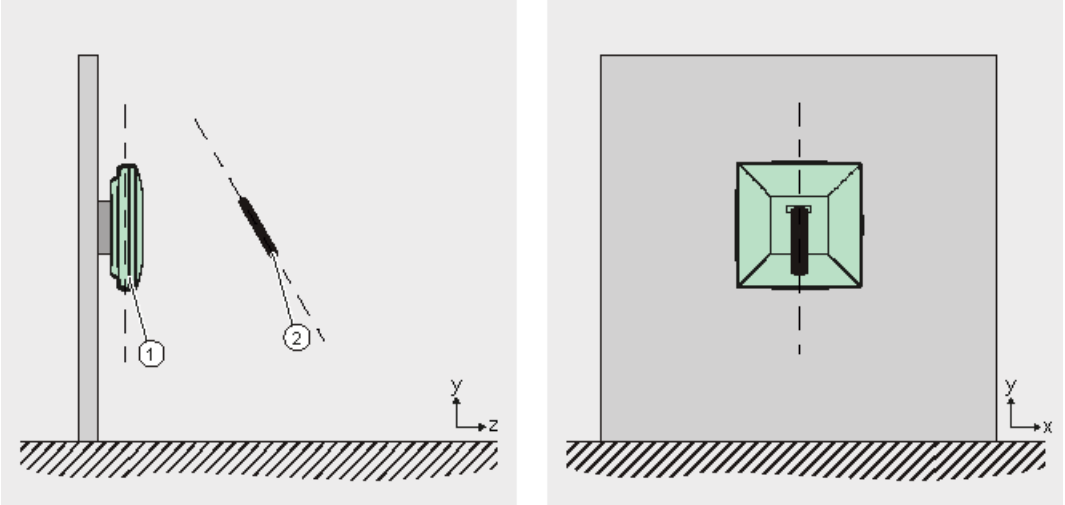


① Antenna RF620A or RF642A
② Transponder

Figure 7-5 Possible transponder alignment with RF620A or RF642A

REVIEW

If the angle is changed within the y-z plane, this causes a reduction in range for all antenna types.



① Antenna RF620A, RF640A, RF642A or RF660A
② Transponder

Figure 7-6 Transponder alignment not allowed

REVIEW

Note

Optimum transponder position/alignment

Depending on the electromagnetic properties of the environment, the optimum transponder position and alignment may differ from those shown above.

7.1.5.2 Effects of the materials of the mounting surfaces on the range

Effects due to antenna mounting

For the RF640A, RF642A and RF660A antennas, the antenna gain and therefore the maximum read/write range does not depend on the selected material of the mounting surface. In contrast to this, the antenna gain of the RF620A antenna and therefore the maximum read/write range of transponders does depend on the mounting surface of the antenna. To achieve the maximum range with an RF620A antenna, the antenna needs to be mounted on a metallic surface of at least 150 x 150 mm.

You will find more detailed information on antenna gain in the subsections of the section "Antenna patterns (Page 257)".

Effects due to transponder mounting

The maximum read/write range of the transponders depends on the material of the mounting surface. The specified ranges apply when mounted on non-metallic surfaces, such as paper or card, with the RF625T, RF630T and RF640T when mounted on metal.

Mounting on plastic can reduce the maximum read/write range considerably depending on the type of plastic (up to 70%). When mounted on wood, the range is furhter reduced the more moisture the wood contains. Due to the attenuating properties of glass, direct mounting without a spacer can halve the range.

If the RF625T, RF630T, RF640T or RF680T transponders are mounted on metal, this metallic surface acts as a reflection surface. This surface should therefore be adequately large. To achieve the listed maximum ranges, transponders must be mounted on a metallic mounting surface with a minimum diameter of 150 mm, for the RF630T and RF680T 300 mm. If the metallic mounting surface only has a diameter of 65 mm instead of the required 150 mm, the range is reduced by 65%.

7.1.5.3 Maximum read/write ranges of transponders

Maximum read ranges

Table 7- 1 Read ranges of transponders at a room temperature of +25 °C (all ranges in m)

	SIMATIC RF630L 6GT2810-2AB00, 6GT2810-2AB01, 6GT2810-2AB02-0AX0	SIMATIC RF630L 6GT2810-2AB03	SIMATIC RF680L	SIMATIC RF610T	SIMATIC RF620T [1)]
SIMATIC RF620R with internal antenna	5	3	2.5	3	5
SIMATIC RF630R with RF620A	1.6	1	0.8	1	1.6
with RF640A	4.5	2.8	2.2	2.8	4.5
with RF642A	5.5	3.5	2.8	3.5	5.5
with RF660A	6	4	3	4	6
SIMATIC RF640R with internal antenna	7	4	3.5	4.5	7
with RF620A	2.2	1.4	1.1	1.4	2.2
with RF640A	6	4	3.1	4	6
with RF642A	8	5	4	5	8
with RF660A	8	5	4	5	8
SIMATIC RF650R with RF620A					
with RF640A					
with RF642A					
with RF660A					

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	SIMATIC RF630L 6GT2810-2AB00, 6GT2810-2AB01, 6GT2810-2AB02-0AX0	SIMATIC RF630L 6GT2810-2AB03	SIMATIC RF680L	SIMATIC RF610T	SIMATIC RF620T [1]
SIMATIC RF670R with RF620A	2.2	1.4	1.1	1.4	2.2
with RF640A	6	4	3	4	6
with RF642A	8	5	4	5	8
with RF660A	8	5	4	5	8
SIMATIC RF680R with RF620A					
with RF640A					
with RF642A					
with RF660A					
SIMATIC RF685R with internal antenna					
with RF620A					
with RF640A					
with RF642A					
with RF660A					

	SIMATIC RF625T [2]	SIMATIC RF630T [2]	SIMATIC RF640T [2]	SIMATIC RF680T [2]
SIMATIC RF620R with internal antenna	1	0.8	2.5	5.5
SIMATIC RF630R with RF620A	0.3	0.3	0.8	1.3
with RF640A	0.8	0.7	2.2	3.5
with RF642A	1.1	0.8	2.8	5
with RF660A	1.2	0.9	3	5
SIMATIC RF640R with internal antenna	1.3	1	3.5	6
with RF620A	0.4	0.3	1.1	1.8
with RF640A	1.2	0.9	3	5
with RF642A	1.5	1.2	4	7
with RF660A	1.5	1.2	4	7
SIMATIC RF650R with RF620A				
with RF640A				
with RF642A				
with RF660A				

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	SIMATIC RF625T [2]	SIMATIC RF630T [2]	SIMATIC RF640T [2]	SIMATIC RF680T [2]
SIMATIC RF670R				
with RF620A	0.4	0.3	1.1	1.8
with RF640A	1.2	0.9	3	5
with RF642A	1.5	1.2	4	7
with RF660A	1.5	1.2	4	7
SIMATIC RF680R				
with RF620A				
with RF640A				
with RF642A				
with RF660A				
SIMATIC RF685R				
with internal antenna				
with RF620A				
with RF640A				
with RF642A				
with RF660A				

[1] Mounting on a non-metallic surface. Mounting surface with a minimum diameter of 300 mm. Mounting on metal is not possible.

[2] Mounting on metal Mounting surface with a minimum diameter of 150 mm, for the RF630T and RF680T 300 mm.

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Maximum write ranges

Depending on the transponder type, the reader antenna requires more power for writing than for reading data. When writing, the maximum range reduces by approximately 30% compared with the read range.

7.1.5.4 Minimum distances between antennas and transponders

The antennas listed here are all far field antennas. For this reason, a minimum distance between antennas and transponders must be maintained to ensure reliable transponder data access:

Table 7- 2 Minimum distances to be maintained between antennas and transponders

RF600 antenna	Minimum distances to be maintained
RF620A	50 mm
RF640A	200 mm
RF642A	200 mm
RF660A	200 mm

7.2 SIMATIC RF630L Smartlabel

7.2.1 Features

SIMATIC RF630L smart labels are passive, maintenance-free data carriers based on UHF Class 1 Gen2 technology that are used to store the "Electronic Product Code" (EPC).

Smart labels offer numerous possible uses for a wide range of applications and support efficient logistics throughout the process chain.

SIMATIC RF630L transponder				
	6GT2810-2AB00	6GT2810-2AB01	6GT2810-2AB02-0AX0	6GT2810-2AB03
Design				
Area of application	Simple identification such as barcode replacement or supplementation, through warehouse and distribution logistics, right up to product identification.			
Memory	EPC 96 bits		EPC 96/128 bits	EPC 96/240 bits
Additional user memory	No		64 bytes	64 bytes
Range [1]	max. 8 m		max. 5 m	
Mounting	Self-adhesive paper labels, for example for attaching to packaging units, paper or cartons		Self-adhesive plastic labels, for example for attaching to packaging units, paper or cartons	
	Not suitable for fixing straight onto metal or onto liquid containers			
[1] The information relates to the maximum read range. You will find more information on ranges in the section "Minimum distances and maximum ranges (Page 344)".				

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7.2.2 Ordering data

RF630L transponder	Article number	Packaging
RF630L transponder, SmartLabel 101.6 mm x 152.4 mm (4" x 6")	6GT2810-2AB00	Minimum order 1600 items (800 on one roll)
RF630L transponder, SmartLabel 101.6 mm x 50.8 mm (4" x 2")	6GT2810-2AB01	Minimum order 1000 items (1000 on one roll)
RF630L transponder, SmartLabel 97 mm x 27 mm	6GT2810-2AB02-0AX0	Minimum order 5000 items (5000 on one roll)
RF630L transponder, SmartLabel 54 mm x 34 mm	6GT2810-2AB03	Minimum order 2000 items (2000 on one roll)

7.2.3 Minimum spacing between labels

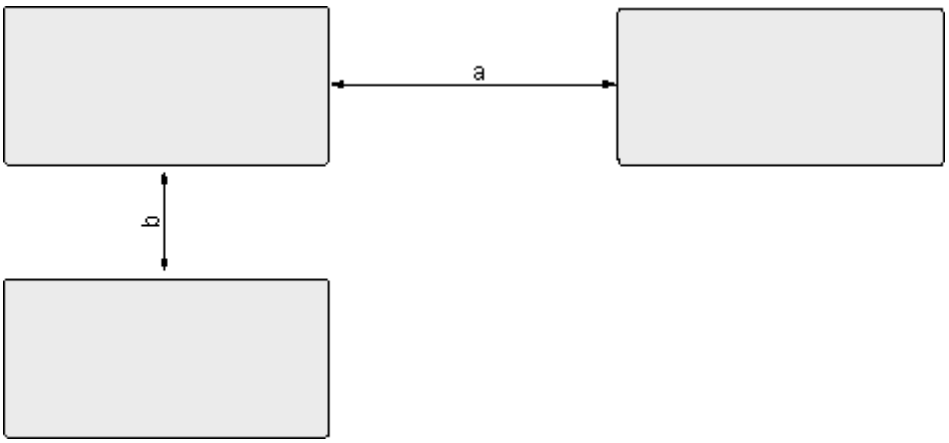

Figure 7-7 Minimum spacing between labels

The specified minimum spacing applies for the SIMATIC RF630L smart labels with the following order numbers:

- 6GT2810-2AB00
- 6GT2810-2AB01
- 6GT2810-2AB02-0AX0
- 6GT2810-2AB03

Table 7- 3 Minimum spacing

Name	Minimum spacing
a	50 mm
b	50 mm

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Please note that smart labels can also be attached one above the other. The spacing between the labels attached one above the other depends on the damping characteristics of the carrier material.

7.2.4 Memory configuration of the smart label

The memory configuration of the smart label is described in the section SIMATIC memory configuration of the RF600 transponders and labels (Page 336).

7.2.5 Technical data

Table 7- 4 Mechanical data

	6GT2810-2AB00	6GT2810-2AB01	6GT2810-2AB02-0AX0	6GT2810-2AB03
Dimensions (L x W)	101.6 mm x 152.4 mm (ca. 4" x 6")	101.6 mm x 50.8 mm (ca. 4" x 2")	97 mm x 27 mm	54 mm x 34 mm
Design	Paper with integrated antenna		Plastic with integrated antenna	
Label type	Paper label		Inlay	
Antenna material	Aluminum			
Static pressure	10 N/mm^2			
Material surface	Paper		Plastic PET	
Type of antenna	Shortened dipole			
Color	white		Transparent	
Printing	Can be printed using heat transfer technique			
Mounting	Single-sided adhesive (self-adhesive label).		Single-sided adhesive (self-adhesive inlay).	
Degree of protection	None, the label must be protected against humidity.		IP65	
Weight	approx. 3 g	approx. 2 g	approx. 1 g	

Table 7- 5 Electrical data

	6GT2810-2AB00	6GT2810-2AB01	6GT2810-2AB02-0AX0	6GT2810-2AB03
Air interface	ISO 18 000-6 Type C			
Polarization type	Linear			
Polarization direction	The polarization direction is parallel with the short side of the paper label	The polarization direction is parallel with the long side of the paper label	The polarization direction is parallel with the long side of the inlay	
Frequency range	860 to 960 MHz			
Range [1)]	max. 8 m		max. 5 m	

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	6GT2810-2AB00	6GT2810-2AB01	6GT2810-2AB02-0AX0	6GT2810-2AB03
Minimum spacing between labels • Vertically • Horizontally	 • 50 mm • 100 mm			
Energy source	Field energy via antenna, without battery			
Multitag capability	Yes			
[1] The information relates to the maximum read range. You will find more information on ranges in the section "Minimum distances and maximum ranges (Page 344)"				

Table 7- 6 Memory specifications

	6GT2810-2AB00	6GT2810-2AB01	6GT2810-2AB02-0AX0	6GT2810-2AB03
Type	EPC Class 1 Gen2			
Memory organization	EPC 96 bits		EPC 96/128 bits	EPC 96/240 bits
Additional user memory	No		64 bytes	64 bytes
Listing	ISO 18000-6C			
Data retention at +25 °C	10 years			
Read cycles	Unlimited			
Write cycles	100.000			
Anti collision	approx. 100 labels/sec			

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Table 7- 7 Environmental conditions

	6GT2810-2AB00	6GT2810-2AB01	6GT2810-2AB02-0AX0	6GT2810-2AB03
Temperature range during operation	-40 °C … 65 °C, up to 80 °C (200 cycles)			
Temperature range during storage	The label should be stored in the range of +15°C and +25°C at a humidity of 40% to 60%.			
Storage duration	Two years, determined by the shelf life of the adhesive			
Torsion and bending load	Partially permissible			
Distance from metal	Not suitable for fixing straight onto metal			

Table 7- 8 Identification

	6GT2810-2AB00	6GT2810-2AB01	6GT2810-2AB02-0AX0	6GT2810-2AB03
CE	CE approval to R&TTE			
FCC	Passive labels or transponders comply with the valid regulations; certification is not required.			

7.2.6 Dimension drawings

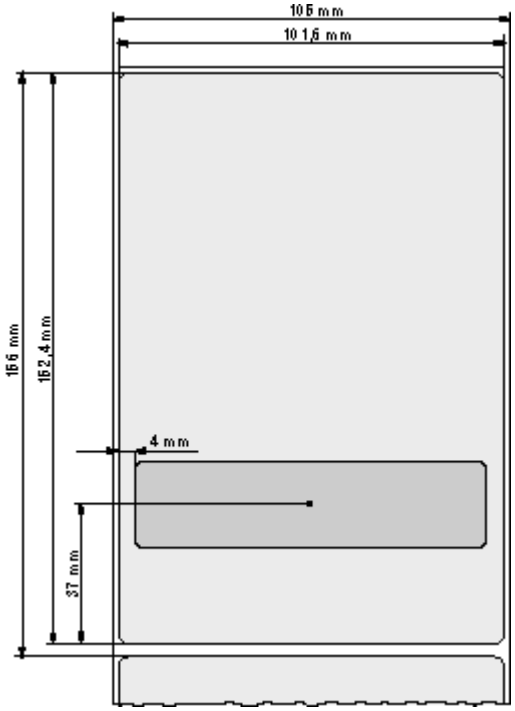

Figure 7-8 SIMATIC RF630L 6GT2810-2AB00 dimension drawing

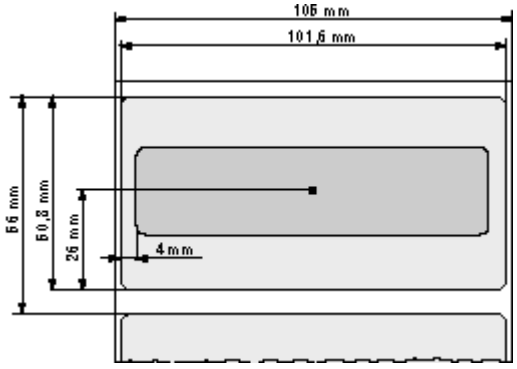

Figure 7-9 SIMATIC RF630L 6GT2810-2AB01 dimension drawing

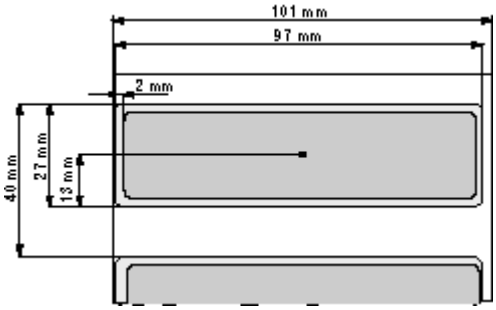

Figure 7-10 Dimension drawing SIMATIC RF630L 6GT2810-2AB02-0AX0

REVIEW

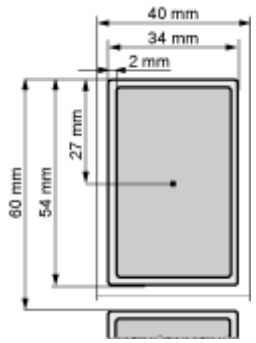

Figure 7-11 SIMATIC RF630L 6GT2810-2AB03 dimension drawing

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7.3 SIMATIC RF680L Smartlabel

7.3.1 Features

The SIMATIC RF680L Smartlabel is passive and maintenance-free. It functions based on the UHF Class 1 Gen 2 technology and is used for saving the electronic product code (EPC) of 96 bits/240 bits. The label also has a 512 bit user memory.

The SIMATIC RF680L is a heat-resistant Smartlabel with a limited service life. Its target use is the direct identification of objects in high-temperature applications.

Thanks to its antenna geometry, the transponder can be read from any direction. However, the range is reduced if it is not aligned in parallel with the antenna.

SIMATIC RF680L Smartlabel	Features	
	Area of application	Production logistics applications subject to high temperatures
	Air interface	according to ISO°18000-6C
	Memory	EPC 96 bit/240 bit Add-on-memory 64 bytes
	Range [1]	max. 4 m
	Mounting	Via a hole on the narrow side. Can also be glued by customer.
[1] The information relates to the maximum read range. You will find more information on ranges in the section "Minimum distances and maximum ranges (Page 344)".		

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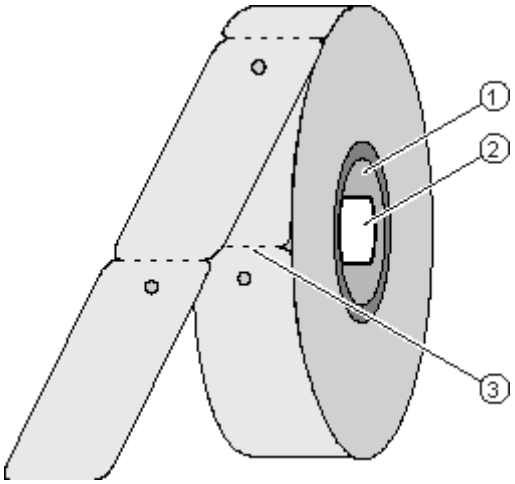
7.3.2 Delivery format

The SIMATIC RF680L is supplied on a roll. One roll always contains 1000 Smartlabels. You can tear off the Smartlabel from the roll at the perforation.



① Cardboard tube, inner dia 76 mm
② Roll label
③ Perforation

Figure 7-12 SIMATIC RF680L roll

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7.3.3 Ordering data

Ordering data	Article number	Packaging
SIMATIC RF680L • Smartlabels 54 x 89 mm • heat-resistant	6GT2810-2AG80	1,000 units on a roll

7.3.4 Minimum spacing between labels

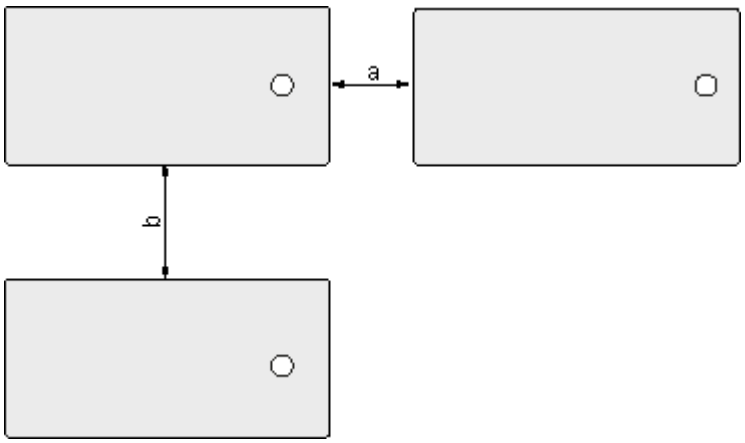

Figure 7-13 Minimum spacing between labels

Table 7- 9 Minimum spacing

Minimum spacing	
a	20 mm
b	50 mm

REVIEW

7.3.5 Memory configuration of the smart label

The memory configuration of the smart label is described in the section SIMATIC memory configuration of the RF600 transponders and labels (Page 336).

7.3.6 Mounting on metal

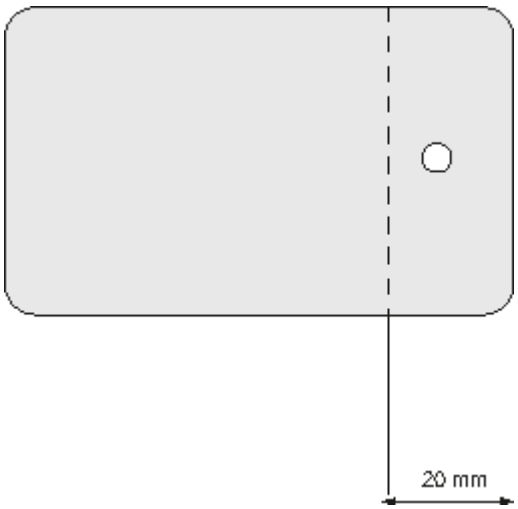

Figure 7-14 Metal mounting surface

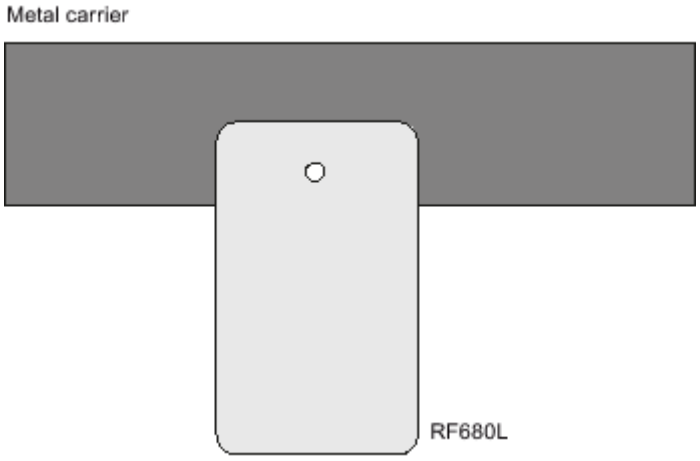

Figure 7-15 Mounting on metal

REVIEW

7.3.7 Technical data

7.3.7.1 Mechanical data

Feature	Description
Dimensions (L x W)	156 mm x 40 mm
Thickness of the label	0.4 mm (±25% incl.. chip)
Design	Synthetic paper; PEEK
Antenna material	Copper
Static pressure	10 N/mm^2
Transponder arching	max. 6 mm (see "Dimension drawing")
Silicone-free	Yes
Type of antenna	Shortened dipole
Color	beige
Printing	Yes, customized
Mounting	Via a hole on the narrow side. Can also be glued by customer.
Weight	Approx. 3 g

7.3.7.2 Electrical data

Characteristic	Description
Air interface	According to ISO 18 000-6 C
Polarization type	Linear
Polarization direction	The polarization direction is parallel with the long side of the inlay
Frequency range	• Europe 865 to 868 MHz • USA 902 to 928 MHz
Range [1)]	max. 4 m
Minimum spacing between labels • Vertically • Horizontally	 • 50 mm • 20 mm
Energy source	Field energy via antenna, without battery
Multitag capability	Yes
[1)] The information relates to the maximum read range. You will find more information on ranges in the section "Minimum distances and maximum ranges (Page 344)".	

7.3.7.3 Memory specifications

Property	Description	
Type	EPC Class 1 Gen 2	
Memory organization	EPC code	96 bits/240 bits
	User memory	64 bytes
	TID	64 bits
	Reserved (passwords)	64 bits
Protocol	ISO 18000-6C	
Data retention time	10 years	
Read cycles	Unlimited	
Write cycles	Minimum at +22 °C 100 000	

7.3.7.4 Environmental conditions

Property	Description
Temperature range during operation	-25 °C … +85 °C (permanent) +200 °C up to six hours +220 °C up to one hour +230 °C for a short time
Temperature range during storage	-40 °C … +85 °C
Torsion and bending load	Partially permissible
Distance from metal	Whole surface not suitable for fixing straight onto metal (see chapter Mounting on metal (Page 359))

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7.3.8 Certificates and approvals

Certificate	Description
CE	Conformity with R&TTE directive
FCC Federal Communications Commission	Passive labels and transponders comply with the valid regulations; certification is not required.
RoHS	Compliant according to EU Directive 2002/95/EC

7.3.9 Dimension drawing

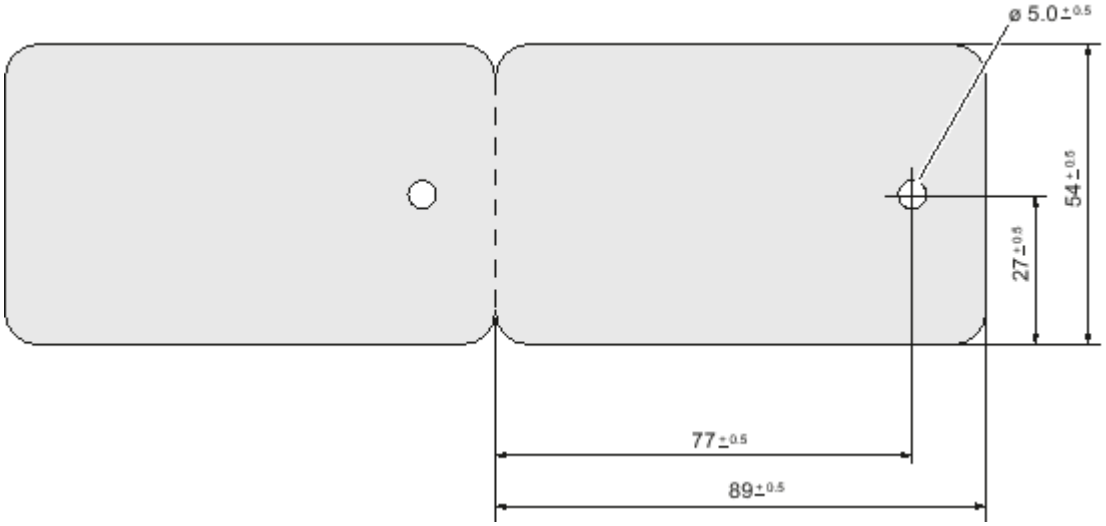

Figure 7-16 SIMATIC RF680L

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7.4 SIMATIC RF610T

7.4.1 Features

The SIMATIC RF610T is passive and maintenance-free. It operates based on the UHF Class 1 Gen 2 technology and is used for saving the electronic product code (EPC) of 96 bits / 240 bits. The label also has a 512 bit user memory.

The SIMATIC RF610T offers a host of possible uses for a wide range of applications and supports efficient logistics throughout the entire process chain.

Thanks to its antenna geometry, the transponder can be read from any direction. However, the range is reduced if it is not aligned in parallel with the antenna.

SIMATIC RF610T	Features	
	Area of application	• Simple identification, such as barcode replacement or barcode supplement • Warehouse and distribution logistics • Product identification For the Food & Beverage sector, a special version can be supplied on request that is certified for use in contact with food.
	Air interface	according to ISO°18000-6C
	Memory	EPC 96 bit/240 bit Add-on-memory 64 bytes
	Range [1]	max. 5 m
	Mounting	• Suspended by means of cable ties, or similar • Can also be fixed with screws or glued by customer. • Not suitable for mounting straight onto metal.
[1] The information relates to the maximum read range. You will find more information on ranges in the section "Minimum distances and maximum ranges (Page 344)".		

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7.4.2 Ordering data

Ordering data	Article number	Packaging
SIMATIC RF610T	6GT2810-2BB80	Min. order quantity 500 units

7.4.3 Safety instructions for the device/system

Note

This device/system may only be used for the applications described in the catalog and the technical documentation "System manual MOBY D, RF200, RF300, RF600 (http://support.automation.siemens.com/WW/view/en/10805817) and only in combination with third-party devices and components recommended and/or approved by Siemens.

7.4.4 Minimum spacing between labels

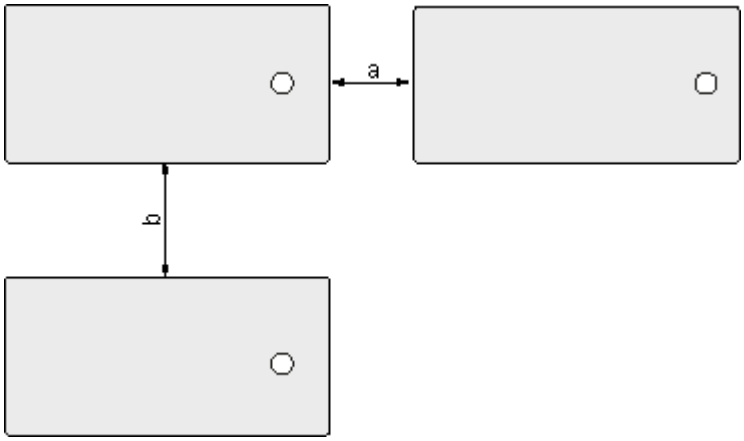

Figure 7-17 Minimum spacing between labels

Table 7- 10 Minimum spacing

Minimum spacing	
a	20 mm
b	50 mm

7.4.5 Memory configuration of the transponder

The memory configuration of the transponder is described in the section SIMATIC memory configuration of the RF600 transponders and labels (Page 336).

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7.4.6 Technical data

7.4.6.1 Mechanical data

Feature	Description
Dimensions (L x W x H)	86 mm x 54 mm x 0.4 mm
Design	PVC (polyvinyl chloride)
Antenna material	Aluminum
Static pressure	10 N/m^2
Type of antenna	Shortened dipole
Color	white
Printing	Can be printed using heat transfer technique
Mounting	• Suspended by means of cable ties, or similar • Can also be fixed with screws or glued by customer. • Not suitable for mounting straight onto metal.
Weight	Approx. 3 g

7.4.6.2 Electrical data

Characteristic	Description
Air interface	According to ISO 18 000-6 C
Polarization type	Linear
Polarization direction	The polarization direction is parallel with the long side of the inlay
Frequency range	• Europe 865 … 868 MHz • USA 902 … 928 MHz
Range [1)]	max. 5 m
Energy source	Field energy via antenna, without battery
Multitag capability	Yes
[1)] The information relates to the maximum read range. You will find more information on ranges in the section "Minimum distances and maximum ranges (Page 344)".	

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7.4.6.3 Memory specifications

Property	Description	
Type	EPC Class 1 Gen 2	
Memory organization	EPC code	96 bits/240 bits
	User memory	512 bits
	TID	64 bits
	Reserved (passwords)	64 bits
Protocol	ISO 18000-6C	
Data retention time	10 years	
Read cycles	Unlimited	
Write cycles	Minimum at +22 °C 100 000	

7.4.6.4 Environmental conditions

Feature	Description
Temperature range during operation	-25 °C … +85 °C
Temperature range during storage	-40 °C … +85 °C
Shock resistant acc. to EN 60068-2-27 Vibration acc. to EN 60068-2-6	100 g[1] 50 g[1]
Torsion and bending load	Partially permissible
Distance from metal	Not suitable for fixing straight onto metal
Degree of protection	IP67

[1)] The values for shock and vibration are maximum values and must not be applied continuously.

Note

Note that in temperature ranges > 70 °C, the transponder can become slightly deformed. However, this has no effect on the transponder function.

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7.4.7 Certificates and approvals

Certificate	Description
CE	Conformity with R&TTE directive
FCC Federal Communications Commission	Passive labels and transponders comply with the valid regulations; certification is not required.
c UL us	This product is UL-certified for the USA and Canada. It meets the following safety standard(s): • UL508 - Industrial Control Equipment • CSA C22.2 No. 142 - Process Control Equipment • UL Report E 120869

7.4.8 Dimension drawing

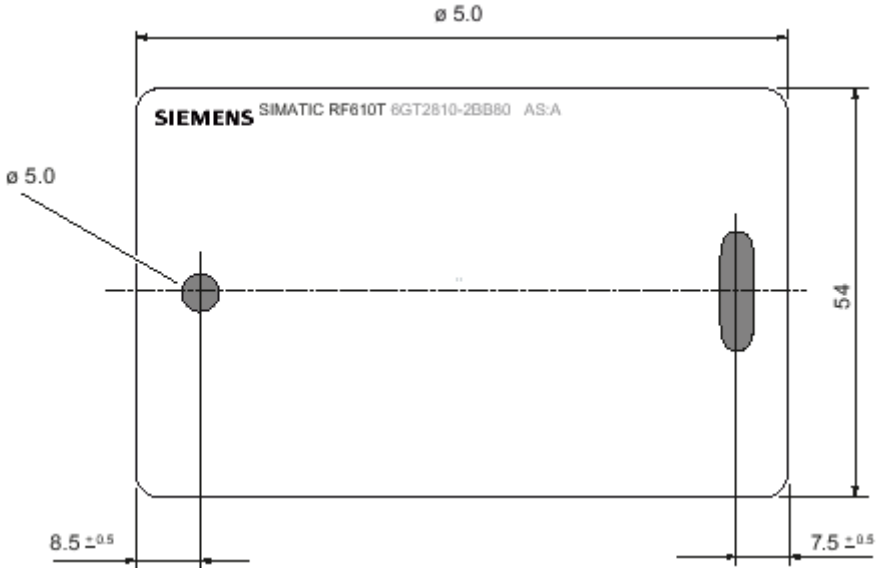

Figure 7-18 Dimensional drawing of SIMATIC RF610T

All dimensions in mm

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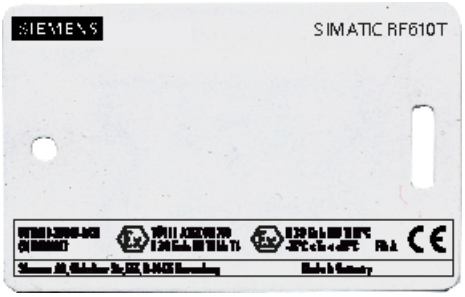
7.5 SIMATIC RF610T ATEX

7.5.1 Features

The SIMATIC RF610T special variant ATEX is passive and maintenance-free. It operates based on the UHF Class 1 Gen 2 technology and is used for saving the electronic product code (EPC) of 96 bits / 240 bits. The label also has a 512 bit user memory.

The SIMATIC RF610T special variant ATEX provides numerous possible uses for a wide range of applications and allows efficient logistics throughout the entire process chain.

Thanks to its antenna geometry, the transponder can be read from any direction. However, the range is reduced if it is not aligned in parallel with the antenna.

SIMATIC RF610T	Features	
	Area of application	• Simple identification, such as barcode replacement or barcode supplement • Warehouse and distribution logistics • Product identification For the Food & Beverage sector, a special version can be supplied on request that is certified for use in contact with food.
	Air interface	according to ISO°18000-6C
	Memory	EPC 96 bit/240 bit Add-on-memory 64 bytes
	Range [1]	max. 5 m
	Mounting	• Suspended by means of cable ties, or similar • Can also be fixed with screws or glued by customer. • Not suitable for mounting straight onto metal.
[1] The information relates to the maximum read range. You will find more information on ranges in the section "Minimum distances and maximum ranges (Page 344)".		

7.5.2 Ordering data

Ordering data	Article number	Packaging
SIMATIC RF610T special variant ATEX	6GT2810-2BB80-0AX1	Min. order quantity 500 units

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7.5.3 Safety instructions for the device/system

NOTICE
Approved use This device/system may only be used for the applications described in the catalog and the technical documentation "System manual MOBY D, RF200, RF300, RF600 (http://support.automation.siemens.com/WW/view/en/10805817) and only in combination with third-party devices and components recommended and/or approved by Siemens.

7.5.4 Minimum spacing between labels

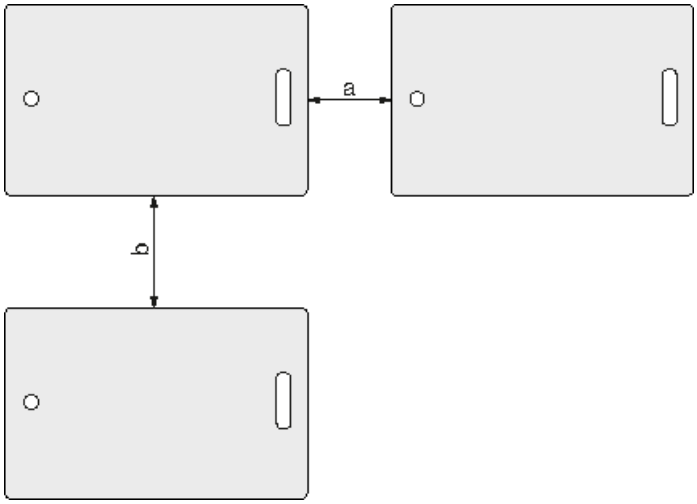


Figure 7-19 Minimum spacing between labels

Table 7- 11 Minimum spacing

Minimum spacing	
a (horizontal)	20 mm
b (vertical)	50 mm

7.5.5 Memory configuration

The memory configuration of the transponder is described in section SIMATIC memory configuration of the RF600 transponder and labels (Page 336).

REVIEW

7.5.6 Technical specifications

7.5.6.1 Mechanical data

Feature	Description
Dimensions (L x W x H)	86 mm x 54 mm x 0.4 mm
Design	PVC (polyvinyl chloride)
Antenna material	Aluminum
Static pressure	10 N/m^2
Type of antenna	Shortened dipole
Color	white
Printing	Can be printed using heat transfer technique
Mounting	• Suspended by means of cable ties, or similar • Can also be fixed with screws or glued by customer. • Not suitable for mounting straight onto metal.
Weight	Approx. 3 g

REVIEW

7.5.6.2 Electrical data

Characteristic	Description
Air interface	According to ISO 18 000-6 C
Polarization type	Linear
Polarization direction	The polarization direction is parallel with the long side of the inlay
Frequency range	Europe: 865 ... 868 MHz USA: 902 to 928 MHz
Range [1]	max. 5 m
Energy source	Field energy via antenna, without battery
Multitag capability	Yes
[1] The information relates to the maximum read range. You will find more information on ranges in the section "Minimum distances and maximum ranges (Page 344)".	

7.5.6.3 Memory data

Feature	Description	
Type	EPC Class 1 Gen 2	
Memory organization	EPC code	96 bits/240 bits
	User memory	64 bytes
	TID	64 bits
	Reserved (passwords)	64 bits
Protocol	ISO 18000-6C	
Data retention time	10 years	
Read cycles	Unlimited	
Write cycles	Minimum 100 000 at +22 °C	

7.5.6.4 Environmental conditions

Feature	Description
Temperature range during operation	-25 °C … +85 °C
Temperature range during storage	-40 °C … +85 °C
Shock resistant acc. to EN 60068-2-27 Vibration acc. to EN 60068-2-6	100 g [1)] 50 g [1)]
Torsion and bending load	Partially permissible
Distance from metal	Not suitable for fixing straight onto metal
Degree of protection	IP67

REVIEW

[1)] The values for shock and vibration are maximum values and must not be applied continuously.

Note

Note that in temperature ranges > 70 °C, the transponder can become slightly deformed. However, this has no effect on the transponder function.

7.5.6.5 Use of the transponder in the Ex protection area

In a conformity declaration, TÜV NORD CERT GmbH has confirmed compliance with the essential health and safety requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive areas as per Annex II of the directive 94/9/EG.

The essential health and safety requirements are satisfied in accordance with standards EN 60079-0: 2009, EN 60079-11: 2007 and EN 61241-11: 2006.

This allows the RF610T special variant ATEX transponder to be used in hazardous areas for gases, for the device category 3 G and gas group IIB, or alternatively in hazardous areas for dusts, for the device category 3 D and group IIIB.

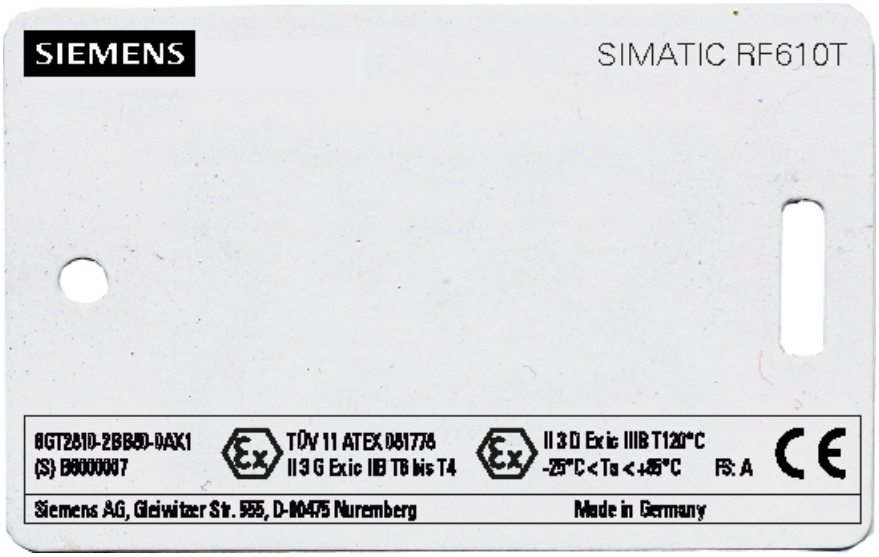
Identification

The identification is as follows:

II 3 G Ex ic IIB T6 to T4 or

II 3 D Ex ic IIIB T120°C,
-25 °C < Ta < +85 °C

7.5.6.6 Use of the transponder in hazardous areas for gases



Note

The labeling of the front of the transponder shown above is an example and can vary between batches produced at different times.

This does not affect the haradous area marking.

Temperature class delineation for gases

The temperature class of the transponder for hazardous areas depends on the ambient temperature range:

Ambient temperature range	Temperature class
-25 °C to +85 °C	T1 - T4
-25 °C to +65 °C	T5
-25 °C to +50 °C	T6

REVIEW

⚠ WARNING

Ignitions of gas-air mixtures

When using the RF610T transponder, check to make sure that the temperature class is adhered to in keeping with the requirements of the area of application

Non-compliance with the permitted temperature ranges while using the transponder can lead to ignitions of gas-air mixtures.

⚠ WARNING

Ignitions of gas-air mixtures

The maximum radiated power of the transmitter used to operate the transponder must not exceed 2000 mW ERP.

Non-compliance with the permitted radiated power can lead to ignitions of gas-air mixtures.

7.5.6.7 Use of the transponder in hazardous areas for dusts

The equipment is suitable for dusts whose ignition temperatures for a dust layer of 5 mm are higher than 190 °C (smoldering temperature). The ignition temperature specified here according to EN 60079-0 and EN 61241-11 for ignition protection type ic in this case references the smoldering temperature of a layer of combustible flyings (ic IIIA) or alternatively non-conductive dusts (ic IIIB).

REVIEW

Temperature class delineation for dusts

Ambient temperature range	Temperature value
-25 °C < Ta < +85 °C	T120 °C

⚠ WARNING

Ignitions of dust-air mixtures

When using the RF610T transponder, make sure that the temperature values are adhered to in keeping with the requirements of the area of application.

Non-compliance with the permitted temperature ranges while using the transponder can lead to ignitions of dust-air mixtures.

7.5.7 Certificates and approvals

Certificate	Description
CE	Compatible with R&TTE directive
	For directive 94/9/EC: conformity declaration no. TÜV 11 ATEX 081778
FCC Federal Communications Commission	Passive labels and transponders comply with the valid regulations; certification is not required.

7.5.8 Dimension drawing

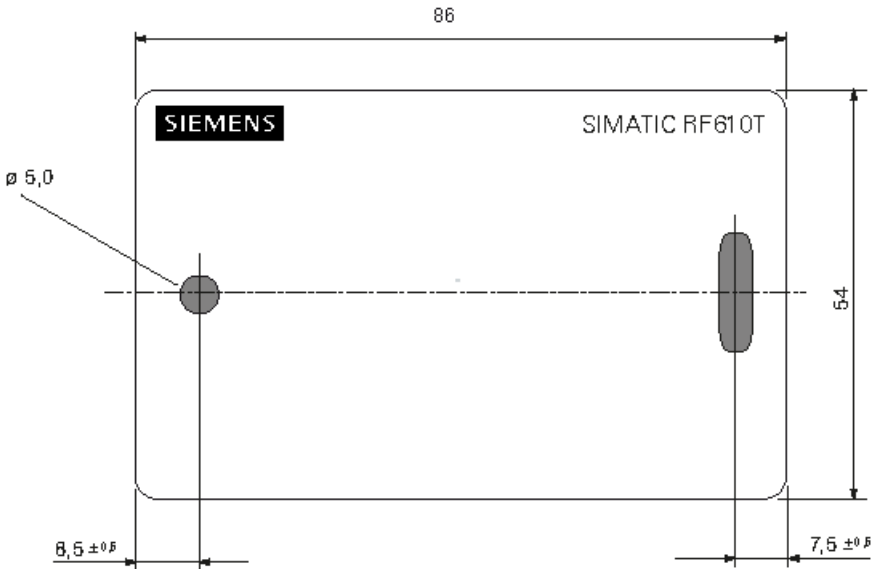


Figure 7-20 Dimension drawing SIMATIC RF610T (special variant ATEX)

All dimensions in mm

REVIEW

7.6 SIMATIC RF620T

7.6.1 Characteristics

The SIMATIC RF620T Transponder is passive and maintenance-free, based on the UHF Class 1 Gen2 technology for storing 96-bit/128-bit electronic product codes (EPC).

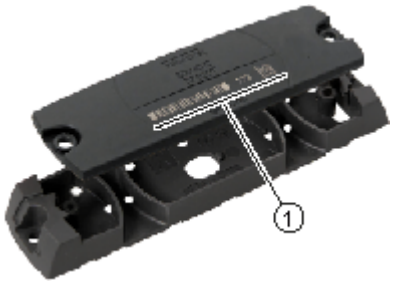
The transponder also has a 64-byte user memory.

The container tag for industrial applications is rugged and highly resistant to detergents. It is designed for easy attachment onto plastic, wood, glass, e.g. containers, palettes, and trolleys

The optimum functionality/range of the RF620T on metal is achieved by means of the spacer.

Since the plastic is food safe, it is also suitable for use in the food-processing industry.

This container tag is designed for the frequency bands of 860 MHz and 960 MHz and can be operated in combination with our UHF system RF660.

SIMATIC RF620T Transponder	Features	
	Area of application	Transponder for rugged, industrial requirements such as RF identification in warehouses and the logistics and transport area.
	Frequency range	860 to 960 MHz
	Polarization	Linear
	Memory	EPC 96 bit/128 bit
	Additional USER memory	64 bytes
	Range [1]	max. 8 m
	Mounting	• Screw, bond • On metal by means of spacers
	① Labeling area	You can inscribe the transponder itself using laser, or adhere a label to position ①. Possible types of labeling: • Barcode • Inscription in plain text • Data matrix code
	Housing color	Anthracite
[1] The information relates to the maximum read range. You will find more information on ranges in the section "Minimum distances and maximum ranges (Page 344)".		

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7.6.2 Ordering data

Ordering data	Article number
SIMATIC RF620T • Frequency 865 MHz to 928 MHz, • UHF Class 1 Gen2 technology (96 bit/128 bit) • -25 °C to +85 °C operating temperature • Dimensions (L x W x H) 127 x 38 x 6 mm • IP67 degree of protection	6GT2810-2HC81
Spacer for SIMATIC RF620T • For attaching to metal surfaces • Dimensions (L x W x H) 155 x 38 x 12 mm	6GT2898-2AA00

7.6.3 Planning the use

7.6.3.1 Optimum antenna/transponder positioning with planar mounting of the transponder on metal

REVIEW

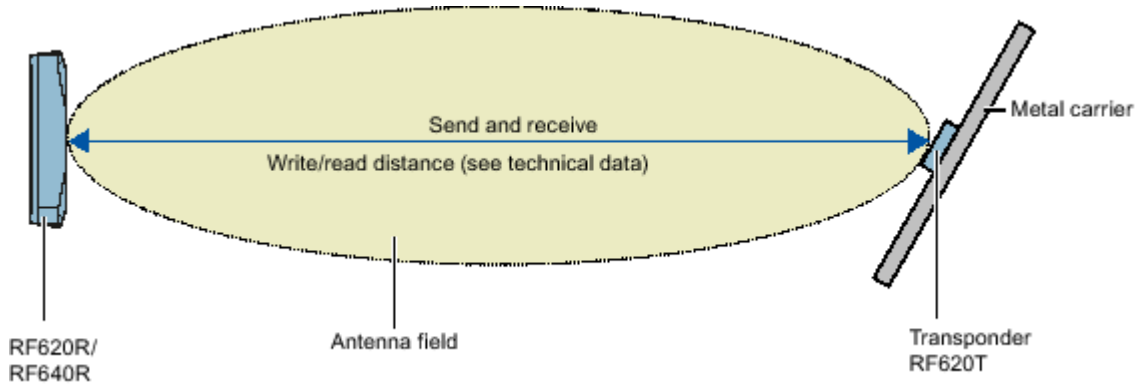


Figure 7-21 Example of optimum reader-transponder positioning with RF620R and RF640R via the internal reader antenna.

7.6.3.2 Range when mounted on flat metallic carrier plates

The transponder generally has linear polarization. The polarization axis runs as shown in the diagram below. If the tag is mounted in the center of a flat metal plate, which is either approximately square or circular, it can be aligned in any direction since the transmitting and receiving RF660A antennas operate with circular polarization.

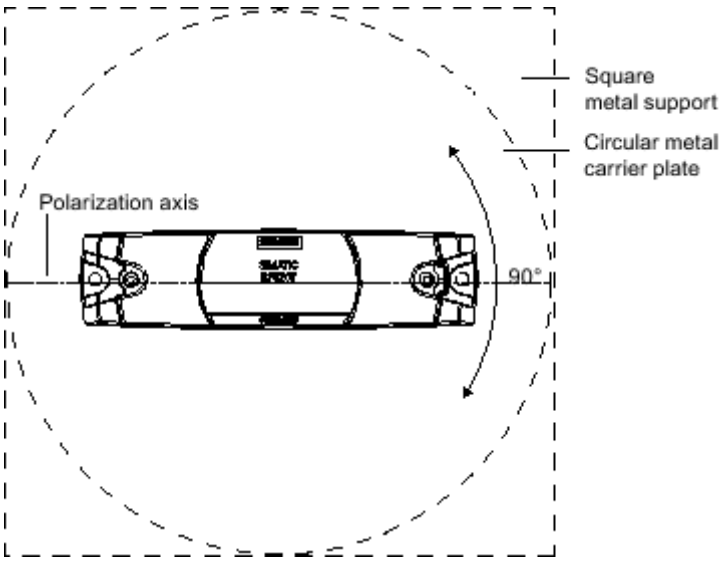


Figure 7-22 Optimum positioning of the transponder on a (square or circular) metal surface

Table 7- 12 Range with metallic, flat carriers without spacers

Carrier material	Range
Metal plate at least 300 x 300 mm	typically 38%

Table 7- 13 Range with flat metallic carriers with spacers

Carrier material	Range
Metal plate at least 300 x 300 mm	typically 87%

The use of spacers on metallic surfaces is recommended.

On rectangular carrier plates, the range depends on the mounting orientation of the transponder A 90° rotation of the transponder about the axis of symmetry may result in greater ranges.

You will find more detailed information on the range in the section "Minimum distances and maximum ranges (Page 344)".

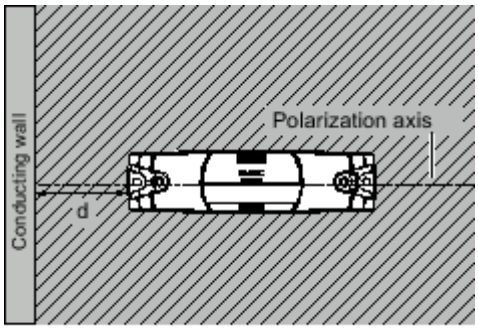
REVIEW

7.6.3.3 Influence of conducting walls on the range

If there are conducting walls or restrictions in the vicinity that could affect the wireless field, a distance of approx. 10 cm is recommended. In principle, walls have least influence if the polarization axis is orthogonal to the wall. A spacer must be used in any case.

Range: One conducting wall

Influence on the range when positioned orthogonally to the conducting wall

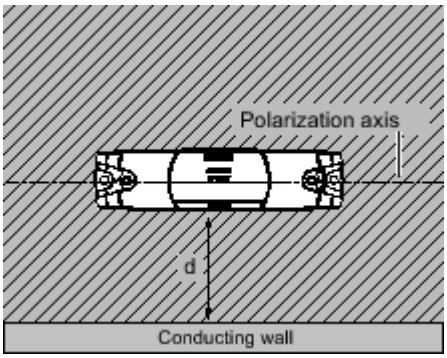


View from above

Distance d	20 mm	50 mm	100 mm	
Range	approx. 100%	approx. 100%	approx. 100%	Wall height 20 mm
	approx. 100%	approx. 100%	approx. 100%	Wall height 50 mm
	approx. 80%	approx. 100%	approx. 100%	Wall height 100 mm

REVIEW

Influence on the range when positioned parallel to the conducting wall



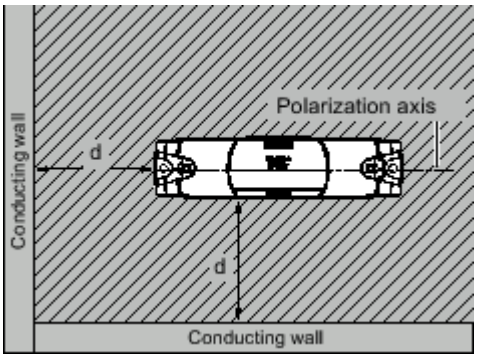
View from above

Distance d	20 mm	50 mm	100 mm	
Range	approx. 70%	approx. 100%	approx. 100%	Wall height 20 mm
	approx. 60%	approx. 90 %	approx. 100%	Wall height 50 mm
	approx. 30%	approx. 70%	approx. 100%	Wall height 100 mm

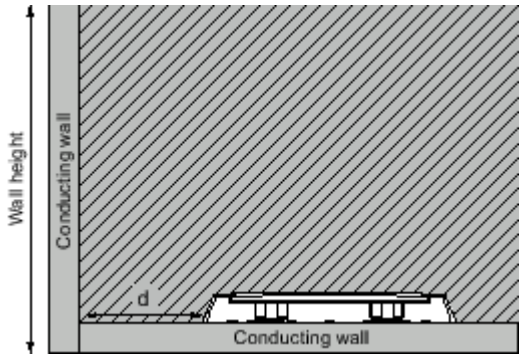
Range: Two conducting walls

REVIEW

Influence on the range when positioned against two conducting walls



View from above



Side view

Distance d	20 mm	50 mm	100 mm	
Range	approx. 70%	approx. 100%	approx. 100%	Wall height 20 mm
	approx. 60%	approx. 90 %	approx. 100%	Wall height 50 mm
	approx. 30%	approx. 70%	approx. 100%	Wall height 100 mm

The values specified in the tables above are guide values.

7.6.3.4 Directional radio pattern of the transponder on metallic surfaces

Preferably, align the data carrier parallel to the transmitting antenna. If, however, the data carrier including the metallic carrier plate is tilted, the reading range will be reduced.

Rotation about the polarization axis or orthogonal to the polarization axis

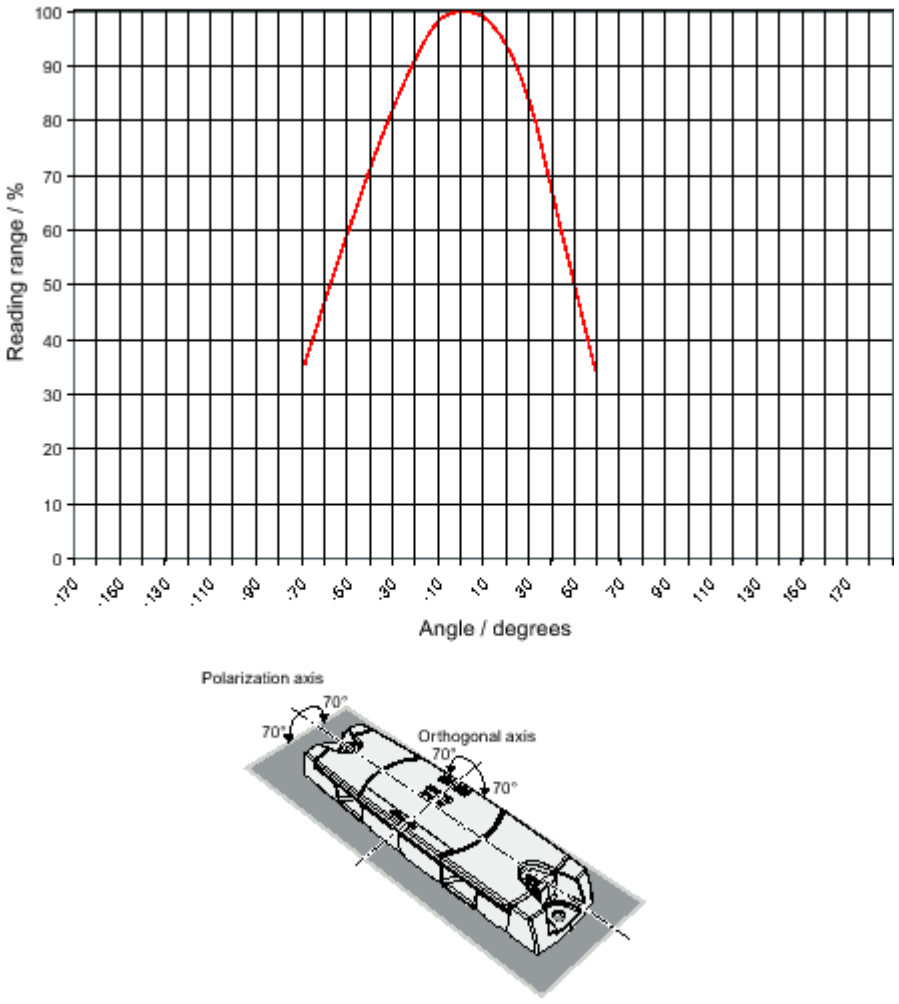


Figure 7-23 Characteristic of the transponder when rotated about the polarization axis or orthogonally to the polarization axis

REVIEW

7.6.3.5 Range when mounted on non-metallic carrier materials

The transponder is generally designed for mounting on non-metallic objects which provide the conditions for the maximum reading ranges

Table 7- 14 Range with non-metallic carriers

Carrier material	Range
Transponder on wooden carrier (dry, degree of moisture < 15%)	typically 75 %
Transponder on plastic carrier	typically 75 %
Transponder on glass	typically 75 %
Transponder on plastic mineral water bottle	typically 15 %

The maximum range of 100% is achieved by mounting the transponder in a free space with low reflections on a metal-free carrier with a diameter of at least 300 mm.

You will find more detailed information on the range in the section "Minimum distances and maximum ranges (Page 344)".

7.6.3.6 Directional radio pattern of the transponder on non-metallic surfaces

Preferably, align the data carrier parallel to the transmitting antenna. If, however, the data carrier including the metallic carrier plate is tilted, the reading range will be reduced.

REVIEW

Rotation about the polarization axis

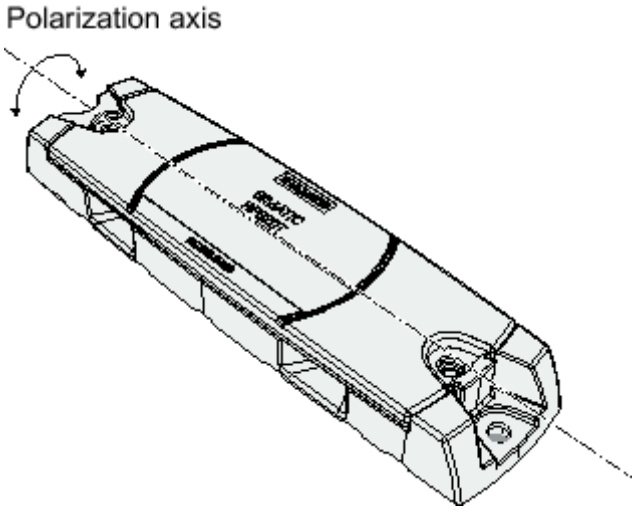


Figure 7-24 Rotation of the transponder about the polarization axis

Generally the range does not change when the transponder without carrier material is rotated about the polarization axis.

REVIEW

Rotation orthogonal to the polarization axis

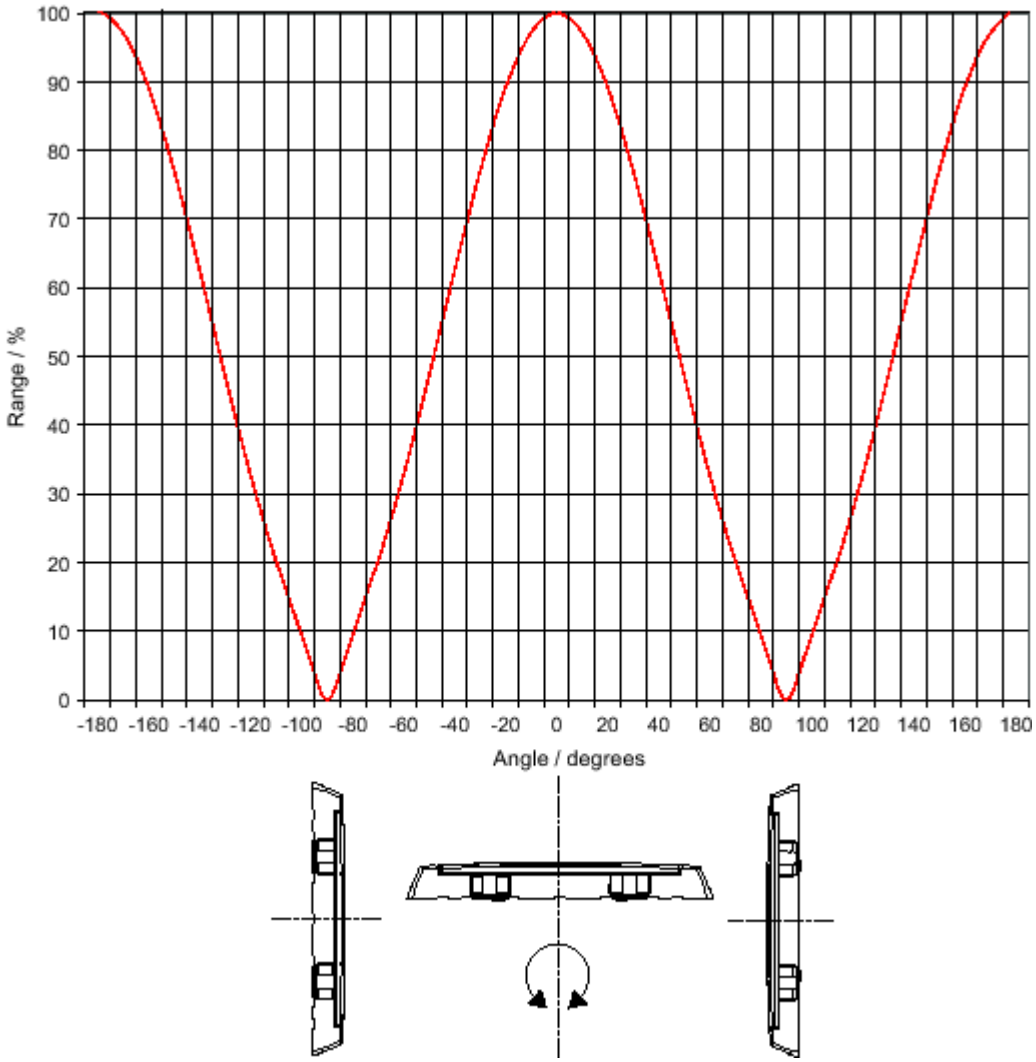


Figure 7-25 Transponder characteristics when rotated orthogonally to the polarization axis (within the tag plane)

If the transponder is positioned orthogonally to the transmitting antenna, it normally cannot be read. Therefore the data carrier is preferably to be aligned parallel to the transmitting antenna. The following figure illustrates this situation.

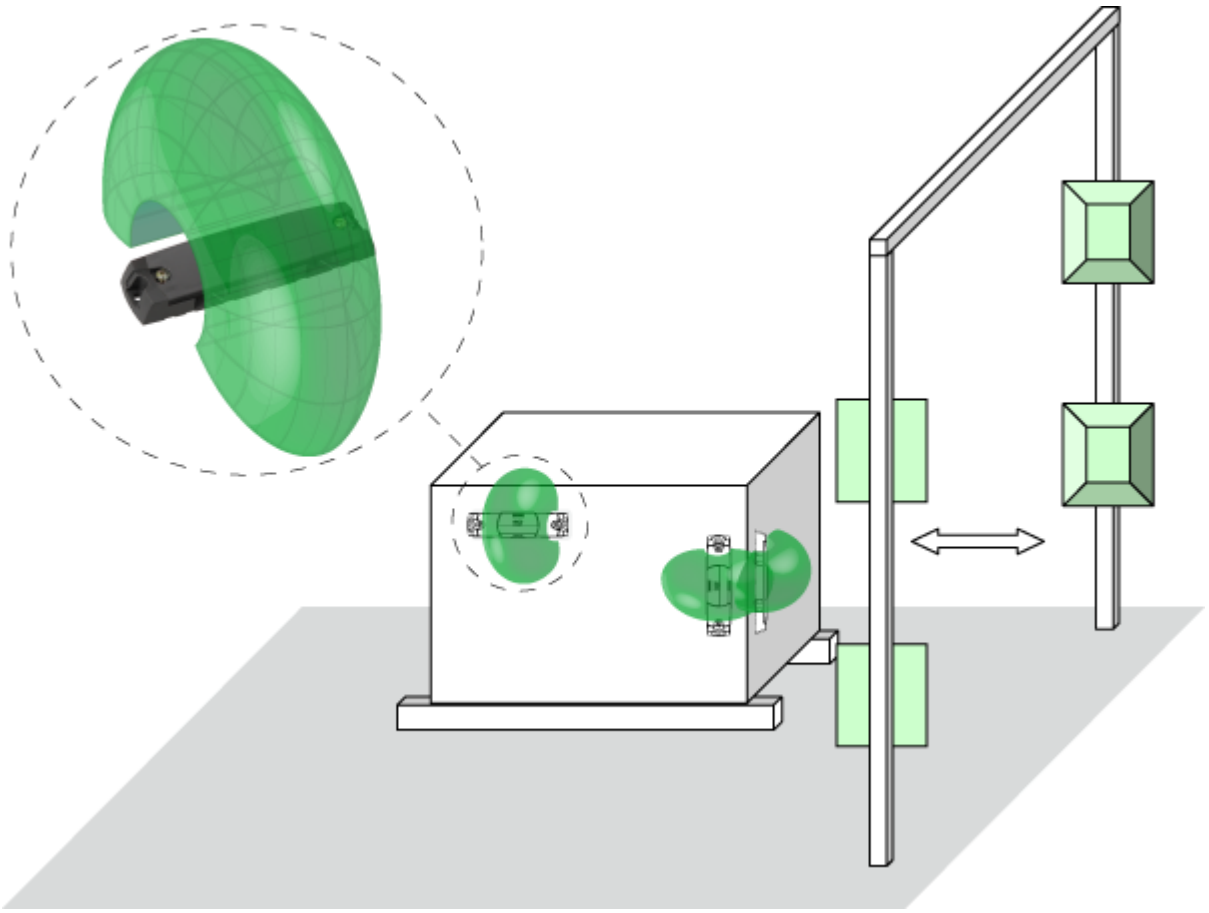


Figure 7-26 Application example for possible orientations of the transponder.

7.6.3.7 Range when mounted on ESD carrier materials

The transponder is generally designed for mounting on non-conductive objects which provide the conditions for the maximum reading ranges The conductive or dissipative surface of ESD materials limits the range depending on the surface resistance. Generally, dissipative materials with a surface resistance of 1 x 10^5 to 1 x 10^{11} ohm and conductive materials with 1 x 10^3 to 1 x 10^5 ohm are available.

Table 7- 15 Limited range with ESD materials

Carrier material	Range
Transponder on electrostatic dissipative materials, dimensions 60°x°40 cm (surface resistance 2 x 10^9 ohm)	approx. 50%
Transponder on electrostatically conductive materials, dimensions 60 x 40 cm (surface resistance 1 x 10^4 ohm) Use of spacers	approx. 12% approx. 25 %

100% range is achieved when mounted in free space with low reflections. With multitag capability, the range may be limited further.

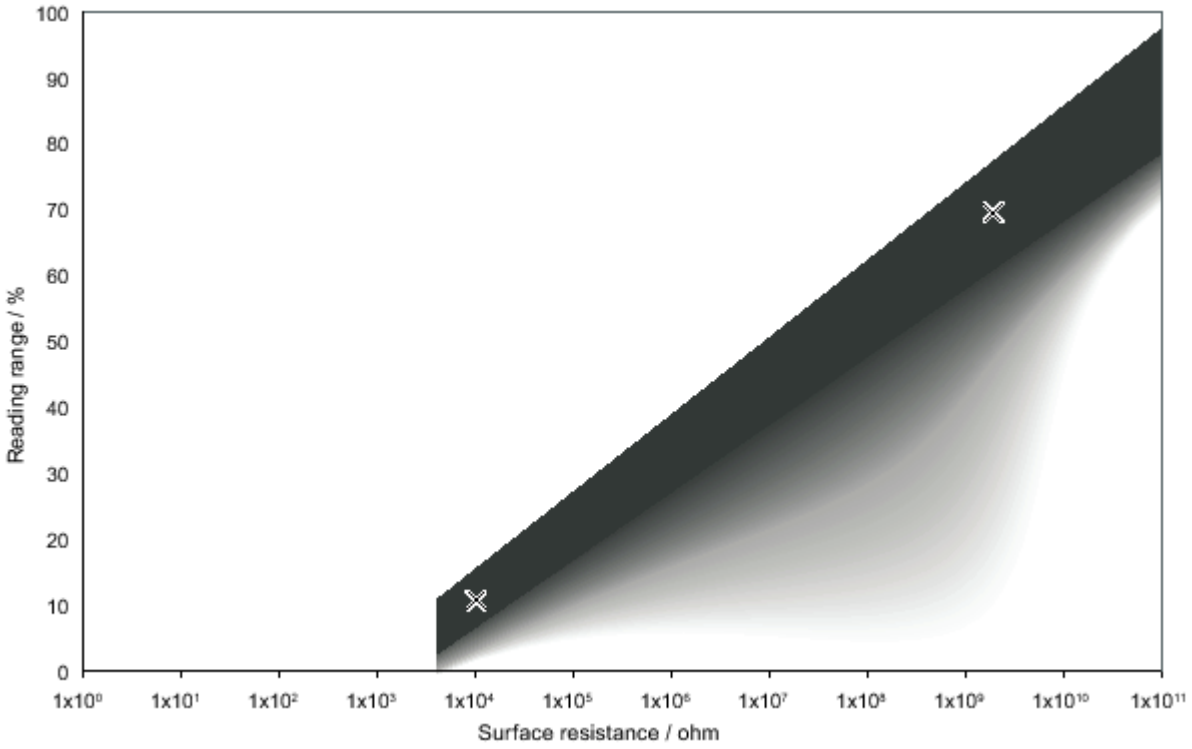


Figure 7-27 Schematic representation of how the range depends on the surface resistance of the ESD material

In the figure above, the two reading points are shown illustrating the range as a percentage dependent on the surface resistance. At the same time a linear dependence between the reading points is to be expected, however with measurement inaccuracies. The darker the hatching, the greater the probability that the reading point is found in the hatched area.

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7.6.3.8 Communication with multiple transponders

The RF600 system is multitag-capable. This means that the reader can detect and write to several transponders almost simultaneously. The minimum distance between the transponders is ≥ 50 mm.

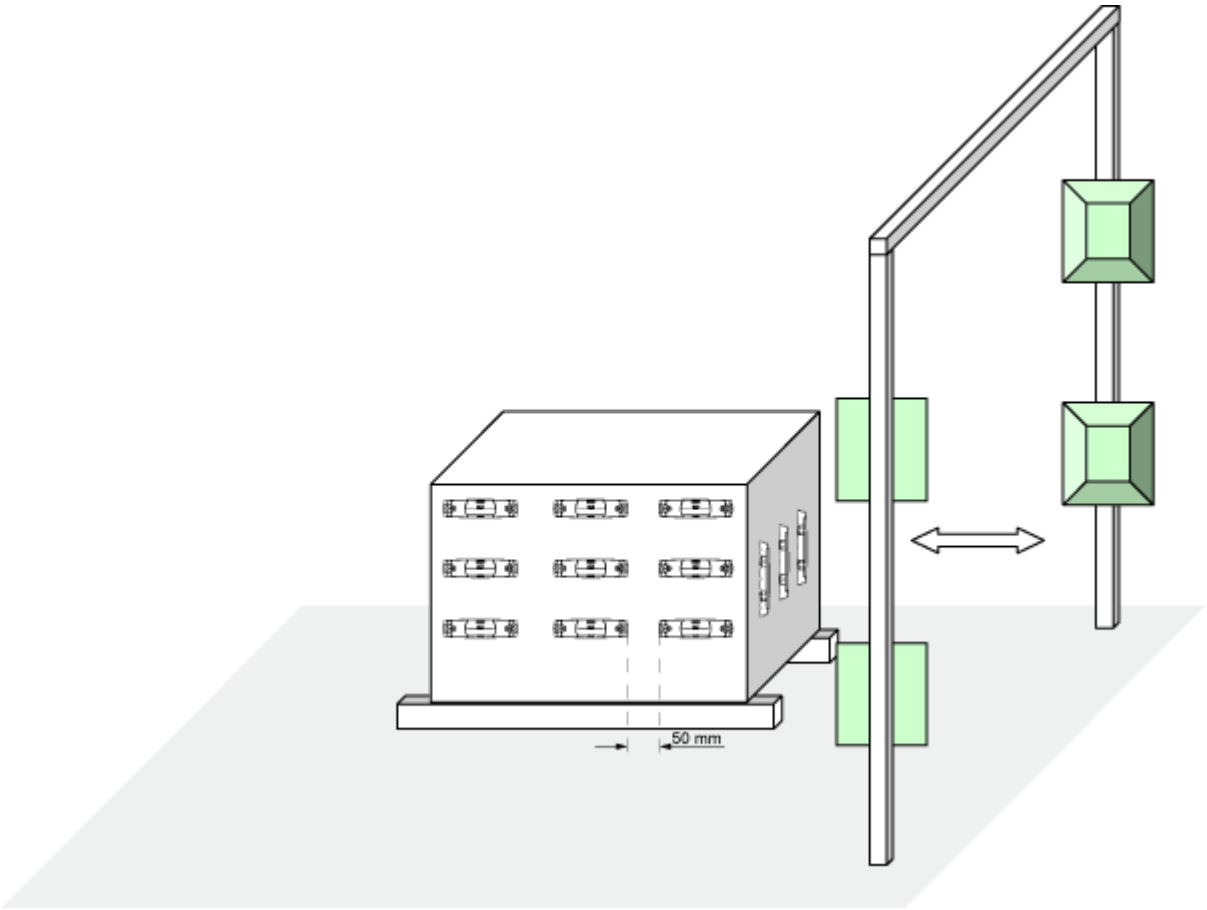

Figure 7-28 Multitag reading

REVIEW

7.6.4 Mounting instructions

NOTICE
Level mounting Please note that both the transponder and the spacer must be mounted on a level surface.

NOTICE
The screw fixing element was tested with the types of screws, spring washers and plain washers indicated below. Depending on the application area, the user must use similar, correspondingly certified screws, spring washers and plain washers (e.g. for the food processing industry).

EJOT screws can be additionally etched and passivated in some areas of the food processing industry, e.g if they made of stainless steel A2. In other areas without special requirements, the screws can be, for example, zinc plated and blue passivated.

Note

In case of high mechanical loads (such as shocks or vibration), the transponder must be fixed onto the spacer by means of screws.

Properties		Description	Graphics
Mounting type	• Transponder	• Screw mounting (e.g. 2 x M4 hexagon socket head cap screws DIN 6912, spring lock and grommet DIN 433) or glued	
	• Transponder on spacer	• Clips or screw on the side of the clip, or 2°x° screws (e.g. EJOT PT ® WN 5411 35x10 VZ crosshead screw/torx)	
	• Spacer	• Screw mounting (e.g.°2 x M4 hexagon socket head cap screws DIN 6912, spring lock and grommet DIN 433) or glued or secured with tape	
Tightening torque		(at room temperature) < 1.2 Nm	

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7.6.5 Memory configuration of the transponder

The memory configuration of the transponder is described in the section SIMATIC memory configuration of the RF600 transponders and labels (Page 336).

7.6.6 Technical Specifications

7.6.6.1 Mechanical data

Property	Description
Dimensions (L x W x H) • Transponder • Spacer	 • 127 x 38 x 6 mm • 157 x 39 x 12 mm
Design	Plastic enclosure (PP; food safe), silicon-free
Housing color	Anthracite
Weight • Transponder • Spacer • Transponder with spacer	 • Approx. 18 g • Approx. 22 g • Approx. 40 g
Mounting on metal	Preferably with spacer

7.6.6.2 Electrical data

Characteristic	Description
Air interface	According to ISO 18 000-6 C
Frequency range	860 ... 960 MHz
Range [1]	max. 8 m
Polarization type	Linear
Energy source	Magnetic energy via antenna, without battery
Multitag capability	Yes, minimum distance between data carriers ≥ 50 mm
[1] Mounting on a flat metal-free carrier with a diameter of at least 300 mm and at room temperature. The information relates to the maximum read range. You will find more information on ranges in the section "Minimum distances and maximum ranges (Page 344)".	

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7.6.6.3 Memory specifications

Characteristic	Description
Type	EPC Class 1 Gen2
Memory organization	EPC code 96/128 bit
User memory	64 byte
Protocol	ISO 18000-6C
Data retention time	10 years
Read cycles	Unlimited
Write cycles	100 000 min.

7.6.6.4 Environmental conditions

Property	Description
Temperature range during operation	-25 °C to +85 °C
Temperature range during storage	-40 °C to +85 °C
Shock Vibration compliant with EN 60721-3-7 Class 7 M3	100 g, 50 g
Torsion and bending load	Not permissible
Degree of protection	IP67

7.6.6.5 Chemical resistance of the transponder RF620T

The following table provides an overview of the chemical resistance of the data memory made of polypropylene.

	Concentration	20 °C	50 °C
Emissions alkaline/containing hydrogen fluoride /carbon dioxide	Low	○○○○	○○○○
Emissions containing hydrochloric acid		○○○○	○○○○
Emissions containing sulphuric acid		○○○○	-
Battery acid	38	○○○○	○○○○
Aluminum acetate, w.		○○○○	○○○○
Aluminum chloride	10	○○○○	○○○○
Aluminum nitrate, w.		○○○○	○○○○
Aluminum salts		○○○○	○○○○
Formic acid	50	○○○○	-
Aminoacetic acid (glycocoll, glycine)	10	○○○○	○○○○
Ammonia gas		○○○○	○○○○
Ammonia	25	○○○○	○○○○
Ammonia, w.	conc.	○○○○	○○○○
	10	○○○○	○○○○
Arsenic acid, w.		○○○○	○○○○
Ascorbic acid, w.		○○○○	○○○○
Petroleum spirit		-	-
Benzene		○○	-
Prussic acid, w.		○○○○	○○○○
Sodium hypochlorite solution	diluted / 20	○○○○	○○
	50	○○	○○
Borax		○○○○	○○○○
Boric acid, w.	10	○○○○	○○○○
Brake fluid		○○○○	○○○○

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	Concentration	20 °C	50 °C
Bromine		-	-
Butane, gas, liquid	techn. pure	○○○○	○○○○
Butyl acetate (acetic acid butyl ester)		○○	-
Calcium chloride, w./ alcoholic		○○○○	○○○
Calcium chloride,		○○○○	○○○○
Calcium nitrate, w.		○○○○	○○○○
	50	○○○○	○○○○
Chlorine		–	–
Chloroacetic acid		○○○○	○○○○
Chloric acid	20	○○○○	-
Chrome baths, tech.		–	–
Chromium salts		○○○○	○○○○
Chromic acid	10	○○○○	○○○○
	20 / 50	○○	○○
Chromic acid, w		○○○○	○○
Chromosulphuric acid	conc.	-	-
Citric acid	10	○○○○	○○○○
Diesel fuel		○○○○	
Diesel oil	100	○○○○	
Diglycole acid	30	○○○○	○○○○
Iron salts, w.	k. g.	○○○○	○○○○
Vinegar		○○○○	○○○○
Acetic acid	5 / 50	○○○○	○○○○
Ethanol	50 / 96	○○○○	○○○○
Ethyl alcohol	96 / 40	○○○○	○○○○
Fluoride		○○○○	○○○○
Formaldehyde	10	○○○○	○○○○
	40	○○○○	○○○
Formaldehyde solution	30	○○○○	○○○○
Glycerin	any	○○○○	○○○○
Glycol		○○○○	○○○○
Uric acid		○○○○	
HD oil, motor oil, without aromatic compounds		○○○○	
Fuel oil		○○○○	
Isopropanol	techn. pure	○○○○	○○○○
Potassium hydroxide, w.		○○○○	○○○○
Potassium hydroxide	10 / 50	○○○○	○○○○
Silicic acid	any	○○○○	○○○○
Common salt		○○○○	○○○○
Carbonic acid	saturated	○○○○	○○○○
Lysol		○○○○	○○

REVIEW

	Concentration	20 °C	50 °C
Magnesium salts, w.	k. g.	○○○○	○○○○
Magnesium salts	any	○○○○	○○○○
Machine oil	100	○○○○	
Sea water		○○○○	○○○○
Methanol		○○○○	○○○○
Methyl alcohol, w.	50	○○○○	○○○○
Lactic acid, w.		○○○○	○○○○
Lactic acid	3 / 85	○○○○	○○○
	80	○○○○	○○○○
Engine oil		○○○○	
Sodium carbonate, w. (soda)	k. g.	○○○○	○○○○
Sodium carbonate		○○○○	○○○○
Sodium chloride, w.	k. g.	○○○○	○○○○
Sodium hydroxide, w.		○○○○	○○○○
Sodium hydroxide solution, w.		○○○○	○○○○
Sodium hydroxide solution	30 / 45 / 60	○○○○	○○○○
Nickel salts, w.	k. g.	○○○○	○○○○
Nickel salts	saturated	○○○○	○○○○
Nitrobenzol		○○○	○○
Oxalic acid		○○○○	○○○○
Petroleum	techn. pure	○○○○	
Phosphoric acid	1-5 / 30	○○○○	○○○○
	85	○○○○	○○○
Phosphoric acid, w	20	○○○○	○○○○
Propane	liquid	○○○○	
Propane	gaseous	○○	
Mercury	pure	○○○○	○○○○
Crude oil	100	○○○○	○○
Ammonium chloride	100	○○○○	○○○○
Ammonium chloride, w.		○○○○	○○○○
Nitric acid		-	-
	50	○○	
	1-10	○○○○	○○○○
Hydrochloric acid	1-5 / 20	○○○○	○○○○
	35	○○○○	○○○
	conc.	○○○○	○○○○
Sulphur dioxide	Low	○○○○	○○○○
	moist	○○○○	○○
	liquid	-	-
Sulphuric acid	1-6 / 40 / 80	○○○○	○○○○
	20	○○○○	○○○
	60	○○○○	○○

REVIEW

	Concentration	20 °C	50 °C
	95	○○	-
	fuming	-	-
Hydrogen sulphide	Low/saturated	○○○○	○○○○
Detergent	High	○○○○	○○○○
Water		○○○○	○○○○
Hydrogen	techn. pure	○○○○	○○○○
Plasticizer		○○○○	○○

Abbreviations	
○○○○	Resistant
○○○	Virtually resistant
○○	Limited resistance
○	Less resistant
–	Not resistant
w.	Aqueous solution
k. g.	Cold saturated

REVIEW

7.6.7 Certificates and approvals

Table 7- 16 6GT2810-2HC00 - RF620T UHF container tag

Certificate	Description
CE	CE Approval to R&TTE

Table 7- 17 6GT2810-2HC80 - RF620T UHF container tag

Standard	
FCC Federal Communications Commission	Passive labels or transponders comply with the valid regulations; certification is not required.
c UL us	This product is UL-certified for the USA and Canada. It meets the following safety standard(s): • UL508 - Industrial Control Equipment • CSA C22.2 No. 142 - Process Control Equipment • UL Report E 120869

7.6.8 Dimension drawing

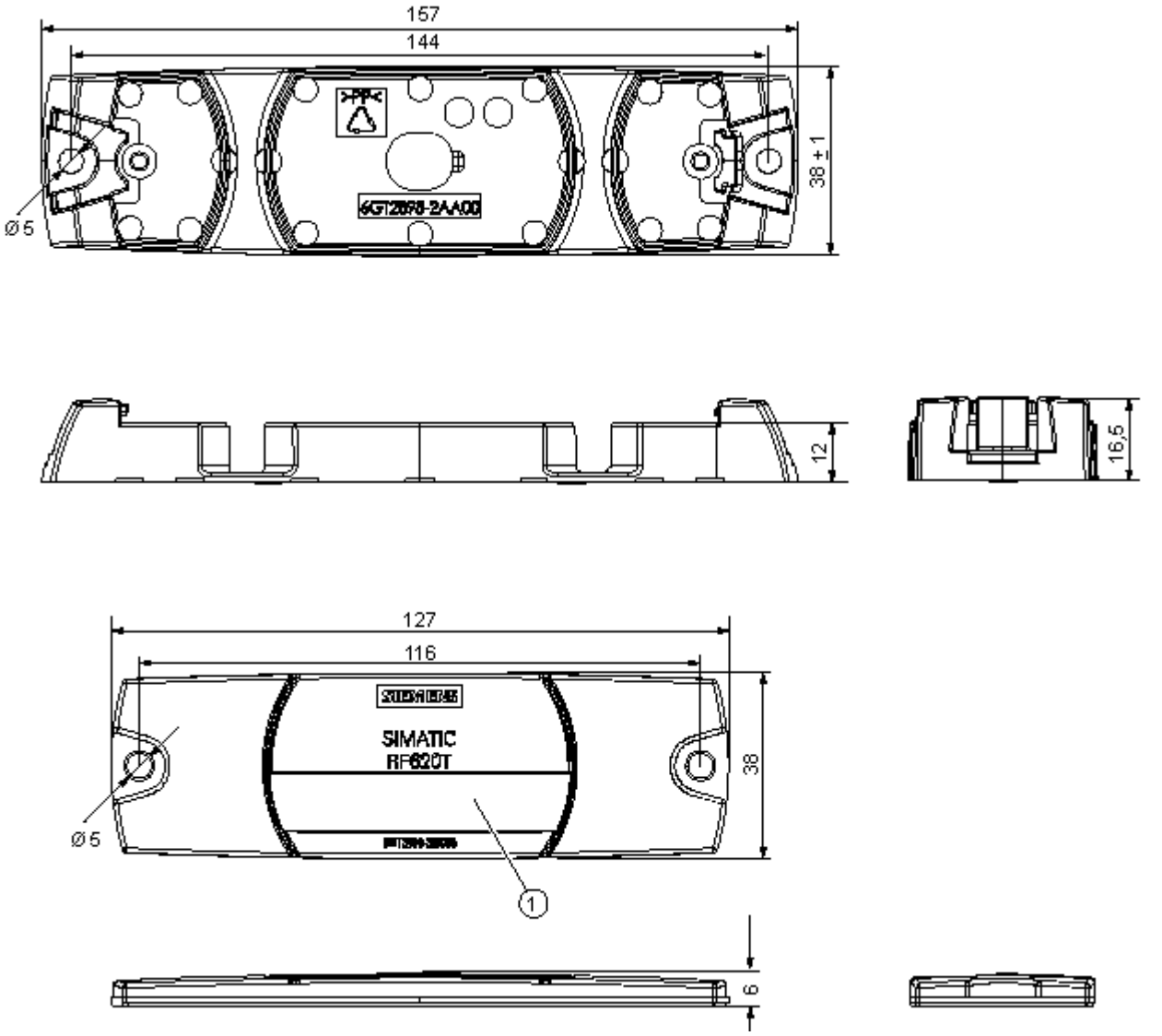


Figure 7-29 SIMATIC RF620T UHF container tag

Units of measurement: All dimensions in mm

Tolerances, unless indicated otherwise, are +-0.5 mm.

① Labeling area, see Section Characteristics (Page 375)

REVIEW

7.7 SIMATIC RF622T

7.8 SIMATIC RF625T

7.8.1 Characteristics

The SIMATIC RF625T transponder is a passive, maintenance-free data carrier with a round design. It operates based on the UHF Class 1 Gen 2 technology and is used to save the "Electronic Product Code" (EPC) of 96 bits/128 bits. The transponder also has a 512-bit user memory.

The areas of application are industrial asset management, RF identification of tools, containers and metallic equipment.

The Disk Tag is small and rugged and suitable for industrial applications with degree of protection IP68. It is highly resistant to oil, grease and cleaning agents.

Ideally, the SIMATIC RF625T is mounted directly on a flat metal surface of at least 150 mm diameter where it achieves a typical sensing distance of 1.5 m.

SIMATIC RF625T	Features		
	Area of application	Identification tasks in rugged industrial environments	
	Frequency variants	Europe	USA/Canada
		865 MHz ... 868 MHz	902 MHz ... 928 MHz
	Air interface	according to ISO°18000-6C	
	Polarization	Linear	
	Memory	EPC 96 bit/128 bit Add-on-memory 64 bytes	
	Range [1]	max. 1.5 m	
	Mounting	for direct mounting on conductive materials (preferably metal).	
[1] The information relates to the maximum read range. You will find more information on ranges in the section "Minimum distances and maximum ranges (Page 344)".			

REVIEW

7.8.2 Ordering data

Ordering data	Article number
SIMATIC RF625T (Europe), frequency range 865 MHz ... 868 MHz	6GT2810-2EE00
SIMATIC RF625T (USA / Canada), frequency range 902 MHz ... 928 MHz	6GT2810-2EE01

7.8.3 Planning the use

7.8.3.1 Optimum antenna/transponder positioning with planar mounting of the transponder on metal

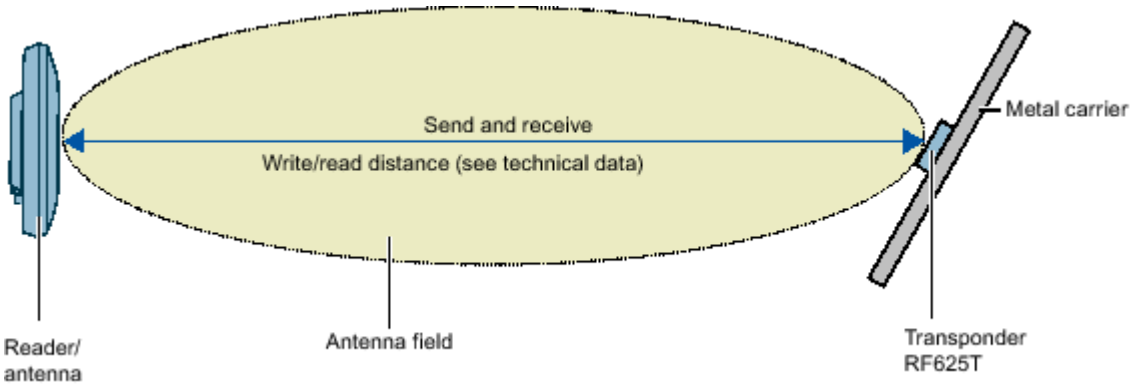


Figure 7-30 Example of optimum reader/antenna transponder positioning

The graphic shows an example of optimum positioning of the transponder relative to the reader or the antenna. This positioning is regardless of whether you are working with the internal reader antenna or with one of the external RF600 antennas.

REVIEW

7.8.3.2 Range when mounted on flat metallic carrier plates

The transponder generally has linear polarization. The polarization axis runs as shown in the diagram below. If the tag is mounted in the center of a flat metal plate, which is either approximately square or circular, it can be aligned in any direction since the transmitting and receiving RF660A antennas operate with circular polarization.

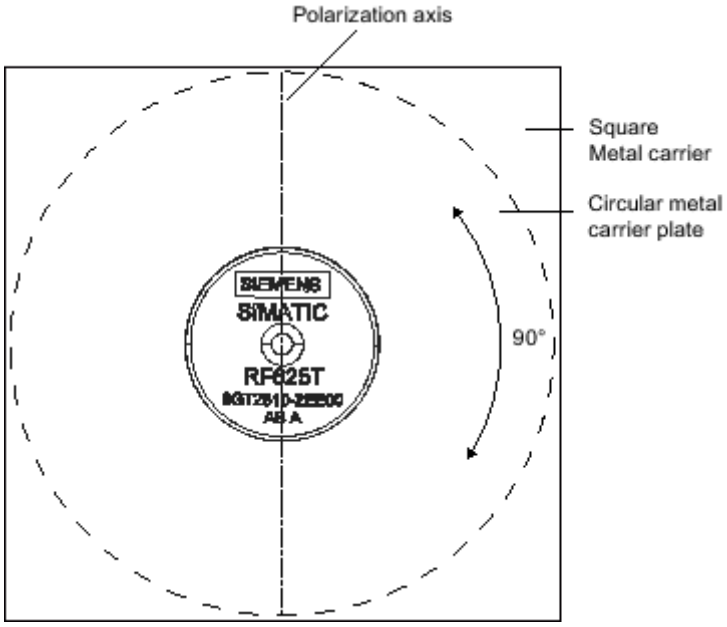


Figure 7-31 Optimum positioning of the transponder on a (square or circular) metal surface

Table 7- 18 Range on flat metallic carriers

Carrier material	Range
Metal plate of at least Ø 150 mm	100 %
Metal plate Ø 120 mm	approx. 70%
Metal plate Ø 85 mm	approx. 60%
Metal plate Ø 65 mm	approx. 60%

On rectangular carrier plates, the range depends on the mounting orientation of the transponder

You will find more detailed information on the range in the section "Minimum distances and maximum ranges (Page 344)".

REVIEW

7.8.3.3 Range when mounted on non-metallic carrier materials

The transponder is generally designed for mounting on metallic objects which provide the conditions for the maximum reading ranges

Table 7- 19 Range with non-metallic carriers

Carrier material	Range
Transponder on wooden carrier	approx. 60%
Transponder on plastic carrier	approx. 65 %
Transponder on plastic mineral water bottle	approx. 70%
Transponder without base	approx. 50 %

The maximum range of 100% is achieved by mounting the transponder in a free space with low reflections on a flat metal carrier with a diameter of at least 150 mm.

You will find more detailed information on the range in the section "Minimum distances and maximum ranges (Page 344)".

7.8.3.4 Influence of conducting walls on the range

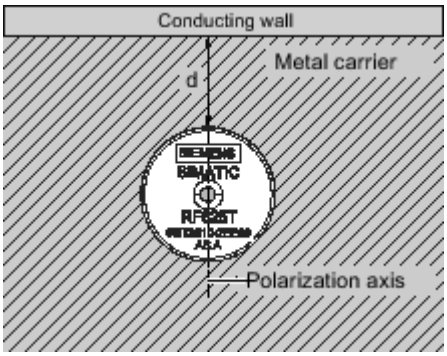
If there are conducting walls or restrictions in the vicinity that could affect the wireless field, a distance of approx. 10 cm is recommended. In principle, walls have least influence if the polarization axis is orthogonal to the wall.

REVIEW

Range: One conducting wall

Influence on range when positioned against one conducting wall

View from above

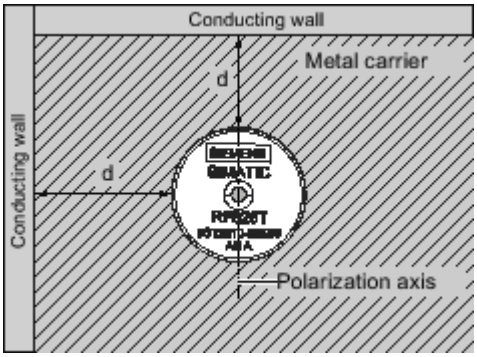


Distance d	20 mm	50 mm	100 mm	
Range	approx. 100%	approx. 100%	approx. 100%	Wall height 20 mm
	approx. 100%	approx. 100%	approx. 100%	Wall height 50 mm
	approx. 80%	approx. 100%	approx. 100%	Wall height 100 mm

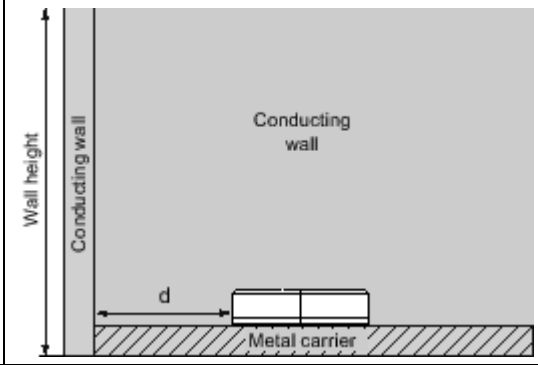
Range: Two conducting walls

Influence on the range when positioned against two conducting walls

View from above



Side view



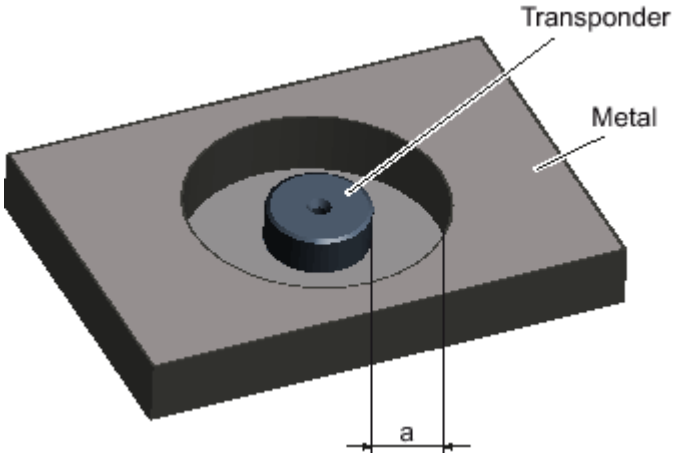
Distance d	20 mm	50 mm	100 mm	
Range	approx. 70%	approx. 75 %	approx. 100%	Wall height 20 mm
	approx. 70%	approx. 80%	approx. 100%	Wall height 50 mm
	approx. 70%	approx. 40%	approx. 50 %	Wall height 100 mm

The values specified in the tables above are guide values.

REVIEW

7.8.3.5 Mounting in metal

It is possible to mount the transponder in metal. If there is not enough clearance to the surrounding metal, this reduces the reading range.



Clearance (all-round)	Reading range [1]
a = 5 mm	Approx. 50 %
a = 10 mm	Approx. 70%

[1] The read range information applies when the transponder is mounted on a metallic carrier with a diameter of at least 150 mm.

Figure 7-32 Flush-mounting of RF625T in metal

REVIEW

7.8.3.6 Directional radiation pattern of the transponder

Directional diagram in the ETSI frequency band (Europe)

The directional diagram is shown for nominal alignment and a center frequency of 866.3 MHz. The nominal transponder alignment is achieved when the transponder is viewed as shown in the following figure.

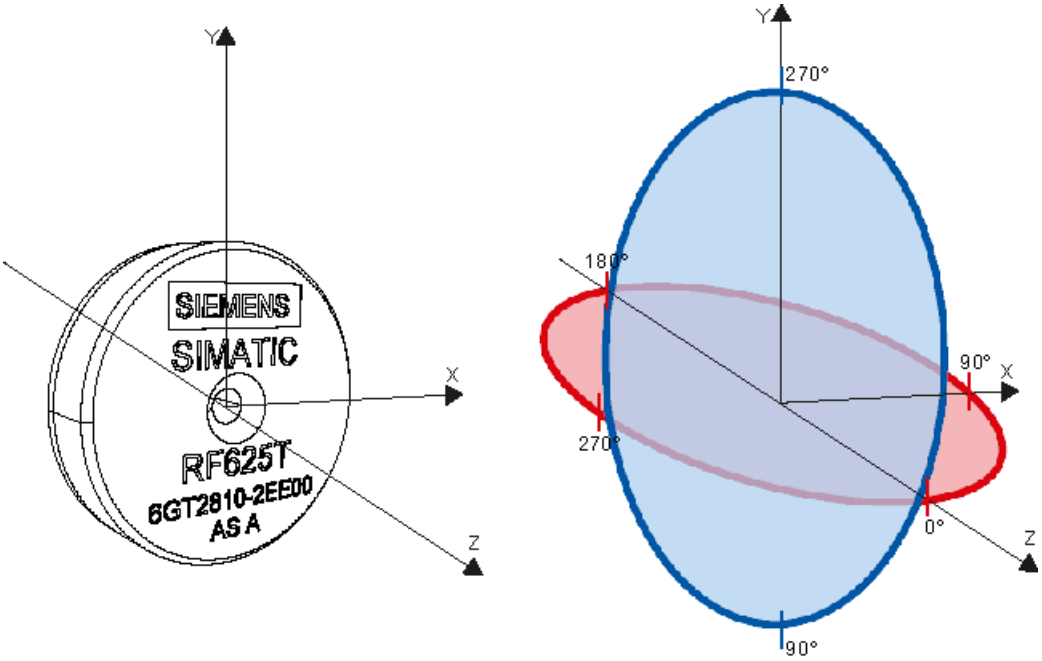


Figure 7-33 Reference system of the RF625T

Ideally, align the data carrier parallel with the transmitting antenna or the reader. If the data carrier including the (metallic) carrier plate is tilted, the reading range will be reduced. The following diagrams show the effects on the reading range depending on the carrier material and the angle of inclination of the transponder.

REVIEW

Directional characteristics of the transponder when mounted on a metallic carrier

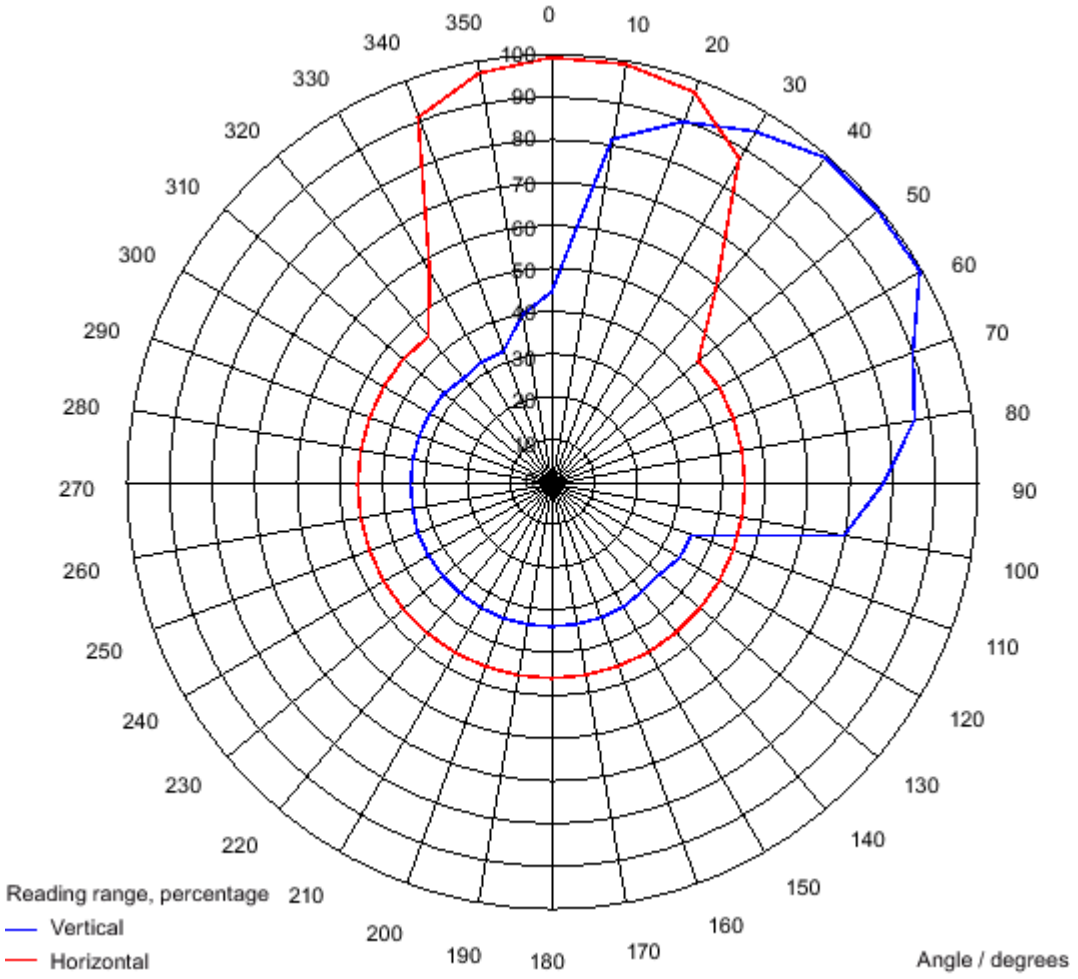


Figure 7-34 Directional characteristics of the RF625T on a metallic carrier depending on the angle of inclination in a vertical or horizontal direction

REVIEW

Directional characteristics of the transponder when mounted on a non-metallic carrier

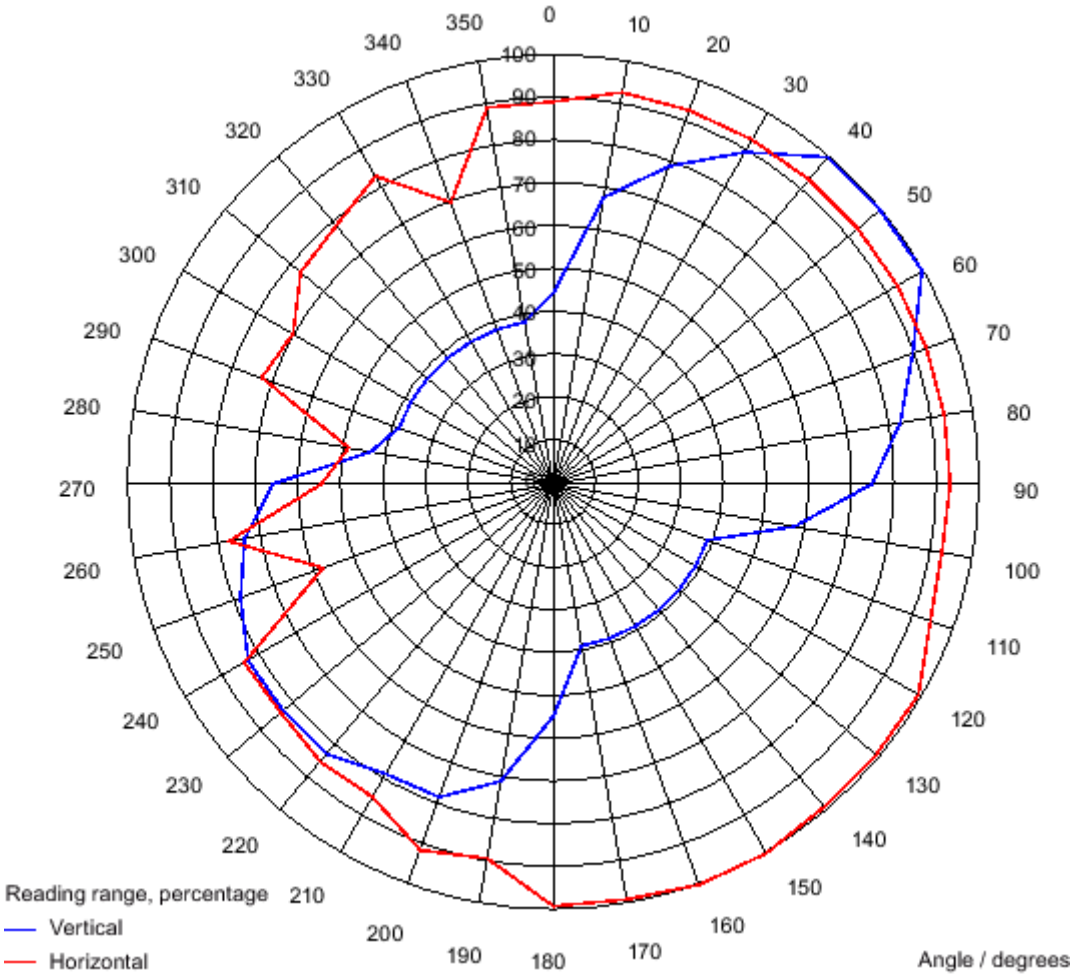


Figure 7-35 Directional characteristics of the RF625T on a non-metallic carrier depending on the angle of inclination in a vertical or horizontal direction

REVIEW

7.8.4 Mounting instructions

Properties	Description
Type of installation	Secured with screw ①, (M3 counter-sunk head screw)
Tightening torque (at room temperature)	≤ 1.0 Nm

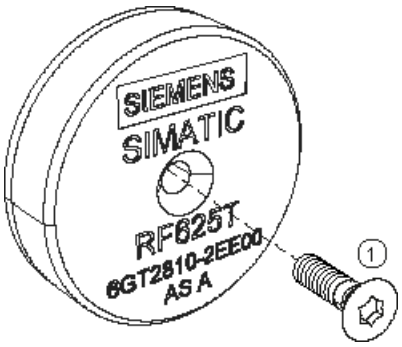


Figure 7-36 Screw mounting

Note

Make sure that the mounting surface is even when mounting the transponder.

REVIEW

7.8.5 Memory configuration of the transponder

The memory configuration of the transponder is described in the section SIMATIC memory configuration of the RF600 transponders and labels (Page 336).

7.8.6 Technical Specifications

7.8.6.1 Mechanical data

Property	Description
Dimensions (D x H)	30 (+0.5) mm x 8 (+0.5) mm
Design	Plastic housing (PA6.6), silicone-free
Weight	Approx. 6 g
Mounting on metal	directly on metal without spacing

7.8.6.2 Electrical data

Characteristic	Description	
	Europe	USA/Canada
Air interface	According to ISO 18 000-6 C	According to ISO 18 000-6 C
Frequency range	865 ... 868 MHz	902 ... 928 MHz [1]
Necessary transmit power	2 W (ERP)	4 W (EIRP)
Range [2]	max. 1.5 m	max. 1.5 m
Polarization type	Linear	Linear
Energy source	Field energy via antenna, without battery	Field energy via antenna, without battery
Multitag capability	yes, minimum distance between data carriers ≥ 50 mm [3]	yes, minimum distance between data carriers ≥ 50 mm [3]

[1] Reduction of range to about 70% at the band limits 902 MHz or 928 MHz; acquisition is guaranteed at 915 MHz due to frequency hopping procedure.

[2] Mounting on a flat metal surface with a diameter of at least 150 mm and at room temperature. The information relates to the maximum read range. You will find more information on ranges in the section "Minimum distances and maximum ranges (Page 344)".

[3] When these minimum distances are not reached, there is a reduction in the maximum possible read and write distances of the transponder.

7.8.6.3 Information on memory

Property	Description	
Type	EPC Class 1 Gen 2	
Memory organization	EPC code	96 bits/128 bits
	User memory	64 bytes
	TID	96 bits
	Reserved (passwords)	64 bits
Protocol	ISO 18000-6C	
Data retention time	10 years	
Read cycles	Unlimited	
Write cycles	Minimum 100 000, at +22 °C	

REVIEW

7.8.6.4 Environmental conditions

Property	Description
Temperature range during operation	-25 °C … +85 °C
Temperature range during storage	-40 °C … +125 °C
Shock resistant to EN 60068-2-27 Vibration to EN 60068-2-6	50 g, [1] 20 g, [1]
Torsion and bending load	Not permissible

Property	Description
Degree of protection	IP68 according to EN 60529: (45 minutes. immersion in water; water depth 1 m from top edge of housing at +20 °C)
	IPx9K to EN 60529: • Steam blaster nozzle distance 150 mm • 10 ... 15 l water per minute • Pressure 100 bar • Temperature 75 °C • Test time 30 seconds
MTBF	2 x 10 [5] hours

[1)] The values for shock and vibration are maximum values and must not be applied continuously.

7.8.6.5 Chemical resistance of the RF625T transponder

The following table provides an overview of the chemical resistance of the data memory made of polyamide 6.6. It must be emphasized that the plastic housing is extremely resistant to chemicals in automobiles (e.g.: oil, grease, diesel fuel, gasoline) which are not listed separately.

REVIEW

Substance	Concentration
Mineral lubricants	■
Aliphatic hydrocarbons	■
Aromatic hydrocarbons	■
Petroleum spirit	■
Weak mineral acids	◪
Strong mineral acids	□
Weak organic acids	◪
Strong organic acids	□
Oxidizing acids	□
Weak alkalis	◪
Strong alkalis	□
Trichloroethylene	■
Perchloroethylene	■
Acetone	■
Alcohols	■
Hot water (hydrolysis resistance)	◪
Abbreviations:	
■	Resistant
◪	Limited resistance
□	Not resistant

7.8.7 Certificates and approvals

Table 7- 20 SIMATIC RF625T UHF Disk Tag (Europe), 6GT2810-2EE00

Certificate	Description
CE	Conforms to R&TTE directive

Table 7- 21 SIMATIC RF625T UHF Disk Tag (USA/Canada), 6GT2810-2EE01

Standard	
FCC Federal Communications Commission	Passive labels or transponders comply with the valid regulations; certification is not required
c UL us	This product is UL-certified for the USA and Canada. It meets the following safety standard(s): • UL508 - Industrial Control Equipment • CSA C22.2 No. 142 - Process Control Equipment • UL Report E 120869

REVIEW

7.8.8 Dimension drawing

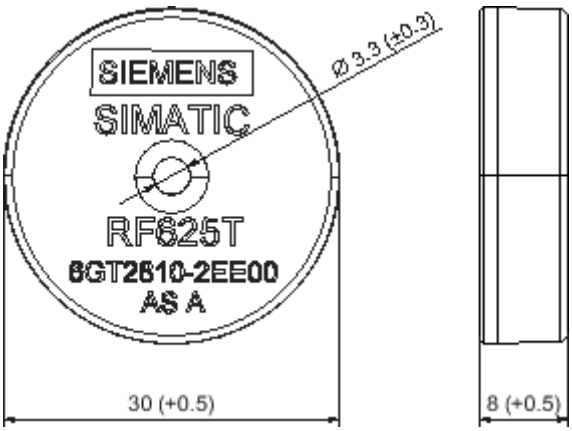


Figure 7-37 SIMATIC RF625T UHF Disk Tag

Units of measurement: All dimensions in mm

7.9 SIMATIC RF630T

7.9.1 Characteristics

The SIMATIC RF630T transponder is a passive (i.e. battery-free) and maintenance-free, cylindrical data carrier. It operates based on the UHF Class 1 Gen 2 technology and is used to save the "Electronic Product Code" (EPC) of 96 bits/240 bits. The transponder also has a 512-bit user memory.

Areas of application include the mounting of metallic components (e.g. engine assembly in the automobile industry) as well as RF identification of tools, containers and metal frames.

The RF630T is small and rugged and suitable for industrial applications with IP68/IPX9K degree of protection. It is highly resistant to oil, grease and cleaning agents.

The SIMATIC RF630T is mounted directly onto metal surfaces to ensure optimum functioning and its typical detection range is 1.2 m.

REVIEW

SIMATIC RF630T	Features		
	Area of application	Identification tasks in rugged industrial environments	
	Frequency variants	Europe	USA/Canada
		868 MHz	915 MHz
	Air interface	according to ISO°18000-6C	
	Polarization	Linear	
	Memory	EPC 96 bit/240 bit Add-on-memory 64 bytes	
	Range [1]	max. 1.2 m	
	Mounting	for direct mounting on conductive materials (preferably metal).	

[1] The information relates to the maximum read range. You will find more information on ranges in the section "Minimum distances and maximum ranges (Page 344)".

7.9.2 Ordering data

Ordering data	Article number
SIMATIC RF630T (Europe) • For attaching to metal surfaces • Frequency 865 MHz to 868 MHz	6GT2810-2EC00
SIMATIC RF630T (USA / Canada) • For attaching to metal surfaces • Frequency 902 MHz to 928 MHz	6GT2810-2EC10

7.9.3 Planning application

7.9.3.1 Optimum antenna/transponder positioning with plane mounting of the transponder on metal

The maximum reading range is achieved when the reader antenna is positioned at right angles to the mounting surface. In the case of parallel mounting directly above the transponder, detection is not possible.

REVIEW

Positioning of the RF660A antenna with the RF630R/RF670R/RF680R reader

The RF630R, RF670R and RF680R readers can operate with an RF660A antenna which can be positioned as shown.

RF630T application example

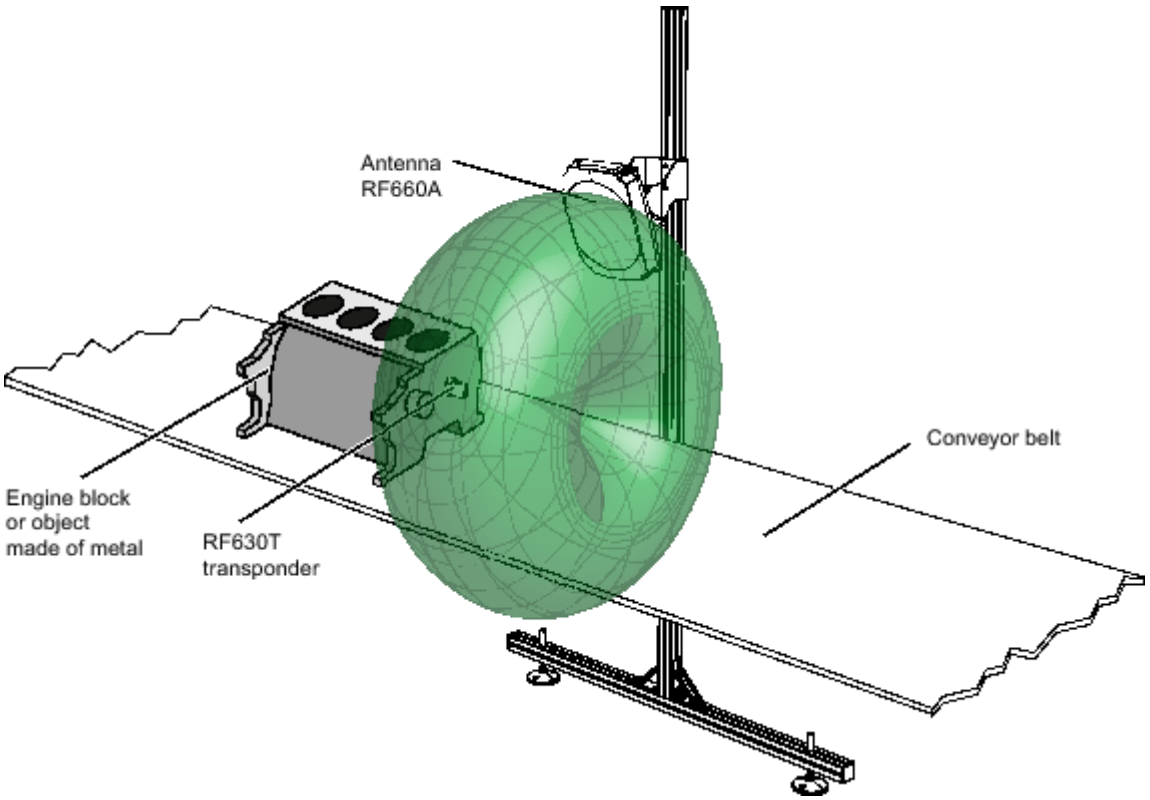


Figure 7-38 RF630T application example

REVIEW

Positioning of two RF660A antennas

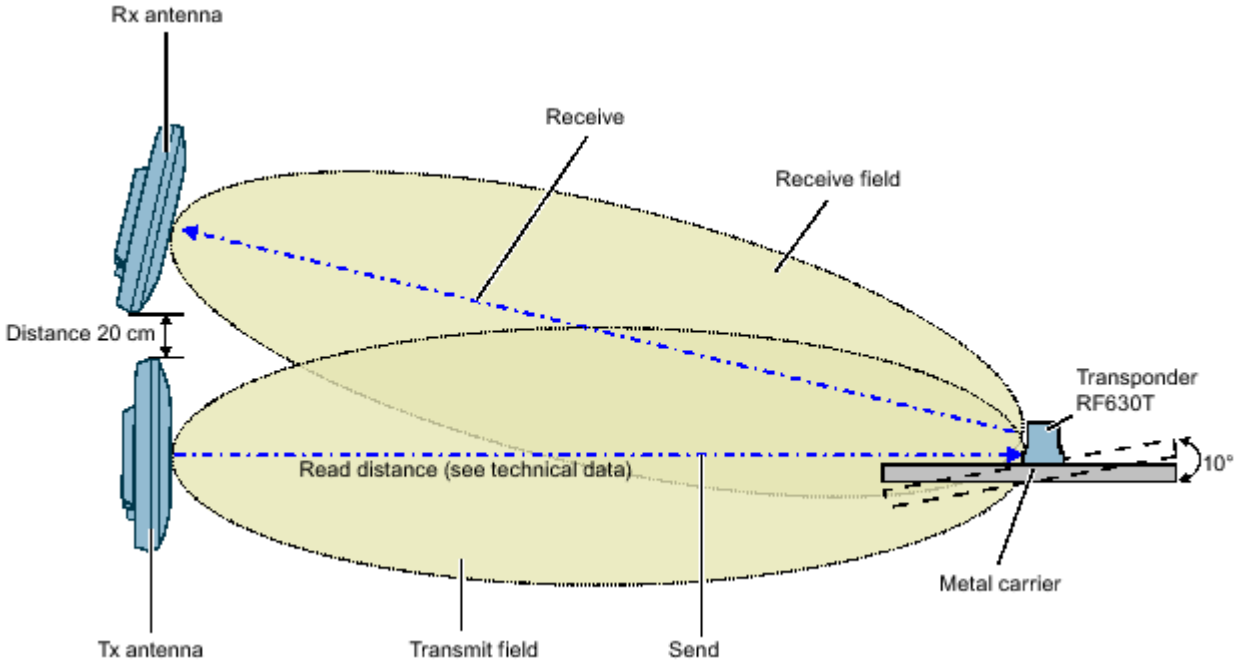


Figure 7-39 Example of optimum antenna/transponder positioning

Depending on the design of the metal bracket (surface parallel to the transmitting antenna), an angle of 10° will have a favorable effect.

REVIEW

Positioning of the RF620R/RF685R reader

The RF620R reader with an integrated circular polarized antenna or the RF685R reader can be placed in the same position relative to the RF630T transponder as the RF660A antennas.

Please note the different reading ranges for the RF600 readers in the section Electrical data (Page 414)

7.9.3.2 Range when mounted on flat metallic carrier plates

The transponder generally has linear polarization. The polarization axis runs as shown in the diagram below. If the tag is mounted in the center of a flat metal plate, which is either approximately square or circular, it can be aligned in any direction since the transmitting and receiving RF660A antennas operate with circular polarization.

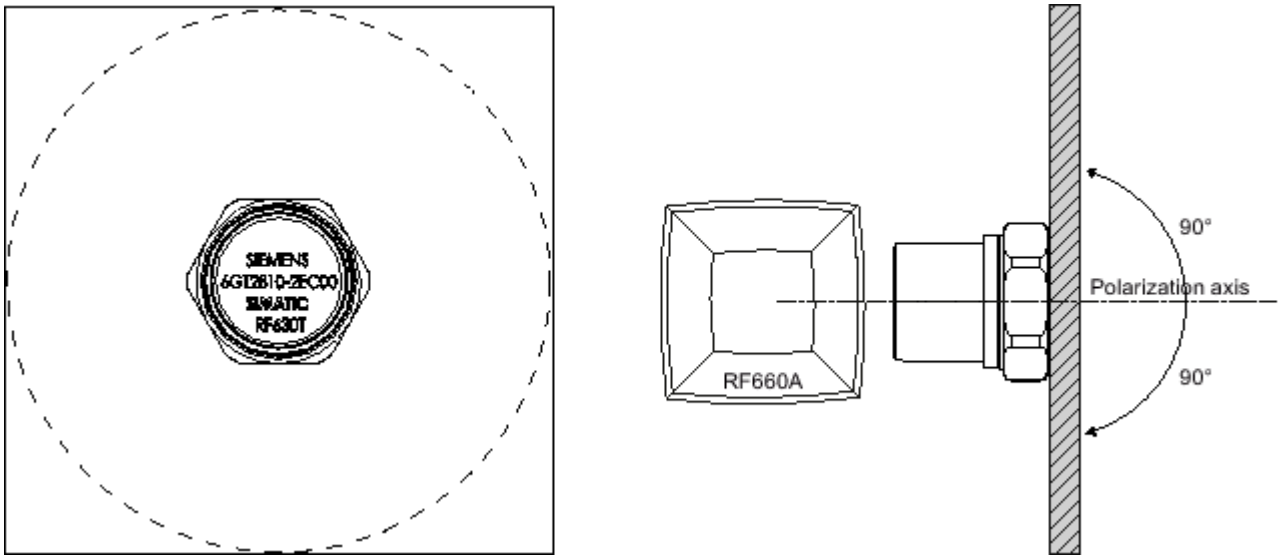


Figure 7-40 Optimum positioning of the transponder on a (square or circular) metal surface

Table 7- 22 Range on flat metallic carriers

Carrier material	Range
Metal plate of at least Ø 300 mm	100 %
Metal plate Ø 150 mm	approx. 75 %
Metal plate Ø 120 mm	approx. 50 %
Metal plate Ø 85 mm	approx. 40%

On rectangular carrier plates, the range depends on the mounting orientation of the transponder

You will find more detailed information on the range in the section "Minimum distances and maximum ranges (Page 344)".

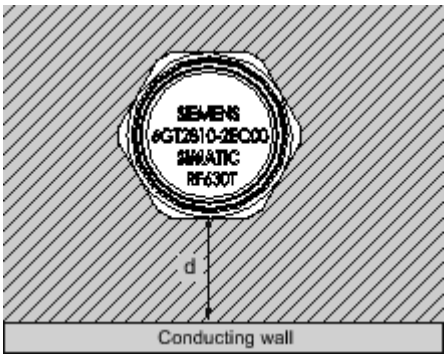
7.9.3.3 Influence of conducting walls on the range

If there are conducting walls or restrictions in the vicinity that could affect the wireless field, a distance of approx. 10 cm is recommended. In principle, walls have least influence if the polarization axis is vertical to the conducting wall.

REVIEW

Range: One conducting wall

Influence on range when positioned against one conducting wall

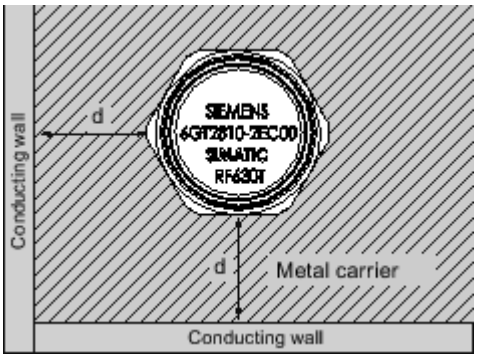


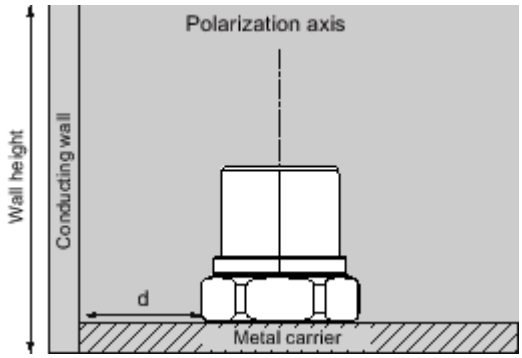
View from above

Distance d	20 mm	50 mm	100 mm	
Range	approx. 40%	approx. 40%	approx. 90 %	Wall height 20 mm
	approx. 40%	approx. 90 %	approx. 90 %	Wall height 50 mm
	approx. 40%	approx. 40%	approx. 90 %	Wall height 100 mm

Range: Two conducting walls

Influence on the range when positioned against two conducting walls





Side view

Distance d	20 mm	50 mm	100 mm	
Range	approx. 90 %	approx. 90 %	approx. 90 %	Wall height 20 mm
	approx. 25 %	approx. 90 %	approx. 90 %	Wall height 50 mm
	approx. 25 %	approx. 90 %	approx. 90 %	Wall height 100 mm

The values specified in the tables above are guide values.

REVIEW

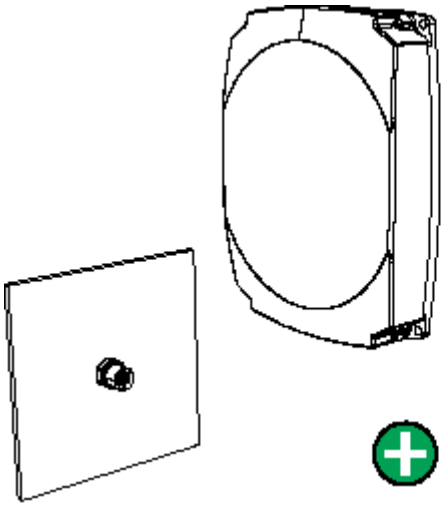
7.9.3.4 Directional radiation pattern of the transponder

Preferably, align the data carrier orthogonal to the transmitting antenna. If, however, the tag including the metallic carrier plate is tilted, the reading range will be reduced.

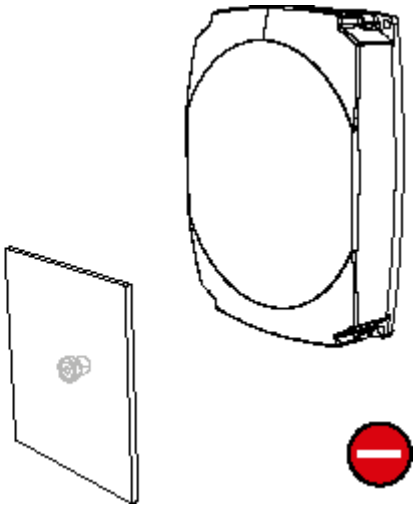
Note

Incorrect alignment of the transponder

When you align the transponder in parallel with the transmitting antenna, it cannot be read!

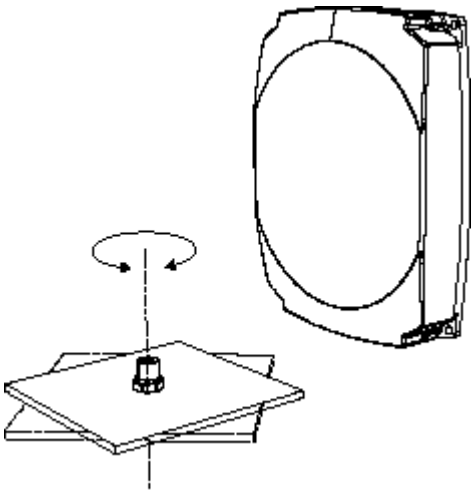


Optimum alignment of the transponder to the transmitting antenna



Incorrect alignment of the transponder to the transmitting antenna

Rotation about the polarization axis



If the transponder mounting surface is circular there is almost no change in the reading range.

REVIEW

Rotation of the mounting plane

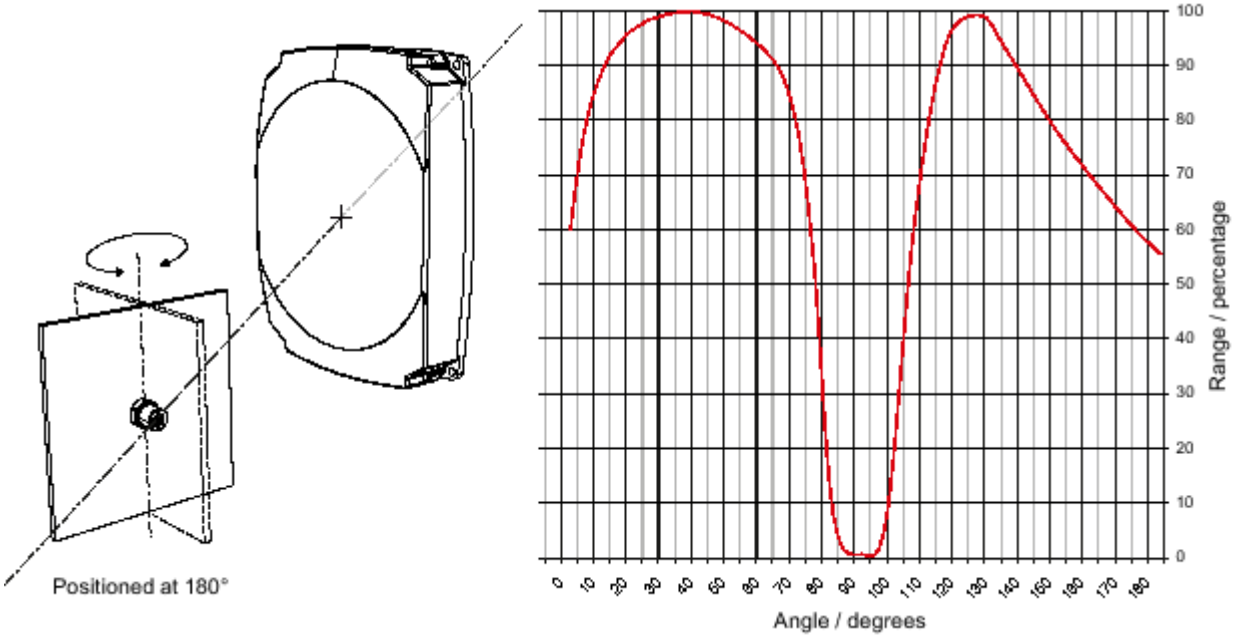


Figure 7-41 Characteristics of the transponder on rotation of the mounting plane

REVIEW

7.9.4 Mounting instructions

Properties	Description
Type of installation	M6 bolt fixing, spanner size 19 mm
Tightening torque	(at room temperature) ≤ 6 Nm

Note

Make sure that the mounting surface is even when mounting the transponder. Electrical contact between the mounting surface and the transponder is necessary.

Without a metal surface the transponder does not function.

7.9.5 Memory configuration of the transponder

The memory configuration of the transponder is described in the section SIMATIC memory configuration of the RF600 transponders and labels (Page 336).

7.9.6 Technical specifications

7.9.6.1 Mechanical data

Property	Description
Dimensions (D x H)	21 mm x 21 mm (without thread), tolerance 1 mm spanner size 19 mm
Design	Plastic enclosure: PA 6.6 GF, silicone-free Thread: Stainless steel
Weight	approx. 22 g
Installation	directly on metal without spacing

7.9.6.2 Electrical data

Characteristic	Description	
	Europe	USA/Canada
Air interface	According to ISO 18 000-6 C	According to ISO 18 000-6 C
Frequency range	865 ... 868 MHz	902 ... 928 MHz [1]
Necessary transmit power	2 W (ERP)	4 W (EIRP)
Range [2]	max. 1.5 m	max. 1.5 m
Polarization type	Linear	Linear
Energy source	Field energy via antenna, without battery	Field energy via antenna, without battery
Multitag capability	yes, minimum distance between data carriers ≥ 50 mm [3]	yes, minimum distance between data carriers ≥ 50 mm [3]

[1] Reduction of range to about 70% at the band limits 902 MHz or 928 MHz; detection is guaranteed at 915 MHz due to frequency hopping procedure.

[2] Mounting on a flat metal surface with a diameter of at least 300 mm and at room temperature. The information relates to the maximum read range. You will find more information on ranges in the section "Minimum distances and maximum ranges (Page 344)".

[3] When these minimum distances are not reached, there is a reduction in the maximum possible read and write distances of the transponder.

7.9.6.3 Memory specifications

Property	Description	
Type	EPC Class 1 Gen 2	
Memory organization	EPC code	96 bits/240 bits
	User memory	64 bytes
	TID	64 bits
	Reserved (passwords)	64 bits
Protocol	ISO 18000-6C	
Data retention time	10 years	

REVIEW

Property	Description
Read cycles	Unlimited
Write cycles	Minimum at +22 °C 100 000

7.9.6.4 Environmental conditions

Property	Description
Temperature range during operation	-25 °C to +85 °C
Temperature range during storage	-40 °C to +125 °C
Shock Vibration compliant with EN 60721-3-7 Class 7 M3	100 g, 1) 20 g, 1)
Torsion and bending load	Not permissible
Degree of protection	IP68 according to EN 60529: (45 minutes. Immersion in water; water depth 1 m from top edge of enclosure at +20 °C) IPx9K according to DIN 40005-9 (steam jet-air ejector: 150 mm; 10 to 15 l/min; 100 bar; 75 °C)

1) The values for shock and vibration are maximum values and must not be applied continuously.

REVIEW

7.9.6.5 Chemical resistance of the transponder

The following table provides an overview of the chemical resistance of the plastic cap of the transponder made of PA 6.6 GF. Different values apply to the stainless steel bolt head. It must be emphasized that the plastic enclosure is extremely resistant to chemicals in automobiles (e.g.: oil, grease, diesel fuel, gasoline) which are not listed separately.

	Concentration	20 °C	60 °C
Ammonia, w.	conc.	+	+
	20	+	+
Benzol		+	+
Bleach solution (12.5 % effective chlorine)		-	–
Butane, gas, liquid		+ 1)	Nothing specified
Butyl acetate (acetic acid butyl ester)		+ 1)	Nothing specified
Calcium chloride, saturated 10% solution		+	○
Chlorine		–	–
Chrome baths, tech.		–	–
Iron salts, w.	k. g.	-	-
Acetic acid, w.	10	○	–
Ethyl alcohol, w., undenaturated	40	+	Nothing specified

	Concentration	20 °C	60 °C
Formaldehyde	30	+	Nothing specified
Formalin		+	Nothing specified
Glycerine		+	Nothing specified
Isopropanol		+	+
Potassium hydroxide, w.	10-15 %	○	Nothing specified
Magnesium salts, w.		+ 1)	Nothing specified
Methyl alcohol, w.	50	+	Nothing specified
Lactic acid, w.		+	−
Sodium carbonate, w. (soda)		+	Nothing specified
Sodium chloride, w.		○	Nothing specified
Sodium hydroxide	10 %	+	Nothing specified
Nitrobenzol		○ 1)	Nothing specified
Phosphoric acid	10	-	-
Propane		+	Nothing specified
Nitric acid	10	-	−
Hydrochloric acid	10	-	−
Sulphur dioxide	Low	○	Nothing specified
Sulphuric acid	25	-	−
	10	-	−
Hydrogen sulphide	Dry	+	-
Carbon tetrachloride	1-4 %	+	Nothing specified

1) Nothing specified for stainless steel

Abbreviations	
+	Resistant
○	Limited resistance
−	Not resistant
w.	Aqueous solution
k. g.	Cold saturated

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7.9.7 Certificates and approvals

Table 7- 23 6GT2810-2EC00 - RF630T UHF Tool Tag - Europe

Certificate	Description
CE	Conformity with R&TTE directive

Table 7- 24 6GT2810-2EC10 - RF630T Gen 2 UHF Tool Tag - USA / Canada

Standard	
FCC Federal Communications Commission	Passive labels and transponders comply with the valid regulations; certification is not required.
c UL us	This product is UL-certified for the USA and Canada. It meets the following safety standard(s): • UL508 - Industrial Control Equipment • CSA C22.2 No. 142 - Process Control Equipment • UL Report E 120869

REVIEW

7.9.8 Dimension drawing

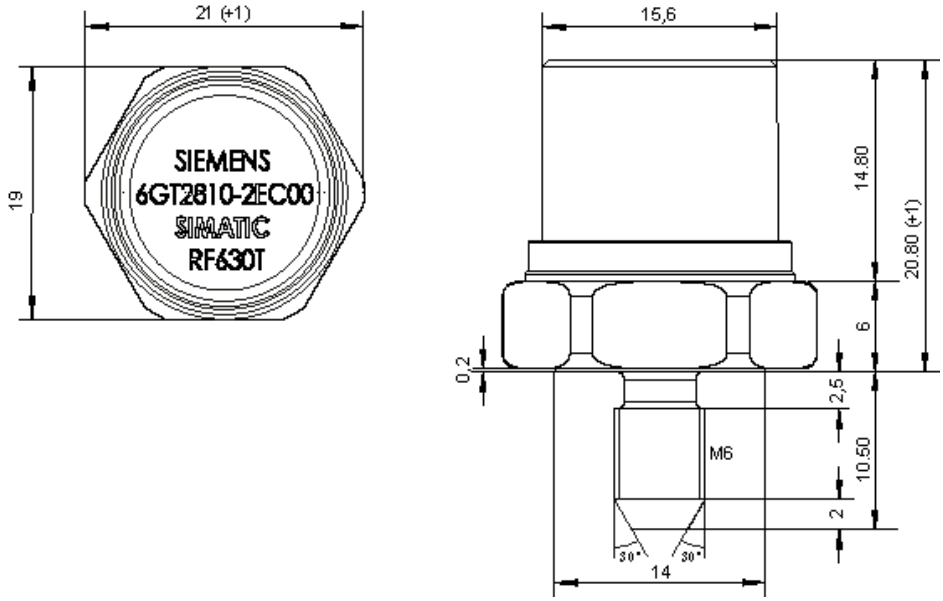

Figure 7-42 SIMATIC RF630T

Units of measurement: All dimensions in mm

General tolerances in accordance with DIN ISO 2768f.

7.10 SIMATIC RF640T Gen 2

7.10.1 Characteristics

The SIMATIC RF640T Gen 2 transponder is a passive (i.e. battery-free) and maintenance-free, round-shaped data carrier. It operates based on UHF Class 1 Gen 2 technology and is used to save the electronic product code (EPC) of 96 bits/240 bits. The transponder also has a 512-bit user memory.

The areas of application are industrial asset management, RF identification of tools, containers and metallic equipment.

The tool tag is small and rugged and suitable for industrial applications with degree of protection IP68. It is highly resistant to oil, grease and cleaning agents.

Preferably the SIMATIC RF640T is to be mounted direct on a flat metal surface of at least 150 mm diameter where it achieves a typical sensing distance of 4 m.

SIMATIC RF640T Gen 2	Features		
	Area of application	Identification tasks in rugged industrial environments Suitable for use in hazardous areas.	
	Frequency variants	Europe	USA/Canada
		868 MHz	915 MHz
	Air interface	according to ISO°18000-6C	
	Polarization	Linear	
	Memory	EPC 96 bit/240 bit Add-on-memory 64 bytes	
	Range [1)]	max. 4.0 m	
	Mounting	for direct mounting on conductive materials (preferably metal).	

[1)] The information relates to the maximum read range. You will find more information on ranges in the section "Minimum distances and maximum ranges (Page 344)".

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7.10.2 Ordering data

Ordering data	Article number
SIMATIC RF640T Gen 2 (Europe) • Frequency 865 MHz to 868 MHz • EPC 96 bits/240 bits • 64-byte user memory • -25 °C to +85 °C operating temperature • Dimensions (D x H) 50 mm x 8 mm	6GT2810-2DC00
SIMATIC RF640T Gen 2 (USA/Canada) • Frequency 902 MHz to 928 MHz • EPC 96 bits/240 bits • 64-byte user memory • -25 °C to +85 °C operating temperature • Dimensions (D x H) 50 mm x 8 mm	6GT2810-2DC10

7.10.3 Planning the use

7.10.3.1 Optimum antenna/transponder positioning with plane mounting of the transponder on metal

REVIEW

Example of optimum antenna/transponder positioning

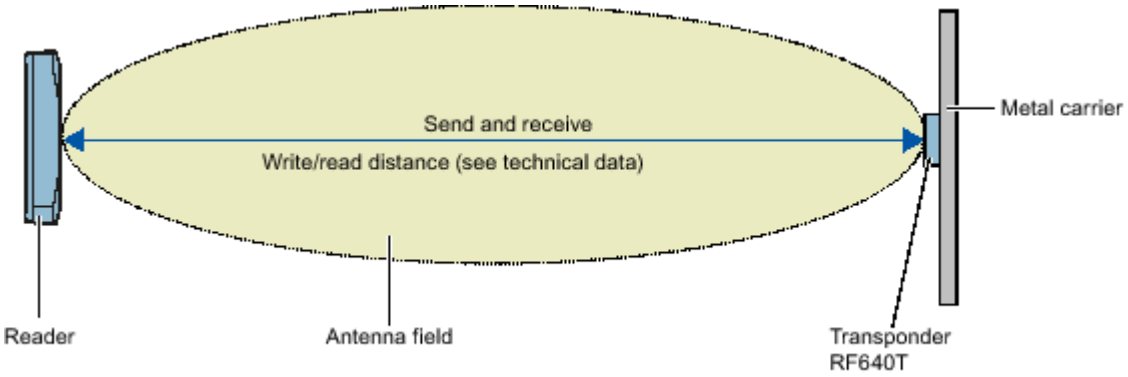

Figure 7-43 Example of optimum antenna/transponder positioning with RF600 readers and an RF600 antenna

7.10.3.2 Range when mounted on flat metallic carrier plates

The transponder generally has linear polarization. The polarization axis runs as shown in the diagram below. If the tag is mounted in the center of a flat metal plate, which is either approximately square or circular, it can be aligned in any direction since the transmitting and receiving RF660A antennas operate with circular polarization.

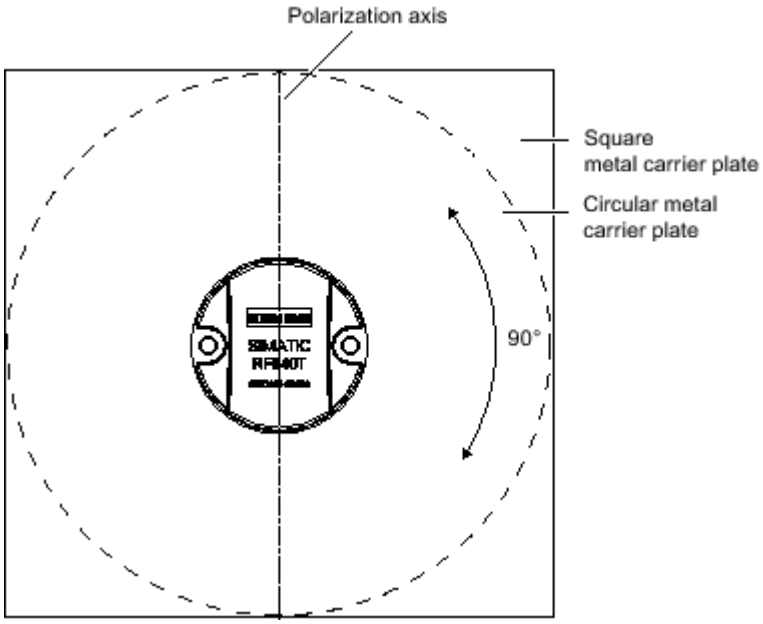

Figure 7-44 Optimum positioning of the transponder on a (square or circular) metal surface

Table 7- 25 Range on flat metallic carriers

Carrier material	Range
Metal plate of at least Ø 150 mm	100 %
Metal plate Ø 120 mm	approx. 80%
Metal plate Ø 85 mm	approx. 55%
Metal plate Ø 65 mm	approx. 40%

On rectangular carrier plates, the range depends on the mounting orientation of the transponder

You will find more detailed information on the range in the section "Minimum distances and maximum ranges (Page 344)".

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7.10.3.3 Range when mounted on non-metallic carrier materials

The transponder is generally designed for mounting on metallic objects which provide the conditions for the maximum reading ranges

Table 7- 26 Range with non-metallic carriers

Carrier material	Range
Transponder on wooden carrier	approx. 40%
Transponder on plastic carrier	approx. 35%
Transponder on plastic mineral water bottle	approx. 55%
Transponder without base	approx. 30%

The maximum range of 100% is achieved by mounting the transponder in a free space with low reflections on a flat metal carrier with a diameter of at least 150 mm.

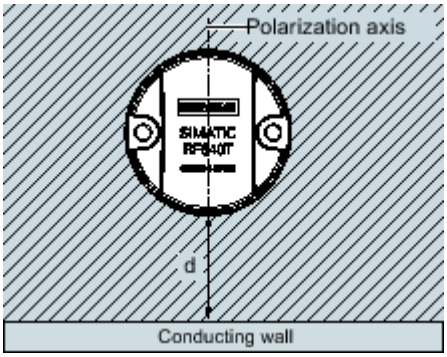
You will find more detailed information on the range in the section "Minimum distances and maximum ranges (Page 344)".

7.10.3.4 Influence of conducting walls on the range

If there are conducting walls or restrictions in the vicinity that could affect the wireless field, a distance of approx. 10 cm is recommended. In principle, walls have least influence if the polarization axis is orthogonal to the wall.

Range: One conducting wall

Influence on range when positioned against one conducting wall



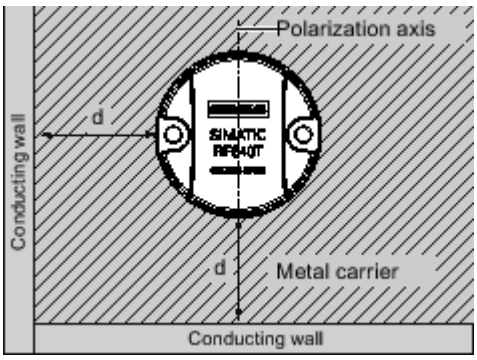
View from above

Distance d	20 mm	50 mm	100 mm	
Range	approx. 90 %	approx. 90 %	approx. 95 %	Wall height 20 mm
	approx. 80%	approx. 90 %	approx. 90 %	Wall height 50 mm
	approx. 70%	approx. 75 %	approx. 90 %	Wall height 100 mm

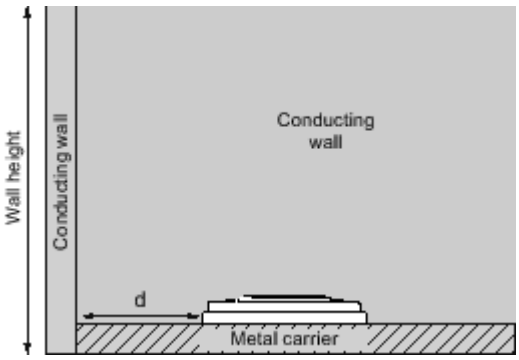
REVIEW

Range: Two conducting walls

Influence on the range when positioned against two conducting walls



View from above



Side view

Distance d	20 mm	50 mm	100 mm	
Range	approx. 75 %	approx. 90 %	approx. 90 %	Wall height 20 mm
	approx. 50 %	approx. 45 %	approx. 80%	Wall height 50 mm
	approx. 40%	approx. 45 %	approx. 75 %	Wall height 100 mm

The values specified in the tables above are guide values.

7.10.3.5 Directional radiation pattern of the transponder

Preferably, align the tag parallel to the transmitting antenna. If, however, the tag including the metallic carrier plate is tilted, the reading range will be reduced.

Rotation about the polarization axis

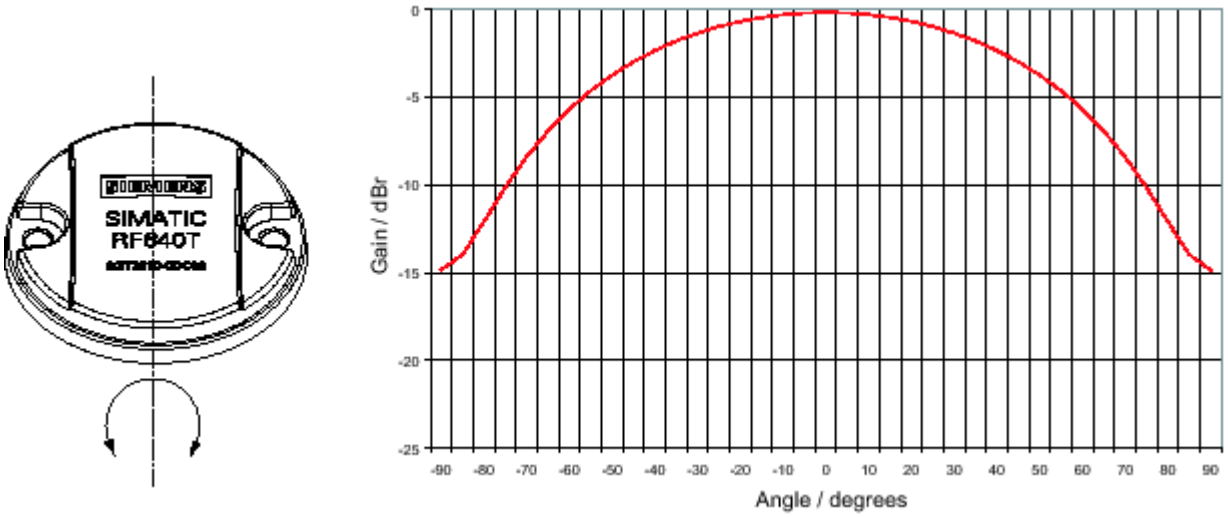


Figure 7-45 Transponder characteristics when rotated about the polarization axis

REVIEW

Rotation orthogonal to the polarization axis

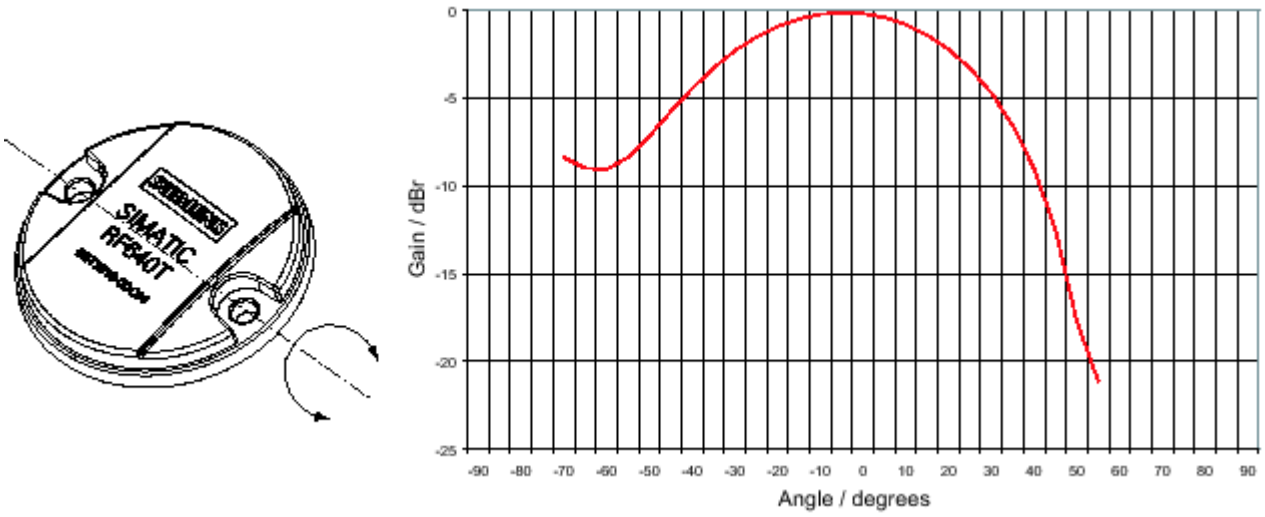


Figure 7-46 Transponder characteristics when rotated orthogonally to the polarization axis (within the tag plane)

REVIEW

7.10.3.6 Use of the transponder in the Ex protection area

TÜV NORD CERT GmbH, appointed center no. 0044 as per Article 9 of the Directive 94/9/EC of the European Council of 23 March 1994, has confirmed the compliance with the essential health and safety requirements relating to the design and construction of equipment and protective systems intended for use in hazardous areas as per Annex II of the Directive.

The essential health and safety requirements are satisfied in accordance with standards IEC 60079-0: 2011 and EN 60079-11: 2012.

This allows the RF640T transponder to be used in hazardous areas for gases, for the device category 2G and gas group IIC, or alternatively in hazardous areas for dusts, for the device category 2D and group IIIB.

Note

Readability of the serial number on the type plate

When using the transponder, make sure that the serial number can be read. The serial number is lasered and can be hidden by paint or other materials making it illegible.

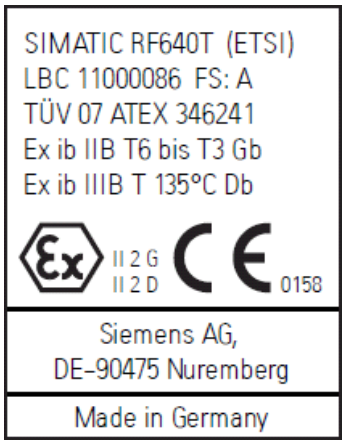
The customer is responsible for making sure that the serial number of a transponder for the hazardous area can be read at all times.

Identification

The identification is as follows:

II 2 G Ex ib IIC T6 to T3 GB or II 2 D Ex ib IIIB T135°C DB

7.10.3.7 Use of the transponder in hazardous areas for gases



REVIEW

Note

Transponder labeling

The labeling of the front of the transponder shown above is an example and can vary between batches produced at different times.

This does not affect the hazardous area marking.

Temperature class delineation for gases

The temperature class of the transponder for hazardous atmospheres (gases) depends on the ambient temperature and the radiated power of an antenna in the 865 - 868 MHz frequency band within the hazardous area.

WARNING

Ignitions of gas-air mixtures

When using the RF640T transponder, check to ensure that the temperature class is observed in respect of the requirements of the area of application

Non-compliance with the permitted temperature ranges while using the transponder can lead to ignitions of gas-air mixtures.

WARNING
Ignitions of gas-air mixtures The maximum transmitting power of the transmitter used to operate the transponder must not exceed 2 W. Non-compliance with the permissible transmitting power can lead to ignitions of gas-air mixtures.

Temperature class assignment for gases and a radiated power less than 100 mW ERP

If the radiated power of an antenna radiating into the hazardous area or located in the hazardous area and operating in the 865 - 868 MHz frequency band cannot exceed the value 100 mW, the temperature class assignment is as follows:

Ambient temperature range	Temperature class
-25 °C to +85 °C	T5
-25 °C to +76 °C	T6

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Temperature class assignment for gases and a radiated power less than 500 mW ERP

If the radiated power of an antenna radiating into the hazardous area or located in the hazardous area and operating in the 865 - 868 MHz frequency band cannot exceed the value 500 mW, the temperature class assignment is as follows:

Ambient temperature range	Temperature class
-25 °C to +85 °C	T4
-25 °C to +77 °C	T5
-25 °C to +62 °C	T6

Temperature class assignment for gases and radiated power for 2000 mW ERP

If the radiated power of an antenna radiating into the hazardous area or located in the hazardous area and operating in the 865 - 868 MHz frequency band cannot exceed the value 2000 mW, the temperature class assignment is as follows:

Ambient temperature range	Temperature class
-25 °C to +85 °C	T3
-25 °C to +65 °C	T4
-25 °C to +25 °C	T5
-25 °C to +10 °C	T6

Temperature class assignment for gases and a radiated power of 10 mW to 2000 mW ERP

If the radiated power of an antenna radiating into the hazardous area or of an antenna located in the hazardous area in the 865 - 868 MHz frequency band cannot exceed the radiated power selected in the following diagram, the maximum permitted ambient temperature range can be found in the corresponding temperature function of the diagram. This makes the following temperature class assignment valid:

Ambient temperature range	Temperature class
-25 °C to +85 °C	T2
-25 °C to +85 °C	T3
-25 °C to T_{max} (T4) °C	T4
-25 °C to T_{max} (T5) °C	T5
-25 °C to T_{max} (T6) °C	T6

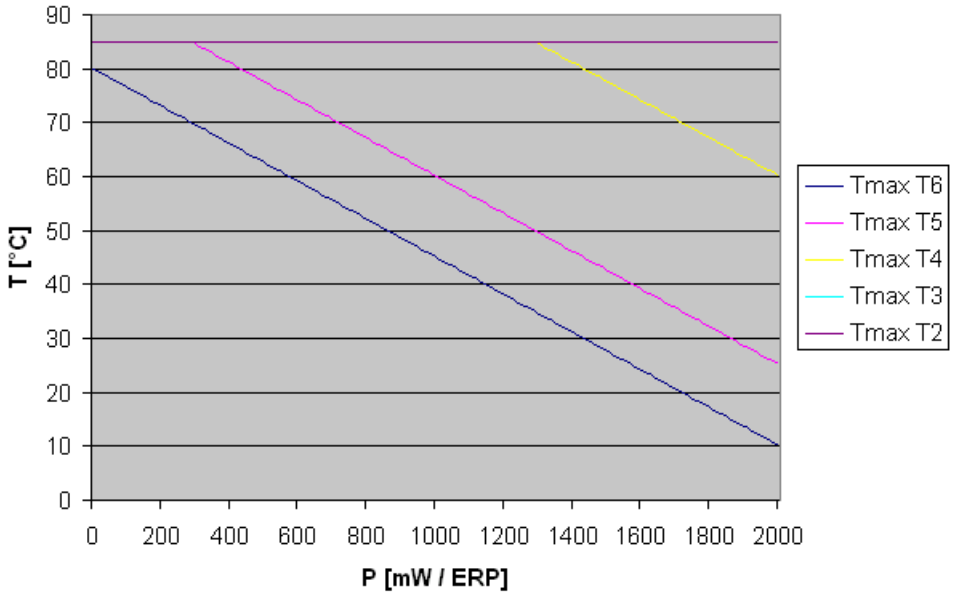

Figure 7-47 Maximum permitted ambient temperature depending on the radiated power

REVIEW

7.10.3.8 Use of the transponder in hazardous areas for dusts

The equipment is suitable for dusts whose ignition temperatures for a dust layer of 5 mm are higher than 210 °C (smoldering temperature). The ignition temperature specified here according to IEC 60079-0: 2011 for ignition protection type ib in this case references the smoldering temperature of a layer of combustible flyings (ib IIIA) or alternatively non-conductive dusts (ib IIIB).

Temperature class delineation for dusts

WARNING

Ignitions of dust-air mixtures

When using the RF640T transponder, check to ensure that the temperature values are complied with in connection with the requirements of the application area.

Non-compliance with the permitted temperature ranges while using the transponder can lead to ignitions of dust-air mixtures.

Temperature class assignment for dusts and a radiated power less than 100 mW ERP

If the radiated power of an antenna radiating into the hazardous area or located in the hazardous area and operating in the 865 - 868 MHz frequency band cannot exceed the value 100 mW, the temperature class assignment is as follows:

Ambient temperature range	Temperature value
-25 °C ≤ Ta ≤ +85 °C	T94 °C

Temperature class assignment for dusts and a radiated power less than 500 mW ERP

If the radiated power of an antenna radiating into the hazardous area or located in the hazardous area and operating in the 865 - 868 MHz frequency band cannot exceed the value 500 mW, the temperature class assignment is as follows:

Ambient temperature range	Temperature value
-25 °C ≤ Ta ≤ +85 °C	T108 °C

Temperature class assignment for dusts and a radiated power less than 1280 mW ERP

If the radiated power of an antenna radiating into the hazardous area or located in the hazardous area and operating in the 865 - 868 MHz frequency band cannot exceed the value 1280 mW, the temperature class assignment is as follows:

Ambient temperature range	Temperature value
-25 °C ≤ Ta ≤ +85 °C	T135 °C

Ambient temperature range for dust and radiated power of 2000 mW ERP

If the radiated power of an antenna radiating into the hazardous area or located in the hazardous area and operating in the 865 - 868 MHz frequency band cannot exceed the value 2000 mW, the temperature class assignment is as follows:

Ambient temperature range	Temperature value
-25 °C ≤ Ta ≤ +60 °C	T135 °C

Temperature class assignment for dusts and a radiated power of 10 mW ERP to 2000 mW ERP

If the radiated power of an antenna radiating into the hazardous area or located in the hazardous area and operating in the 865 - 868 MHz frequency band can be between the values 10 mW ERP and 1280 mW ERP, the temperature class assignment is as follows:

Ambient temperature range	Temperature value
-25 °C ≤ Ta ≤ +85 °C	T_{value} °C [1]

[1] See diagram, blue line

If the radiated power of an antenna radiating into the hazardous area or located in the hazardous area and operating in the 865 - 868 MHz frequency band can be between the values 1280 mW ERP and 2000 mW ERP, the temperature class assignment is as follows:

Ambient temperature range	Temperature value
-25 °C ≤ Ta ≤ $T_{max. ambient}$ °C [1]	135°C

[1] See diagram, orange line

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WARNING

Ignitions of dust-air mixtures

Using the RF640T transponder with radiant power greater than 1280 mW ERP, requires compliance with the reduced maximum ambient temperature (see diagram) for maintaining the temperature value to a maximum of 135 °C.

Non-compliance with the permitted temperature ranges while using the transponder can lead to ignitions of dust-air mixtures.

The respective temperature value and the maximum allowed ambient temperature in relation to the radiated power of the antenna is shown in the diagram below:

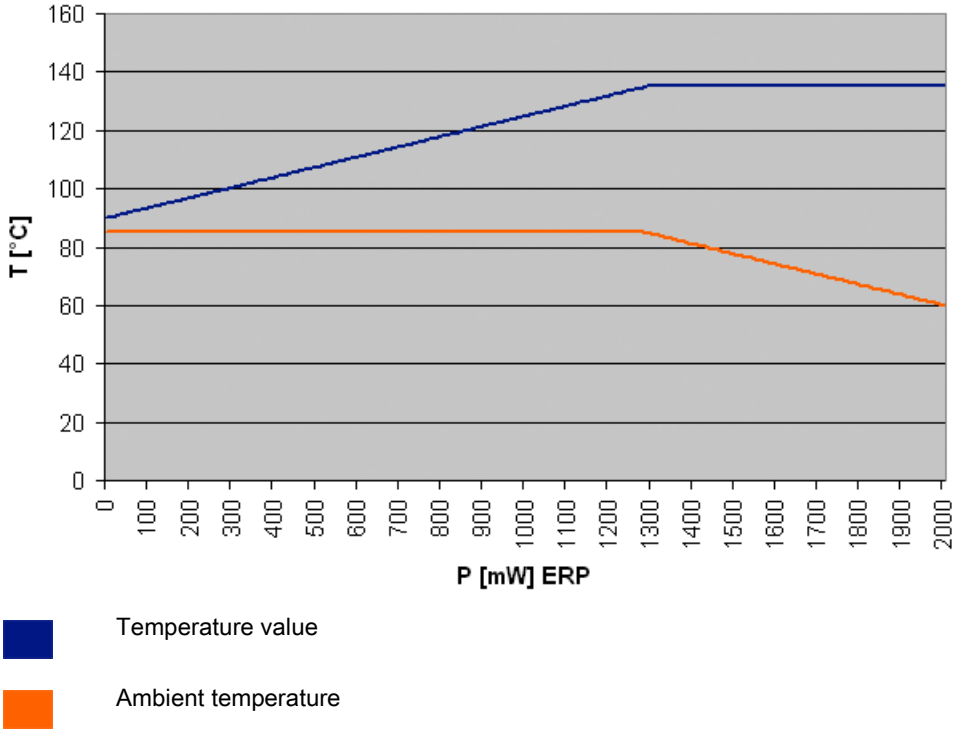

Figure 7-48 Temperature value and maximum permitted ambient temperature in relation to the radiated power

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7.10.4 Mounting instructions

Properties	Description
Type of installation	Screw mounting ①, (M4 screws) (two DIN 433 washers and two M4 hexagon socket head cap screws DIN 6912)
Tightening torque	(at room temperature) < 1.2 Nm

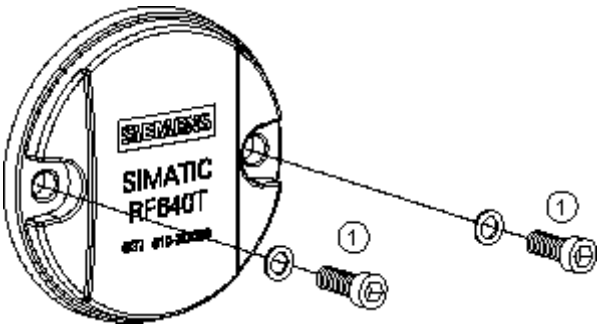
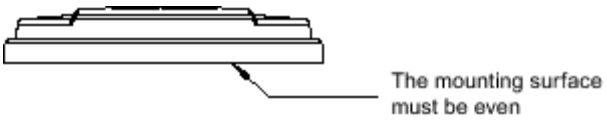


Figure 7-49 Screw mounting

Note

Make sure that the mounting surface is even when mounting the transponder.



REVIEW

7.10.5 Memory configuration of the transponder

The memory configuration of the transponder is described in the section SIMATIC memory configuration of the RF600 transponders and labels (Page 336).

7.10.6 Technical Specifications

7.10.6.1 Mechanical data

Property	Description
Dimensions (D x H)	50 mm x 8 mm (+1 mm)
Design	PCB with integrated antenna
Design	Plastic enclosure (PA12), silicone-free
Weight	approx. 13 g
Mounting on metal	directly on metal without spacing

7.10.6.2 Electrical data

Characteristic	Description	
	Europe	USA/Canada
Air interface	According to ISO 18 000-6 C	According to ISO 18 000-6 C
Frequency range	865 ... 868 MHz	902 ... 928 MHz [1]
Necessary transmit power	2 W (ERP)	4 W (EIRP)
Range [2]	max. 4.0 m	max. 4.0 m
Polarization type	Linear	Linear
Energy source	Field energy via antenna, without battery	Field energy via antenna, without battery
Multitag capability	yes, minimum distance between data carriers ≥ 50 mm [3]	yes, minimum distance between data carriers ≥ 50 mm [3]

[1] Reduction of range to about 70% at the band limits 902 MHz or 928 MHz; acquisition is guaranteed at 915 MHz due to frequency hopping procedure.

[2] Mounting on a flat metal surface with a diameter of at least 150 mm and at room temperature. The information relates to the maximum read range. You will find more information on ranges in the section "Minimum distances and maximum ranges (Page 344)".

[3] When these minimum distances are not reached, there is a reduction in the maximum possible read and write distances of the transponder.

7.10.6.3 Memory specifications

Property	Description	
Type	EPC Class 1 Gen 2	
Memory organization	EPC code	96 bits/240 bits
	User memory	64 bytes
	TID	64 bits
	Reserved (passwords)	64 bits
Protocol	ISO 18000-6C	
Data retention time	10 years	

REVIEW

Property	Description
Read cycles	Unlimited
Write cycles	Minimum at +22 °C 100 000

7.10.6.4 Environmental conditions

Property	Description
Temperature range when operating in non-hazardous areas	-25 °C … 85 °C[1)]
Temperature range when operating in areas at risk of a gas explosion with temperature class T3-T6	See alsoUse of the transponder in hazardous areas for gases (Page 425) [2)]
Temperature range when operating in areas at risk of dust explosions with temperature value ≤ T135 °C	See alsoUse of the transponder in hazardous areas for dusts (Page 427) [2)]
Temperature range during storage	-40 °C … 125 °C[1)]
Shock Vibration compliant with EN 60721-3-7 Class 7 M3	100 g, [3)] 20 g, [3)]
Torsion and bending load	Not permissible
Degree of protection	IP68 according to EN 60529: (45 minutes. immersion in water; water depth 1 m from top edge of housing at +20 °C)
	IP x9K according to EN 60529: • Steam blaster nozzle distance 150 mm • 10 ... 15 l of water per minute • Pressure 100 bar • Temperature 75 °C • Test time 30 seconds

REVIEW

[1)] At temperatures above 70 °C the casing may distort slightly; this does not however cause any impairment of function (mechanical or electrical).

[2)] Directive 94/9/EC of the European Council of 23 March 1994 must be complied with, see also Chapter "Using the transponder in hazardous areas".

[3)] The values for shock and vibration are maximum values and must not be applied continuously.

⚠ WARNING

Ignitions of gas-air or dust-air mixtures

When using the RF640T transponder, check to ensure that the temperature values are observed in respect of the requirements of the hazardous area of application.

Non-compliance with the permitted temperature ranges while using the transponder can lead to ignitions of gas-air or dust-air mixtures.

Note

Damage to the surface of the housing

The values specified for the IP x9K test are maximum values and must not be applied continuously.

Protracted loading of the transponder can lead to damage to the surface of the housing due to high pressures.

7.10.6.5 Chemical resistance of the RF640T transponder

The following table gives an overview of the chemical composition of the data memory made from polyamide 12. The plastic housing has a notably high resistance to chemicals used in automobiles (e.g.: oil, grease, diesel fuel, gasoline) which are not listed separately.

	Concentration	20 °C	60 °C
Battery acid	30	○○	–
Ammonia gas		○○○○	○○○○
Ammonia, w.	conc.	○○○○	○○○○
	10	○○○○	○○○○
Benzol		○○○○	○○○
Bleach solution (12.5 % effective chlorine)		○○	–
Butane, gas, liquid		○○○○	○○○○
Butyl acetate (acetic acid butyl ester)		○○○○	○○○○
Calcium chloride, w.		○○○○	○○○
Calcium nitrate, w.	k. g.	○○○○	○○○
Chlorine		–	–
Chrome baths, tech.		–	–
Iron salts, w.	k. g.	○○○○	○○○○
Acetic acid, w.	50	–	–
Ethyl alcohol, w., undenaturated	96	○○○○	○○○
	50	○○○○	○○○○
Formaldehyde, w.	30	○○○	–
	10	○○○○	○○○
Formalin		○○○	–
Glycerine		○○○○	○○○○
Isopropanol		○○○○	○○○
Potassium hydroxide, w.	50	○○○○	○○○○
Lysol		○○	–
Magnesium salts, w.	k. g.	○○○○	○○○○
Methyl alcohol, w.	50	○○○○	○○○○
Lactic acid, w.	50	○○	–
	10	○○○	○○
Sodium carbonate, w. (soda)	k. g.	○○○○	○○○○

REVIEW

	Concentration	20 °C	60 °C
Sodium chloride, w.	k. g.	○○○○	○○○○
Sodium hydroxide		○○○○	○○○○
Nickel salts, w.	k. g.	○○○○	○○○○
Nitrobenzol		○○○	○○
Phosphoric acid	10	○	V
Propane		○○○○	○○○○
Mercury		○○○○	○○○○
Nitric acid	10	○	−
Hydrochloric acid	10	○	−
Sulphur dioxide	Low	○○○○	○○○○
Sulphuric acid	25	○○	−
	10	○○○	−
Hydrogen sulphide	Low	○○○○	○○○○
Carbon tetrachloride		○○○○	○○○○
Toluene		○○○○	○○○
Detergent	High	○○○○	○○○○
Plasticizer		○○○○	○○○○

Abbreviations	
○○○○	Resistant
○○○	Virtually resistant
○○	Limited resistance
○	Less resistant
−	Not resistant
w.	Aqueous solution
k. g.	Cold saturated

REVIEW

7.10.7 Certificates and approvals

Table 7- 27 6GT2810-2DC00 - RF640T Gen 2 UHF Tool Tag - Europe

Certificate	Description
CE	CE approval according to R&TTE guideline
	For Directive 94/9/EC: EC type test certification no. TÜV 07 ATEX 346241 Recognition of the quality assurance BVS 11 ATEX ZQS/E111

Table 7- 28 6GT2810-2DC10 - RF640T Gen 2 UHF Tool Tag - USA/Canada

Standard	
FCC Federal Communications Commission	Passive labels or transponders comply with the valid regulations; certification is not required.
c UL us	This product is UL-certified for the USA and Canada. It meets the following safety standard(s): UL 60950-1 - Information Technology Equipment Safety - Part 1: General Requirements CSA C22.2 No. 60950 -1 - Safety of Information Technology Equipment UL Report E 205089

REVIEW

7.10.7.1 EC Declaration of Conformity according to directive 94/9EC RF640T Gen 2 UHF Tool Tag Version 1

The type test certification for the RF640T Gen 2 UHF Tool Tag Version 1 is stored by TÜV 07 ATEX 346241. On the basis of this certification, the CE declaration by the manufacturer has been made according to directive 94/9/EC.
The producing factory of the RF640T Gen 2 UHF Tool Tag Version 1 has an ATEX quality assurance system recognized by the DEKRA EXAM GmbH with certificate number BVS 11 ATEX ZQS/E111.

Manufacturer's address - distributor

Siemens Aktiengesellschaft
Industry Sector (I)
Industry Automation Division (IA)
Sensors and Communication (SC)
Communication and Identification (CI)
Gleiwitzer Str. 555
D-90475 Nürnberg, Germany

Manufacturer's address - factory

Siemens Aktiengesellschaft
Industry Sector (I)
Industry Automation Division (IA)
Control Components and System Engineering (CE)
Würzburger Straße 121
D-90766 Fürth, Germany

7.10.8 Dimension drawing

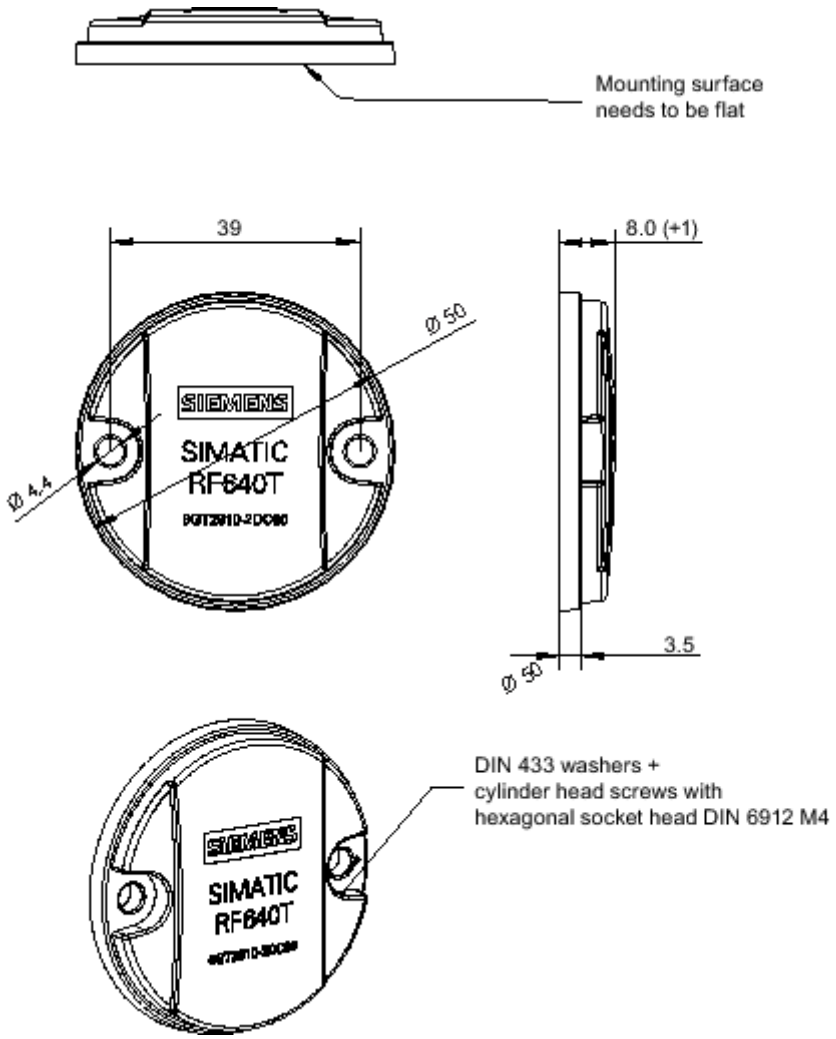


Figure 7-50 SIMATIC RF640T Gen 2 UHF Tool Tag Version 1

Units of measurement: All dimensions in mm

REVIEW

7.11 SIMATIC RF680T

7.11.1 Characteristics

The heat-resistant SIMATIC RF680T transponder is a passive, maintenance-free data carrier. It operates based on UHF Class 1 Gen 2 technology and is used to save the "Electronic Product Code" (EPC) of 96 bits/240 bits. The transponder also has a 512-bit user memory.

These transponders with limited service life are ideally suited to high-temperature applications
(e.g. the painting of vehicle bodies) as well as applications in production logistics.

The RF680T is rugged and suitable for industrial applications with IP68/IPX9K degree of protection. It is highly resistant to oil, grease and cleaning agents.

The SIMATIC RF680T is mounted directly onto metal and non-metal carrier plates to ensure optimum operation and has a typical detection range of 6.7 m.

REVIEW

SIMATIC RF680T	Features	
	Area of application	Applications with high temperatures (up to +220 °C). Suitable for use in hazardous areas. Typical application areas: • Paint shops and their preparatory treatments, incl. drying ovens • Electrophoretic deposition area • Primer coat incl. drying oven • Top coat area incl. drying oven • Washing areas at temperatures > 85 °C
	Frequency range	865 ... 928 MHz (ETSI and FCC)
	Air interface	according to ISO°18000-6C
	Polarization	Linear
	Temperature range	up to 220 °C
	Memory	EPC 96 bit/240 bit Add-on-memory 64 bytes
	Range [1)]	max. 7 m
	Mounting	Suitable for direct mounting on conductive and non-conductive materials.
	Material	Plastic PPS; silicone-free
	Dimensions	130 x 32 x 15 mm

[1)] The information relates to the maximum read range. You will find more information on ranges in the section "Minimum distances and maximum ranges (Page 344)".

7.11.2 Ordering data

Ordering data	Article number
SIMATIC RF680T • Frequency 865 MHz to 928 MHz • EPC 96 bit/240 bit (64 bytes user memory) • -25 ... +220 °C • 130 x 32 x 15 mm	6GT2810-2HG80

7.11.3 Planning the use

7.11.3.1 Optimum antenna/transponder positioning with plane mounting of the transponder on metal

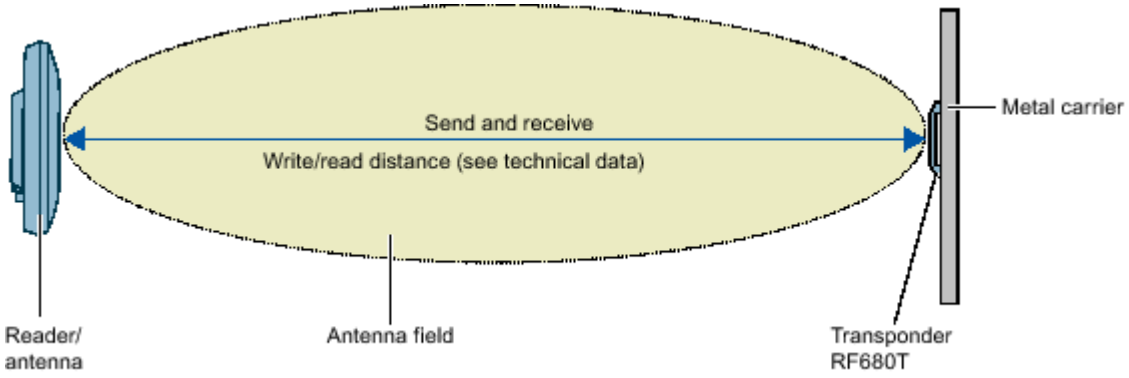


Figure 7-51 Example of optimum antenna/transponder positioning

REVIEW

7.11.3.2 Range when mounted on flat metallic carrier plates

The transponder generally has linear polarization. The polarization axis runs as shown in the diagram below. If the transponder is centrally mounted on a plane metal plate, which may either be almost square or circular, it can be aligned in any direction if the transmitting and receiving antennas operate with circular polarization (such as RF660A and RF620R).

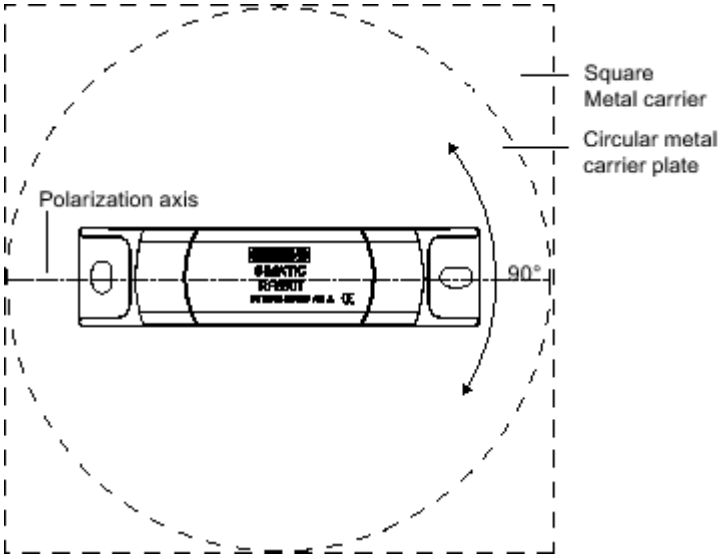


Figure 7-52 Optimum positioning of the transponder on a (square or circular) metal surface

Table 7- 29 Range on flat metallic carriers

Carrier material	Range Europe	Range USA
Metal plate 150 x 150 mm	typically 50 %	typically 50 %
Metal plate 300 x 300 mm	typically 100 %	typically 100 %

On rectangular carrier plates, the range depends on the mounting orientation of the transponder A 90° rotation of the transponder about the axis of symmetry may result in greater ranges.

You will find more detailed information on the range in the section "Minimum distances and maximum ranges (Page 344)".

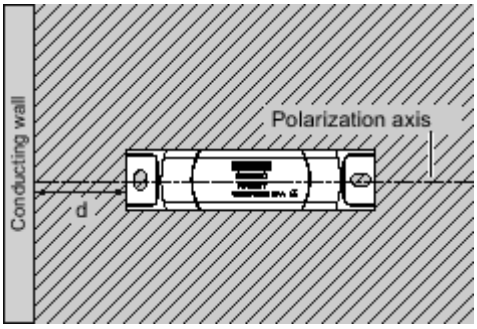
REVIEW

7.11.3.3 Influence of conducting walls on the range

If there are conducting walls or restrictions in the vicinity that shade the radio field, a distance of approx. 10 cm is recommended between the transponder and the wall. In principle, walls have least influence if the polarization axis is orthogonal to the wall.

Range: One conducting wall

Influence on the range when positioned orthogonally to the conducting wall

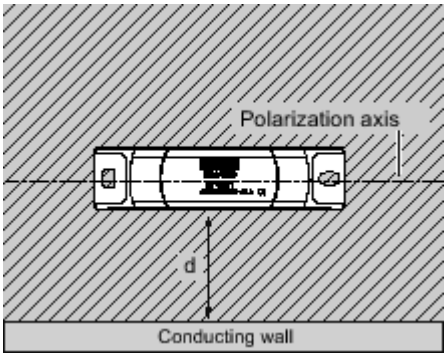


View from above

Distance d	20 mm	50 mm	100 mm	
Range	approx. 100%	approx. 100%	approx. 100%	Wall height 20 mm
	approx. 100%	approx. 100%	approx. 100%	Wall height 50 mm
	approx. 80%	approx. 100%	approx. 100%	Wall height 100 mm

REVIEW

Influence on the range when positioned parallel to the conducting wall



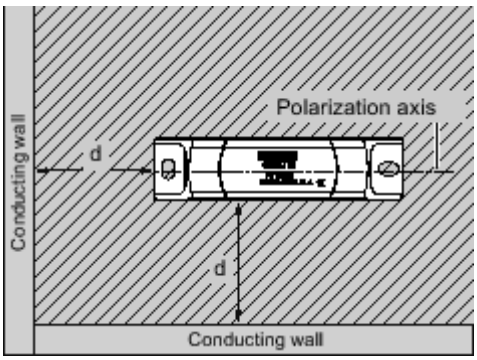
View from above

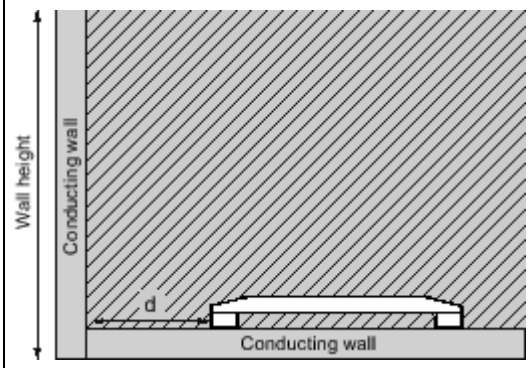
Distance d	20 mm	50 mm	100 mm	
Range	approx. 50%	approx. 70%	approx. 90%	Wall height 20 mm
	approx. 40%	approx. 70%	approx. 90%	Wall height 50 mm
	approx. 30%	approx. 50%	approx. 90%	Wall height 100 mm

Range: Two conducting walls

REVIEW

Influence on the range when positioned against two conducting walls





Side view

Distance d	20 mm	50 mm	100 mm	
Range	approx. 50%	approx. 70%	approx. 90%	Wall height 20 mm
	approx. 30%	approx. 60%	approx. 90%	Wall height 50 mm
	approx. 25%	approx. 50%	approx. 90%	Wall height 100 mm

The values specified in the tables above are guide values.

7.11.3.4 Directional radiation pattern of the transponder on metallic surfaces

It is recommendable to align the transponder parallel to the transmitting antenna. If, however, the transponder including the metallic carrier plate is tilted, the reading range will be reduced.

Rotation about the polarization axis or orthogonal to the polarization axis

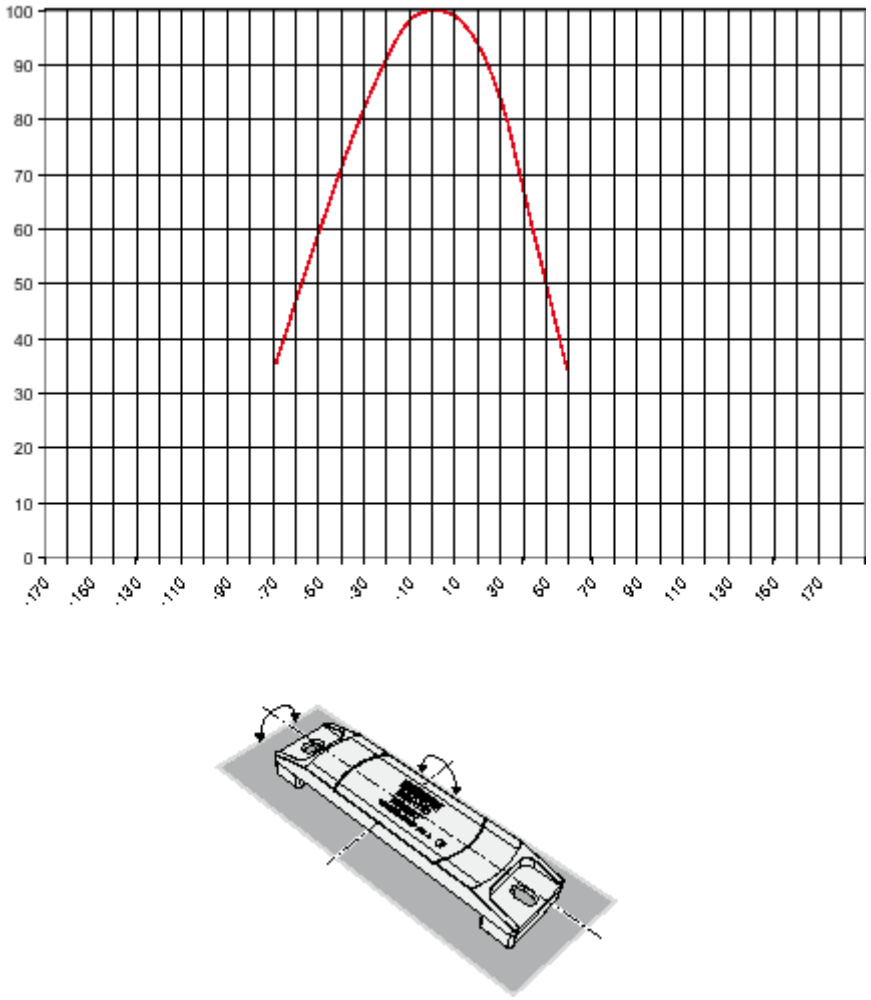


Figure 7-53 Characteristic of the transponder when rotated about the polarization axis or orthogonally to the polarization axis

Note

Please note that the directional effect is dependent on the size of the metal surface. The larger the metal surface, the larger the directional effect.

REVIEW

7.11.3.5 Range when mounted on non-metallic carrier materials

The RF680T transponder is a universal transponder for mounting on many different types of carrier materials.

Table 7- 30 Range for non-metal carriers (RF670R = 2 W ERP;)

Carrier material	Range
Transponder on wooden carrier (dry, degree of moisture < 15%)	typically 50 %
Transponder on plastic carrier	typically 50 %
Transponder on glass	typically 50 %

The maximum range of 100% is achieved by mounting the transponder in a free space with low reflections on a flat metal carrier with a diameter of at least 300 mm.

You will find more detailed information on the range in the section "Minimum distances and maximum ranges (Page 344)".

7.11.3.6 Directional radiation pattern of the transponder on non-metallic surfaces

It is recommendable to align the transponder parallel to the transmitting antenna. If, however, the transponder including the metallic carrier plate is tilted, the reading range will be reduced.

REVIEW

Rotation about the polarization axis

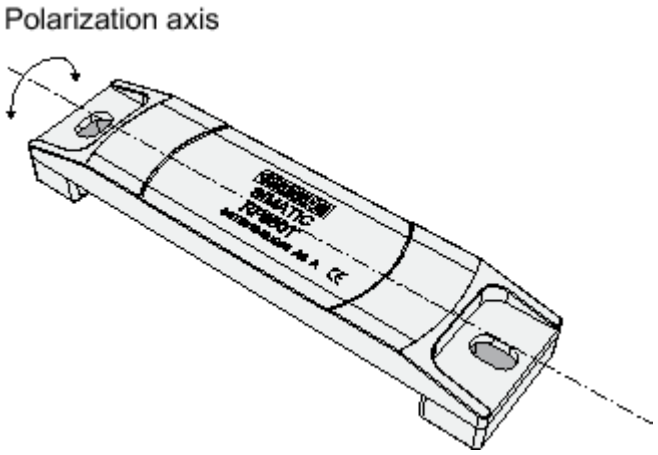


Figure 7-54 Rotation of the transponder about the polarization axis

Generally the range does not change when the transponder without carrier material is rotated about the polarization axis.

Rotation orthogonal to the polarization axis

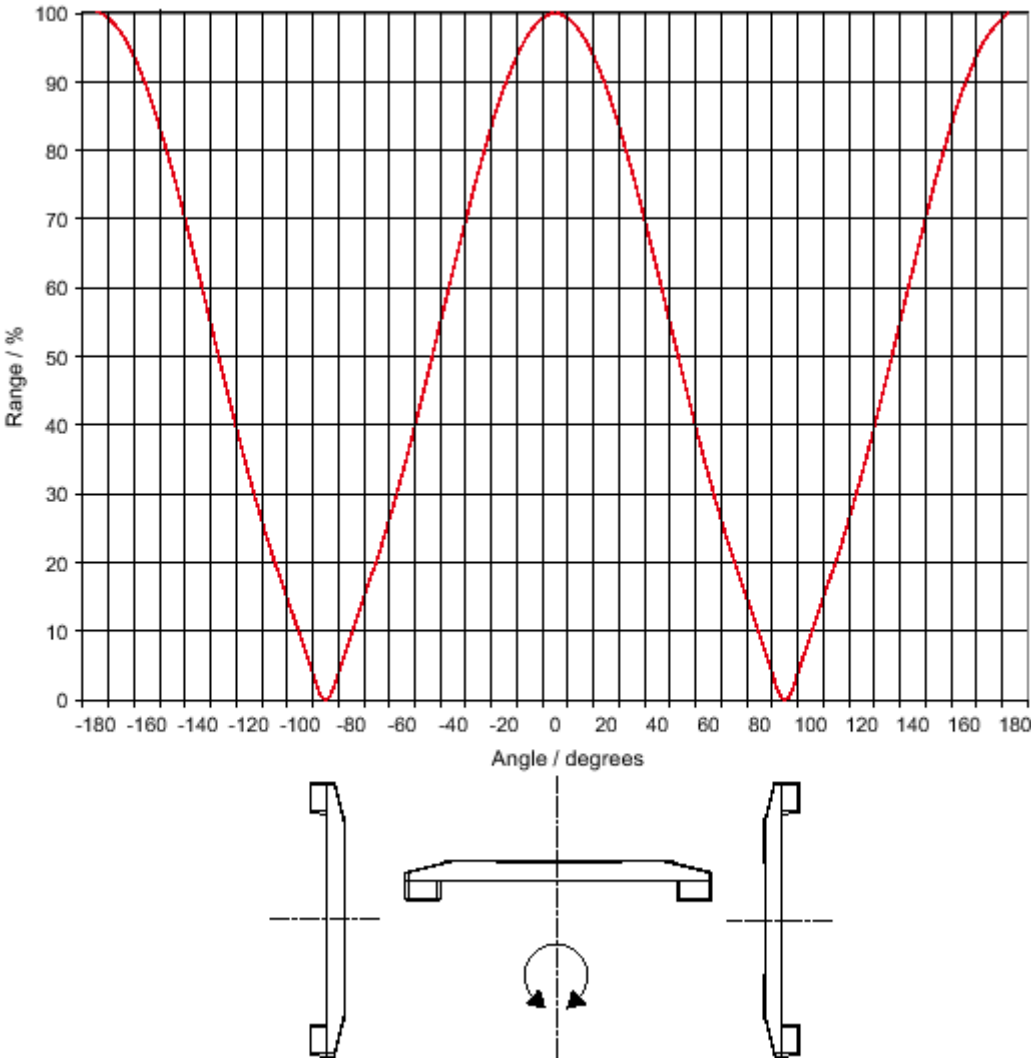


Figure 7-55 Transponder characteristics when rotated orthogonally to the polarization axis (within the tag plane)

If the transponder is positioned orthogonally to the transmitting antenna, it normally cannot be read. Therefore the transponder is preferably to be aligned parallel to the transmitting antenna. The following figure illustrates this situation.

REVIEW

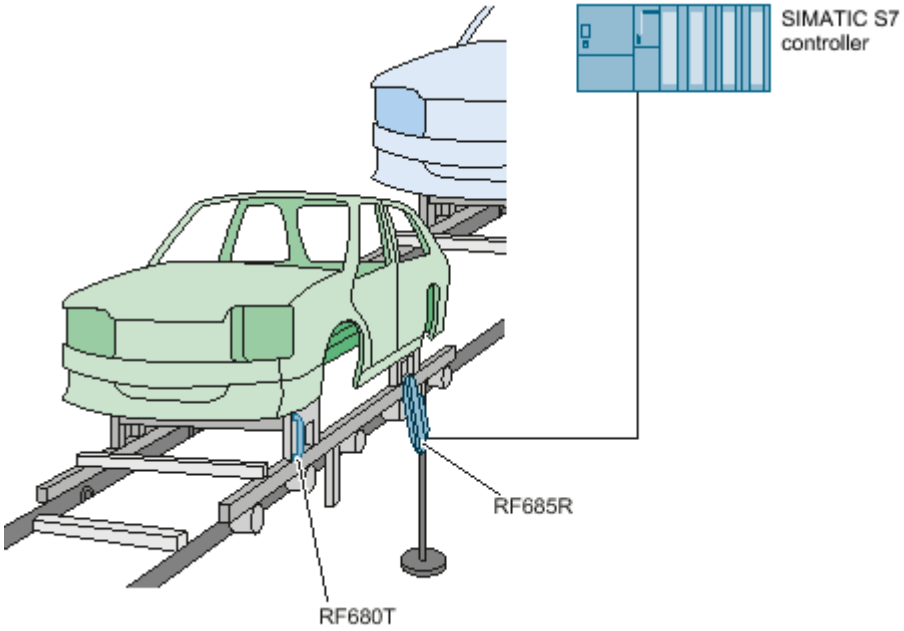


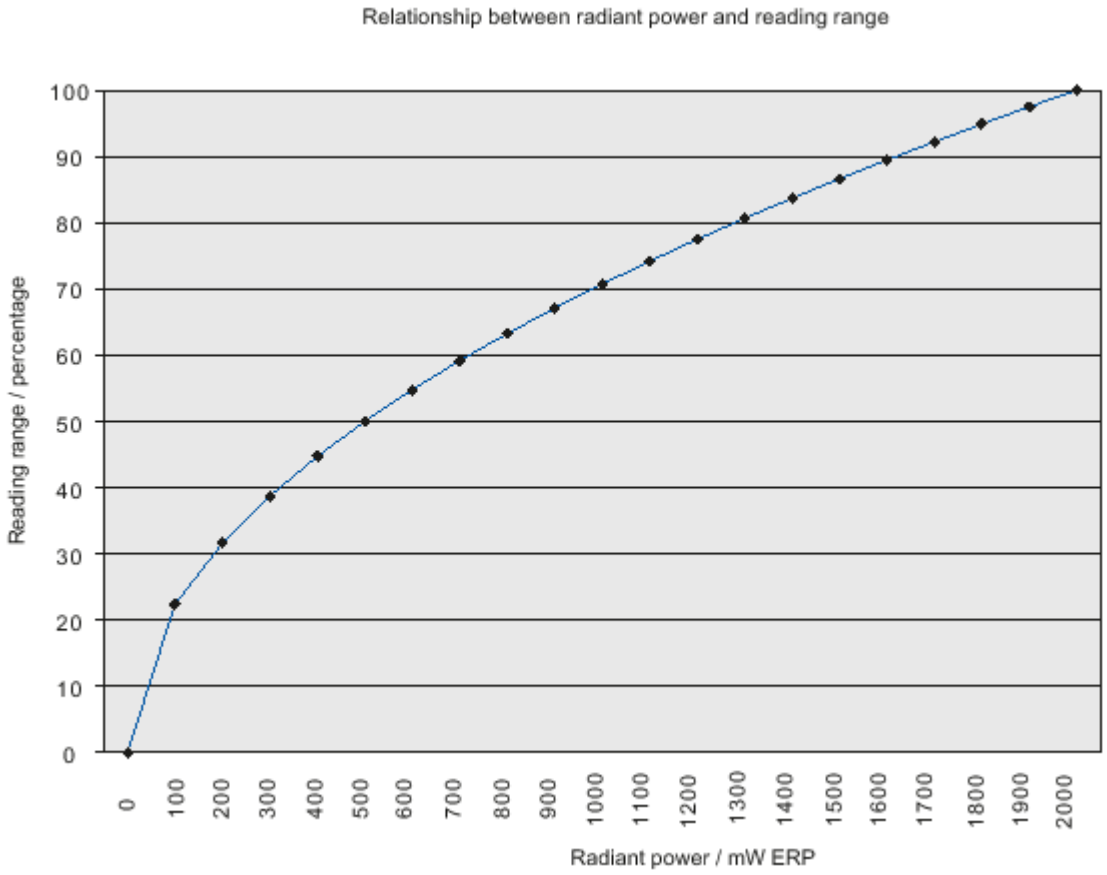
Figure 7-56 Application example

REVIEW

7.11.3.7 Relationship between performance and reading range

The absolute values of the reading ranges specified below refer to a transmit power of 2 W ERP.

When the power is reduced (e.g. when a different reader is used), you will find the corresponding reduced reading ranges in the following table:



REVIEW

7.11.3.8 Use of the transponder in hazardous areas

TÜV NORD CERT GmbH, appointed center no. 0044 as per Article 9 of the Directive 94/9/EC of the European Council of 23 March 1994, has confirmed the compliance with the essential health and safety requirements relating to the design and construction of equipment and protective systems intended for use in hazardous areas as per Annex II of the Directive.

The essential health and safety requirements are satisfied in accordance with standards IEC 60079-0:2011 and EN 60079-11:2012.

This allows the RF680T transponder to be used in hazardous areas for gases, for the device category 2G and gas group IIB, or alternatively in hazardous areas for dusts, for the device category 2D and group IIIB.

Note

Readability of the serial number on the type plate

When using the transponder, make sure that the serial number can be read. The serial number is lasered and can be hidden by paint or other materials making it illegible.

The customer is responsible for making sure that the serial number of a transponder for the hazardous area can be read at all times.

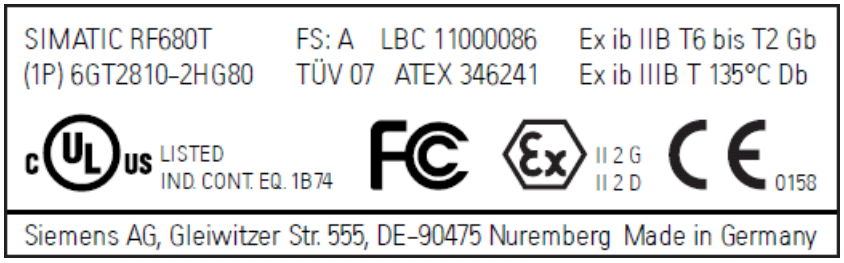
Identification

The identification is as follows:

II 2G Ex ib IIB T6 to T2 Gb or

II 2D Ex ib IIIB T135 °C Db

7.11.3.9 Use of the transponder in hazardous areas for gases



Note

Transponder labeling

The labeling of the front of the transponder shown above is an example and can vary between batches produced at different times.

This does not affect the hazardous area marking.

REVIEW

Temperature class delineation for gases

The temperature class of the transponder for hazardous atmospheres (gases) depends on the ambient temperature and the radiated power of an antenna in the 865 - 868 MHz frequency band within the hazardous area.

WARNING

Ignitions of gas-air mixtures

When using the RF680T transponder, check to make sure that the temperature class is adhered to in keeping with the requirements of the area of application Non-compliance with the permitted temperature ranges while using the transponder can lead to ignitions of gas-air mixtures.

⚠ WARNING
Ignitions of gas-air mixtures The maximum transmitting power of the transmitter used to operate the transponder must not exceed 2 W. Non-compliance with the permissible transmitting power can lead to ignitions of gas-air mixtures.

Temperature class assignment for gases and a radiated power less than 100 mW ERP

If the radiated power of an antenna radiating into the hazardous area or located in the hazardous area and operating in the 865 - 868 MHz frequency band cannot exceed the value 100 mW, the temperature class assignment is as follows:

Ambient temperature range	Temperature class
-25 °C ... +200 °C	T2
-25 °C ... +190 °C	T3
-25 °C ... +125 °C	T4
-25 °C ... +90 °C	T5
-25 °C ... +75 °C	T6

REVIEW

Temperature class assignment for gases and a radiated power less than 500 mW ERP

If the radiated power of an antenna radiating into the hazardous area or located in the hazardous area and operating in the 865 - 868 MHz frequency band cannot exceed the value 500 mW, the temperature class assignment is as follows:

Ambient temperature range	Temperature class
-25 °C ... +220 °C	T2
-25 °C ... +173 °C	T3
-25 °C ... +108 °C	T4
-25 °C ... +73 °C	T5
-25 °C ... +58 °C	T6

Temperature class assignment for gases and radiated power for 1000 mW ERP

If the radiated power of an antenna radiating into the hazardous area or located in the hazardous area and operating in the 865 - 868 MHz frequency band cannot exceed the value 1000 mW, the temperature class assignment is as follows:

Ambient temperature range	Temperature class
-25 °C ... +220 °C	T2
-25 °C ... +151 °C	T3
-25 °C ... +86 °C	T4
-25 °C ... +51 °C	T5
-25 °C ... +36 °C	T6

Temperature class assignment for gases and radiated power for 2000 mW ERP

If the radiated power of an antenna radiating into the hazardous area or located in the hazardous area and operating in the 865 - 868 MHz frequency band cannot exceed the value 2000 mW, the temperature class assignment is as follows:

Ambient temperature range	Temperature class
-25 °C ... +208 °C	T2
-25 °C ... +108 °C	T3
-25 °C ... +43 °C	T4
-25 °C ... +8 °C	T5

REVIEW

Temperature class assignment for gases and a radiated power of 10 mW to 2000 mW ERP

If the radiated power of an antenna radiating into the hazardous area or of an antenna located in the hazardous area in the 865 - 868 MHz frequency band cannot exceed the radiated power selected in the following diagram, the maximum permitted ambient temperature range can be found in the corresponding temperature function of the diagram. This makes the following temperature class assignment valid:

Ambient temperature range	Temperature class
-25 °C ... T_{max} (T2) °C	T2
-25 °C ... T_{max} (T3) °C	T3
-25 °C ... T_{max} (T4) °C	T4
-25 °C ... T_{max} (T5) °C	T5
-25 °C ... T_{max} (T6) °C	T6

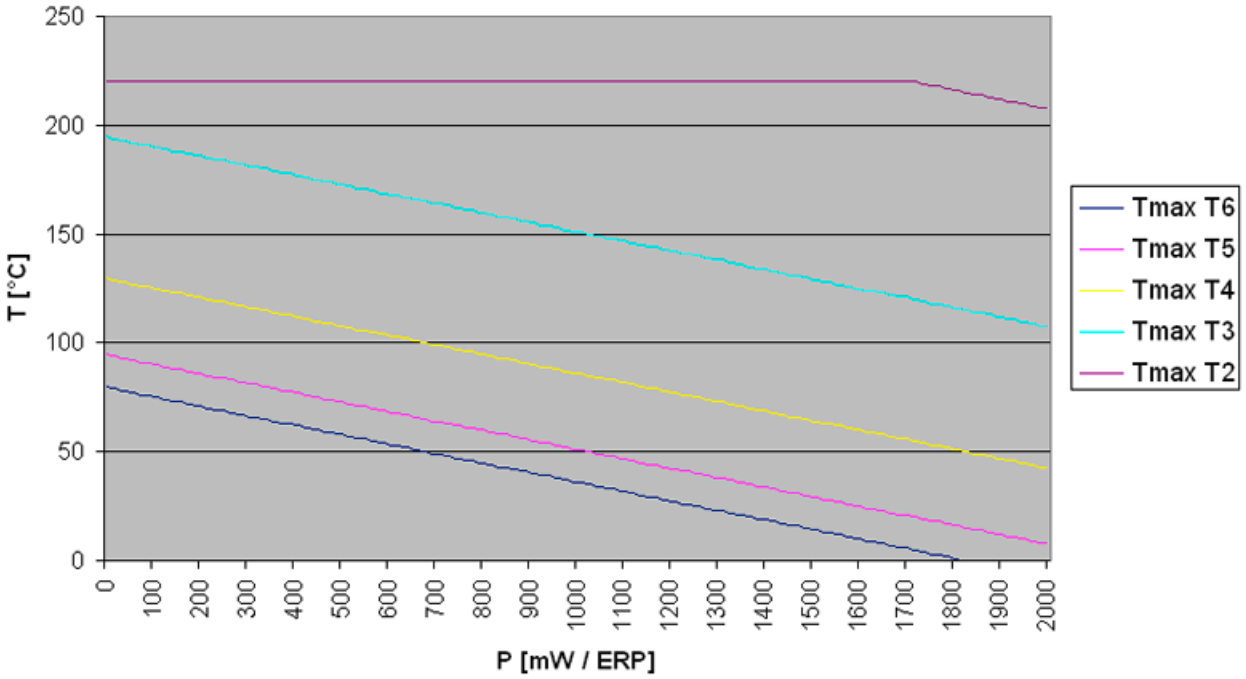


Figure 7-57 Maximum permitted ambient temperature depending on the radiated power

REVIEW

7.11.3.10 Use of the transponder in hazardous areas for dusts

The equipment is suitable for dusts whose ignition temperatures for a dust layer of 5 mm are higher than 210 °C (smoldering temperature). The ignition temperature specified here according to IEC 60079-0:2011 for ignition protection type ib in this case references the smoldering temperature of a layer of combustible flyings (ib IIIA) or alternatively non-conductive dusts (ib IIIB).

Temperature class delineation for dusts

⚠ WARNING

Ignitions of dust-air mixtures

When using the RF680T transponder, check to make sure that the temperature values are adhered to in keeping with the requirements of the area of application Non-compliance with the permitted temperature ranges while using the transponder can lead to ignitions of dust-air mixtures.

Temperature class assignment for dusts and a radiated power less than 100 mW ERP

If the radiated power of an antenna radiating into the hazardous area or located in the hazardous area and operating in the 865 - 868 MHz frequency band cannot exceed the value 100 mW, the temperature class assignment is as follows:

Ambient temperature range	Temperature value
-25 °C ≤ Ta ≤ +125 °C	T135 °C

Temperature class assignment for dusts and a radiated power less than 500 mW ERP

If the radiated power of an antenna radiating into the hazardous area or located in the hazardous area and operating in the 865 - 868 MHz frequency band cannot exceed the value 500 mW, the temperature class assignment is as follows:

Ambient temperature range	Temperature value
-25 °C ≤ Ta ≤ +108 °C	T135 °C

Temperature class assignment for dusts and a radiated power less than 1000 mW ERP

If the radiated power of an antenna radiating into the hazardous area or located in the hazardous area and operating in the 865 - 868 MHz frequency band cannot exceed the value 1000 mW, the temperature class assignment is as follows:

Ambient temperature range	Temperature value
-25 °C ≤ Ta ≤ +86 °C	T135 °C

Ambient temperature range for dust and radiated power of 2000 mW ERP

If the radiated power of an antenna radiating into the hazardous area or located in the hazardous area and operating in the 865 - 868 MHz frequency band cannot exceed the value 2000 mW, the temperature class assignment is as follows:

Ambient temperature range	Temperature value
-25 °C ≤ Ta ≤ +43 °C	T135 °C

REVIEW

Temperature class assignment for dusts and a radiated power of 10 mW ERP to 2000 mW ERP

If the radiated power of an antenna radiating into the hazardous area or located in the hazardous area and operating in the 865 - 868 MHz frequency band can be between the values 10 mW ERP and 2000 mW ERP, the temperature class assignment is as follows:

Ambient temperature range	Temperature value
-25 °C ≤ Ta ≤ $T_{max. ambient}$ °C [1]	135°C [2]

[1] See diagram, orange line

[2] See diagram, blue line

WARNING

Ignitions of dust-air mixtures

Using the RF680T transponder with radiant power greater than 1280 mW ERP, requires compliance with the reduced maximum ambient temperature (see diagram) for maintaining the temperature value to a maximum of 135 °C. Non-compliance with the permitted temperature ranges while using the transponder can lead to ignitions of dust-air mixtures.

The respective temperature value and the maximum allowed ambient temperature in relation to the radiated power of the antenna is shown in the diagram below:

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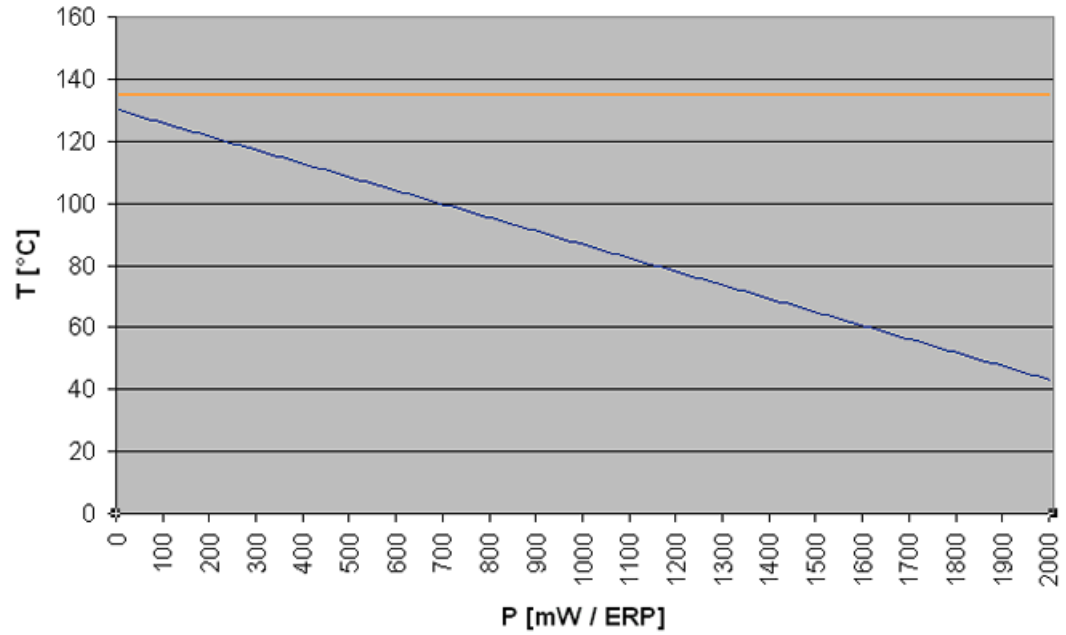

Figure 7-58 Temperature value and maximum permitted ambient temperature in relation to the radiated power

7.11.4 Mounting instructions

Mount the SIMATIC RF680T transponder on the base using two M6 screws.

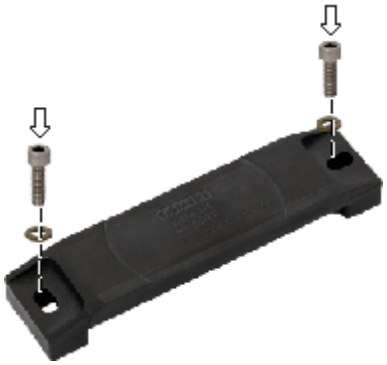

Figure 7-59 Mounting SIMATIC RF680T

Properties	Description
Type of mounting	M6 screw mounting
Tightening torque (at room temperature)	≤ 1 Nm (Note the expansion coefficients of the materials used at high temperatures!)

Note

Reduction of the read/write distance

When mounting on metal or conductive material, ensure that the space below the transponder remains empty.

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7.11.5 Memory configuration of the transponder

The memory configuration of the transponder is described in the section SIMATIC memory configuration of the RF600 transponders and labels (Page 336).

7.11.6 Technical specifications

7.11.6.1 Mechanical data

Property	Description
Dimensions (L x W x H)	130 x 32 x 15 mm
Design	Plastic housing (PPS)
Housing color	Black
Weight	Approx. 50 g
Mounting on metal	Yes

7.11.6.2 Electrical data

Characteristic	Description	
	Europe	USA/Canada
Air interface	According to ISO 18 000-6 C	
Frequency range	865 ... 868 MHz	915 ... 928 MHz [1]
Necessary transmit power	2 W (ERP)	4 W (EIRP)
Range [2]	max. 7 m	
Polarization type	Linear	
Energy source	Magnetic energy via antenna, without battery	
Multitag capability	yes, minimum distance between data carriers ≥ 50 mm [3]	

[1] Reduction of range to about 70% at the band limit 928 MHz on metal surfaces; acquisition is guaranteed at 921 MHz due to the frequency hopping procedure.

[2] Mounting on a flat metal surface with a diameter of at least 300 mm and at room temperature. The information relates to the maximum read range. You will find more information on ranges in the section "Minimum distances and maximum ranges (Page 344)".

[3] When these minimum distances are not reached, there is a reduction in the maximum possible read and write distances of the transponder.

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7.11.6.3 Memory specifications

Property	Description
Type	EPC Class 1 Gen2
Memory organization	96 bits/240 bits EPC code
User memory	64 bytes
Protocol	ISO 18000-6C
Data retention time	10 years
Read cycles	Unlimited
Write cycles	Typ. 1 000 000 (at +40 °C)

7.11.6.4 Environmental conditions

Property		Description	
Ambient temperature	• Operation	-25 °C ... +100 °C	Permanent
		from 100 °C ... +140 °C	20% reduction in the limit distance
		+200 °C [2]	Tested up to 5000 hours or 3000 cycles
		+220 °C	Tested up to 2000 hours or 1500 cycles
		Temperature range when operating in areas at risk of a gas explosion with temperature class T2-T6	See also Use of the transponder in hazardous areas for gases (Page 448) [3]
		Temperature range when operating in areas at risk of dust explosions with T135 °C	See also Use of the transponder in hazardous areas for dusts (Page 451) [3]
	• Transport and storage	-40 °C ... +100 °C	
Shock Vibration compliant with EN 60721-3-7 Class 7 M3		50 g, [1] 20 g [1]	
Torsion and bending load		Not permissible	
Degree of protection		• IP68 according to EN 60529: (60 minutes. Immersion in cleaning fluids, fluid depth 5 m top edge of housing) • Dipping lacquer • IPx9K (steam jet: 150 mm; 10 to 15 l/min; 100 bar; 75 °C)	
Silicone-free		Yes	
MTBF		$1{,}6 \cdot 10^7$ h	

[1] The values for shock and vibration are maximum values and must not be applied continuously.

[2] Note that no processing is possible at temperatures of +140 °C or higher.

[3] Directive 94/9/EC of the European Council of 23 March 1994 must be complied with, see also Chapter "Using the transponder in hazardous areas (Page 447)".

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7.11.6.5 Chemical resistance of the RF680T transponder

The following table provides an overview of the chemical resistance of the data memory made of polypropylene sulfide.

	20 °C	65 °C
Ammonia, w. conc.	○	-
Butane gas	+	+
Butyl acetate (acetic acid butyl ester)	+	+
Calcium chloride	+	+
Chlorine	-	-
Chrome baths, tech.	-	-
Acetic acid, w. 10%	+	+
Ethyl alcohol, w., undenaturated	+	+
Formaldehyde	+	+
Isopropanol	+	+
Methyl alcohol	+	+
Lactic acid, w.	+	+
Sodium carbonate, w. (soda)	+	+
Sodium chloride, w.	+	+
Sodium hydroxide 10%	+	+
Nitrobenzol	○	-
Phosphoric acid	-	-
Propane	+	+
Nitric acid 10%	-	-
Hydrochloric acid 10%	-	-
Sulfur dioxide, minimal	+	+
Sulfuric acid 25%	-	-
Hydrogen sulfide, dry	+	+
Carbon tetrachloride	○	-

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Abbreviations	
+	Resistant
○	Limited resistance
−	Not resistant

7.11.7 Certificates and approvals

Table 7- 31 6GT2810-2HG80 - RF680T - Europe

Certificate	Description
CE	Conformity with R&TTE directive For Directive 94/9/EC: EC type test certification no. TÜV 07 ATEX 346241 Recognition of the quality assurance BVS 11 ATEX ZQS/E111

Table 7- 32 6GT2810-2HG80- RF680T - USA / Canada

Standard	
FCC Federal Communications Commission	Passive labels or transponders comply with the valid regulations; certification is not required.
c UL us	This product is UL-certified for the USA and Canada. It meets the following safety standard(s): • UL508 - Industrial Control Equipment • CSA C22.2 No. 142 - Process Control Equipment • UL Report E 120869

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7.11.7.1 EC Declaration of Conformity according to directive 94/9/EG RF680T Version 1

The type test certification for the RF680T Version 1 is stored by TÜV 07 ATEX 346241. On the basis of this certification, the CE declaration by the manufacturer has been made according to directive 94/9/EC.
The producing factory of the RF680T Version 1 has an ATEX quality assurance system recognized by the DEKRA EXAM GmbH with certificate number BVS 11 ATEX ZQS/E111.

Manufacturer's address - distributor

Siemens Aktiengesellschaft
Industry Sector (I)
Industry Automation Division (IA)
Sensors and Communication (SC)
Communication and Identification (CI)
Gleiwitzer Str. 555
D-90475 Nürnberg, Germany

Manufacturer's address - factory

Siemens Aktiengesellschaft
Industry Sector (I)
Industry Automation Division (IA)
Control Components and System Engineering (CE)
Würzburger Straße 121
D-90766 Fürth, Germany

7.11.8 Dimension drawing

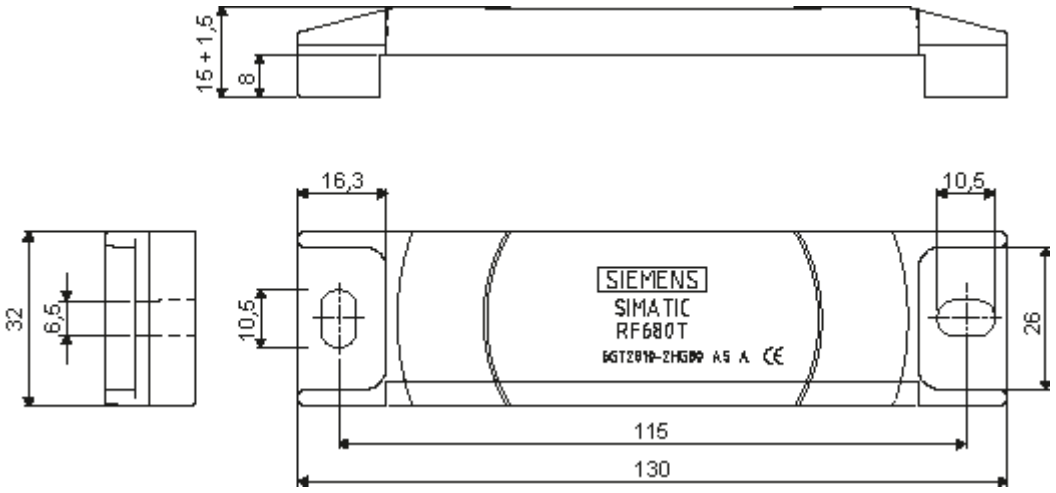

Figure 7-60 Dimension drawing of SIMATIC RF680T

Units of measurement: All dimensions in mm

Tolerances, unless indicated otherwise, are +-0.5 mm.

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Integration into networks

8

8.1 Overview of parameterization of RF600 reader

The parameter assignment possibilities that are available to you for each reader of the RF600 family are outlined below. You will find detailed information on parameter assignment in the specified chapters of the documentation:

Reader	SIMATIC command messages	RF-MANAGER Basic	XML commands	RFID reader interface
RF620R/ RF630R:	"Configuration Manual RF620R/RF630R", chapter "Overview of commands"	-	-	-
RF640R/ RF670R	-	Online help > chapter "Working with RFID objects"	SIMATIC RF Function Manual, Chapter "Standard Configuration Messages"	-
RF650R/ RF680R/ RF685R	"Configuration manual RF650R/RF680R/RF685R" section "Interface to the SIMATIC controller"	-	"Configuration manual RF650R/RF680R/RF685R" section "XML interface"	-
RF680M	-	-	-	Function Manual Mobile Reader, section "RFID Reader Interface Reference"

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8.2 Integration in IT networks via the user application

Connecting the readers RF640R/RF670R using XML

If you want to create your own applications for the RF640R/RF670R reader, you can do this using the XML-based interface of the reader. For information about XML commands, refer to the "SIMATIC RF Function Manual" .

Connecting the readers RF650R/RF680R/RF685R using XML

If you want to create your own applications for the RF650R/RF680R/RF685R reader, you can do this using the XML-based demo application of the reader. You will find information on the XML commands in the configuration manual "SIMATIC RF650R/RF680R/RF685R".

8.3 Integration in SIMATIC networks

Connecting the readers RF620R/RF630R

RF620R and RF630R readers are connected to the SIMATIC controller via the following communications modules:

- SIMATIC RF170C
- SIMATIC RF180C
- ASM 456
- ASM 475

The RF182C communications module is connected with the PC directly over Ethernet.

Connecting the RF680R/RF685R readers

The RF680R/RF685R readers can be connected to a SIMATIC controller via PROFINET.

Note

Connection to the SIMATIC network planned

A connection via the ASM 456 and RF180C communications modules is currently being planned. This connection allows operation of the devices via PROFINET and PROFIBUS. With the help of the communications modules, the readers can also be connected in series.

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Options for connecting via communications modules

Table 8- 1 Option for connecting the readers via communications modules

Function blocks	Communications modules						
	ASM 456	RF170C [1]	RF180C	ASM 475 [1]	RF182C [2]	RF160C [1] [2]	RFID 181EIP [2]
FB 45	1 - 2 readers	1 - 2 readers	1 - 2 readers	1 - 2 readers	N/A	N/A	N/A
FB 55	1 - 2 readers	1 - 2 readers	1 - 2 readers	1 - 2 readers	N/A	N/A	N/A
XML	N/A	N/A	N/A	N/A	1 - 2 readers	N/A	N/A
FC 44	N/A	N/A	N/A	N/A	N/A	1 - 2 readers	N/A
Ethernet/IP	N/A	N/A	N/A	N/A	N/A	N/A	1 - 2 readers

With all possible combinations, the input voltage at the communications module must not be below 21.6 V. The CMs/ASMs may only be operated in an ambient temperature of maximum 55 °C.

[1] If 2 readers are used with a CM/ASM, the CM/ASM may only be operated at a maximum ambient temperature of 35 °C.

[2] The communications modules do not currently support multitag operation.

Communications modules and function blocks

Table 8- 2 Properties of the communications modules

ASM/CM	Interfaces to the application (PLC)	Interfaces to the reader	Function blocks	Reader connections	Dimensions (W x H x D) in mm	Temperature range	Degree of protecti on
ASM 456	PROFIBUS DP-V1	2 x 8-pin connection socket, M12	FB 45 FC 55	2 (parallel)	60 x 210 x 54 or 79	0 ... +55 °C	IP67
SIMATIC RF170C	PROFIBUS DP-V1 PROFINET IO	2 x 8-pin connection socket, M12	FB 45 FC 55	2 (parallel)	90 x 130 x 60	-25 ... 55° C	IP67
SIMATIC RF180C	PROFINET IO	2 x 8-pin connection socket, M12	FB 45	2 (parallel)	60 x 210 54	0 ... +60° C	IP67
SIMATIC RF182C	TCP/IP	2 x 8-pin connection socket, M12	-	2 (parallel)	60 x 210 x 54	0 ... +60° C	IP67

The following configuration graphics show which readers can be connected to which interface modules/communications modules.

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Configuration with SIMATIC RF170C

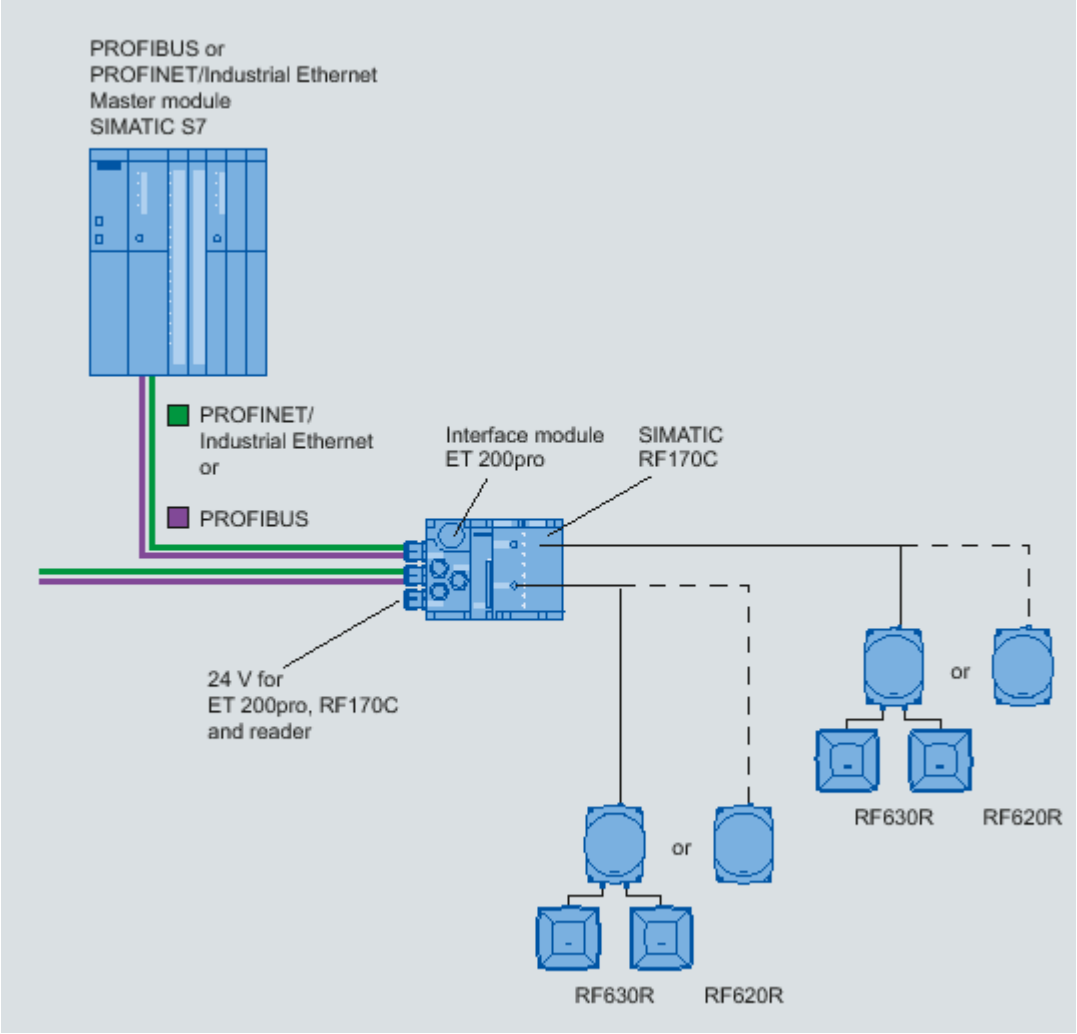

Figure 8-1 Configuration with SIMATIC RF170C

For more detailed information, refer to SIMATIC RF170C Operating Instructions (http://support.automation.siemens.com/WW/view/en/32622825).

Configuration with SIMATIC RF180C

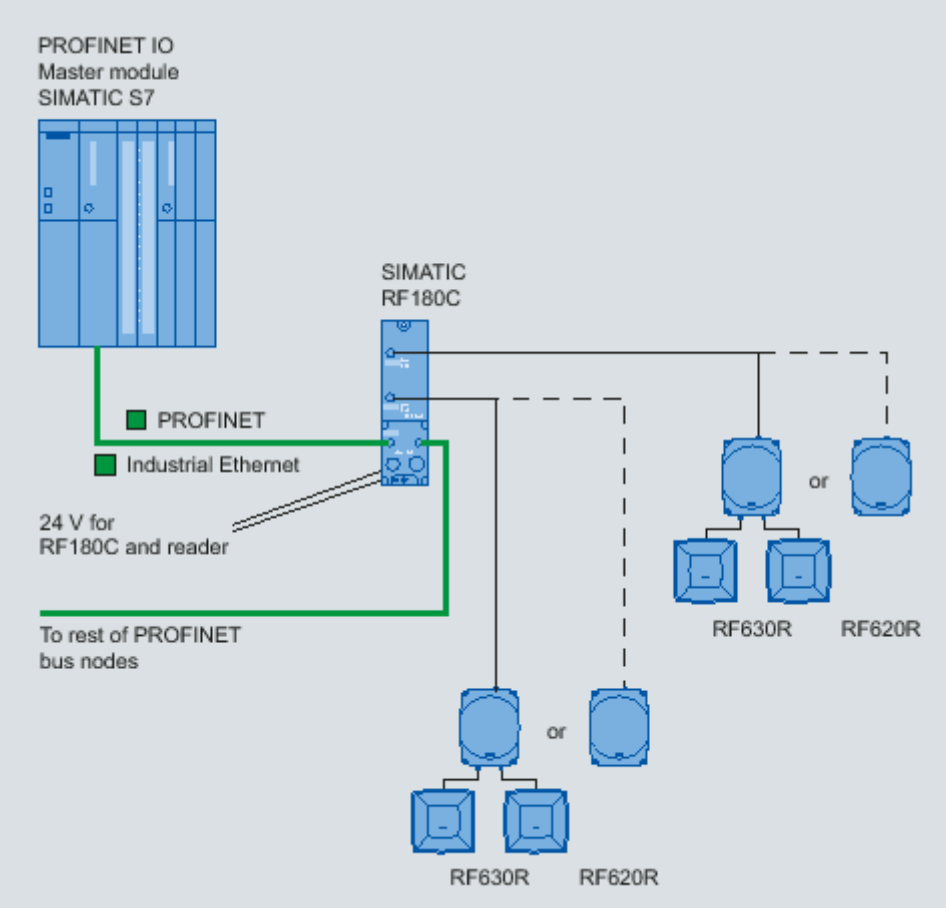

Figure 8-2 Configuration with SIMATIC RF180C

For more detailed information, refer to SIMATIC RF180C Operating Instructions (http://support.automation.siemens.com/WW/view/en/30012157).

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Configuration with ASM 456

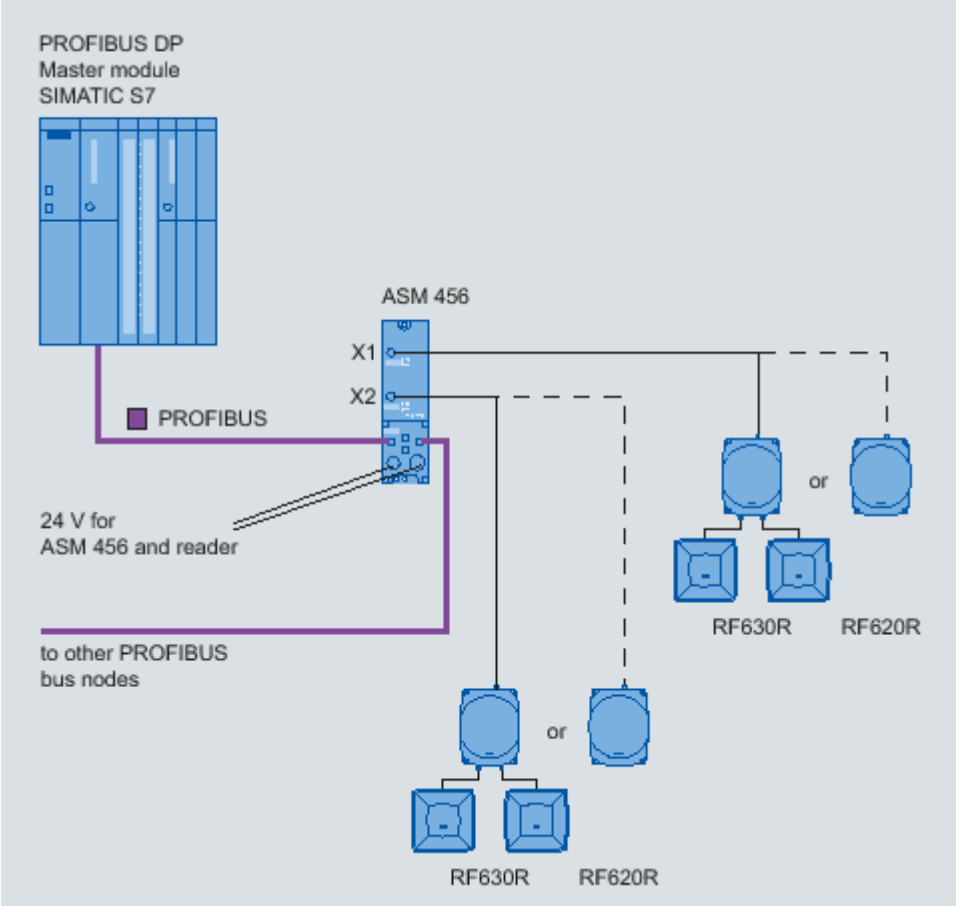

Figure 8-3 Configuration with ASM 456

For more detailed information, refer to ASM 456 Operating Instructions (http://support.automation.siemens.com/WW/view/en/32629442).

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Configuration with RF182C

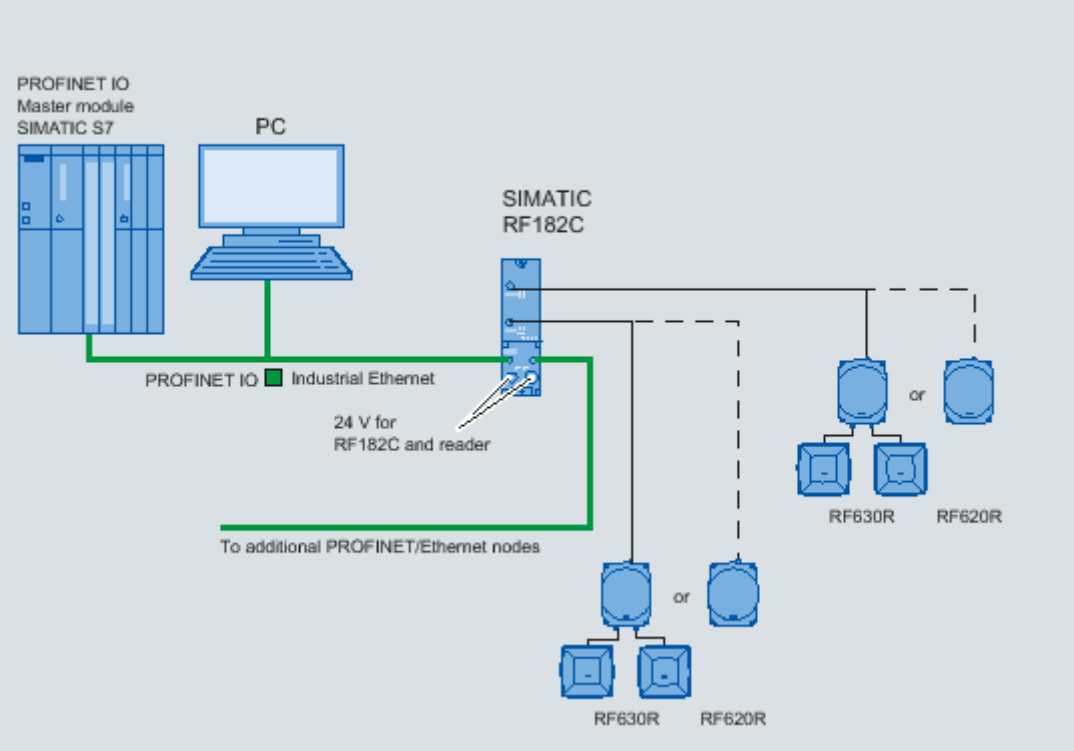

Figure 8-4 Configuration with SIMATIC RF182C

For more detailed information, see SIMATIC RF182C Operating Instructions (http://support.automation.siemens.com/WW/view/en/38507897)

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System diagnostics

9

9.1 Error messages and flash codes for RF620R/RF630R

error_MOBY

The ERR LED of the reader flashes when there are error messages. Some errors are also indicated by the flashing ERR LED of the CM.

Table 9- 1 Error messages of the communications module via the "error_MOBY" variable

Error code (B#16#..)	Flashing of ERR LED	Description
00	–	No error Default value if everything is ok
	1x	Boot message
01	2x	Presence error, possible causes: • The active command was not carried out completely • The transponder left the field while the command was being processed • Communication problem between reader and transponder The next command is automatically executed on the next transponder. A read or write command is possible. If the write command is aborted with error code 01, inconsistencies between the expected and actual data may occur on the data carrier. Repeat the read/write command.
03	3x	Problem on the connection to the reader or antenna problem. • The cable between the communications module and reader is wired incorrectly or there is a cable break • Antenna error: (Cable is defective), cable is no longer connected • The 24 V supply voltage is not connected or is not on or has failed briefly • Automatic fuse on the CM has blown • Hardware defect • Another reader is in the vicinity and is active • Interference on reader - or PROFIBUS line • Execute "init_run" after eliminating the problem

Error code (B#16#..)	Flashing of ERR LED	Description
05	5x	Command/parameter assignment error, possible causes: • Unknown command • Incorrect parameter • Function not allowed • Mode in "SET-ANT" command unknown FB 45 / FB 55 is sending an uninterpretable command to the communications module. • "command_DB" contains invalid command parameters • The "command_DB" was overwritten by the user • The transponder has signaled an address error
06	6x	Field disturbance on reader The reader is receiving interference pulses from the environment. • The distance between two readers is too small and does not correspond to the configuration guidelines • The connecting cable to the reader is defective or too long or does not comply with the specification
07	7x	No free ETSI transmit channel
09	9x	Wrong communications standard selected in the "init_run" command (e.g. FCC for ETSI reader)
0B	11x	Transponder memory cannot be read correctly or cannot be written to. The transponder signals an error. Options for troubleshooting: • Increase power • Change antenna alignment • Avoid field interference
0C	12x	Memory of the transponder cannot be written to • Transponder memory is defective • Memory is write-protected (Memory Locked: 000000100B) (The transponder memory is PERMA-locked and cannot be overwritten or the reader password has to be reset)
0D	13x	Error in specified address (address error) • The specified address does not exist on the transponder • The command must be checked and corrected. • This is not the correct transponder type. • Access attempted to non-existent or non-accessible memory areas (Memoryoverrun: 00000011B)
0E	14x	Password error • Incorrect transponder password (the reader password must be set again so that it matches the password).

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Error code (B#16#..)	Flashing of ERR LED	Description
0F	1x	Start-up message from CM. The CM was off and has not yet received an "init_run" command • "init_run" needs to be executed • The same physical CM channel is used in two (or more) UDT 10 structures. Check "ASM_address" and "ASM_channel" in all UDT 10 structures.
10	16x	"NEXT" not possible or not permitted • CM is operating without MDS control ("MDS_control = 0,1") • CM has already received a "NEXT" command • CM/reader does not recognize a "NEXT" command "REPEAT" after forbidden commands: • "REPEAT" for "SET-ANT" • "REPEAT" for "SLG-STATUS"
11	–	Short circuit or overload of the 24 V outputs (DQ, error code, presence) • The affected output is turned off • All outputs are turned off when total overload occurs • A reset can only be performed by turning the 24 V voltage off and on again • Then start "init_run"
12	18x	Internal CM communication error. • Connector contact problem on the CM • Defective CM hardware – Return CM for repair • Start the "init_run" command after eliminating the problem
13	19x	• CM/reader does not have enough buffer space to store the command temporarily. • Maximum allowable number of 150 commands in a command chain was ignored. If "REPEAT" is used in conjunction with a command chain, the maximum number of commands is also 150 (including the number of commands from a command repetition). If a command chain contains more than 150 commands, after the 150th command is called, it will be stopped and the above error message will be sent without processing the complete chain. Commands in the command chain that have already been executed can still be sent later after the error message "0x13" is sent.
14	20x	Internal CM/reader error. • Program sequence error on the CM • Cycle power to the CM • Start the "init_run" command after eliminating the problem • Watchdog error on reader

Error code (B#16#..)	Flashing of ERR LED	Description
15	21x	Bad parameter assignment of the CM/reader • Check INPUT parameters in UDT 10 • Check parameters in HW Config • Transmit power set too high • Unused parameter bits are not 0. • "init_run" command has incorrect parameters • After a start-up, the CM has still not received an "init_run". • "scanning_time = 0x00" parameter was set (no standard selected).
16	22x	The FB command cannot be executed with the CM parameter assignment on PROFIBUS. • Length of the input/output areas too small for the cyclic I/O word. Did you use the right GSD file? • FB command (e.g. read) has too much user data (data length > 233 bytes)
17	23x	Communication error between FB 45 / FB 55 and communications module. Handshake error • "Params_DB" (UDT 10) of this CM station is overwritten by other parts of the program • Check parameter assignment of communications module in UDT 10 • Check FB 45/FB 55 command that caused this error • Start the "init_run" command after eliminating the problem
18	–	An error has occurred that must be acknowledged with an "init_run". • A temporary short circuit has occurred on PROFIBUS • The "init_run" command is incorrect • Start the "init_run" command after eliminating the problem • Check the parameters "ASM_address", "ASM_channel" and "MOBY_mode".
19	25x	Previous command is active or buffer overflow The user sent a new command to the CM although the last command was still active. • Active command can only be terminated with an "init_run" • Before a new command can be started "READY-Bit = 1 must be set; exception: "init_run" • Two FB 45/FC 55 calls were set with the same "ASM_address" and "ASM_channel" parameters • Two FB 45/FC 55 calls are using the same "Params_DB" pointer • Start the "init_run" command after eliminating the problem • When command repetition (e.g. read-only MDS) is used, no data is fetched from the transponder. The data buffer on the CM has overflowed. Transponder data has been lost.

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Error code (B#16#..)	Flashing of ERR LED	Description
1A	–	PROFIBUS DP error occurred. • The PROFIBUS DP bus connection was interrupted – Wire break on the bus – Bus connector on CM was removed briefly • PROFIBUS DP master does not address CM anymore • "init_run" needs to be executed • The CM has detected a frame interruption on the bus. PROFIBUS may have been reconfigured (e.g. with HW Config). This error is only indicated when access monitoring has been enabled in the PROFIBUS configuration.
1B	27x	There is an inconsistency in the parameter assignment of the reader. Parameters were probably set in the Advanced User Parameter parameter with which the reader cannot work. • ETSI performance testing faulty
1C	28x	• Antenna is already switched off • Antenna is already switched on • Mode in "SET-ANT" unknown.
1D	–	More transponders are located in the antenna field than can be processed simultaneously by the reader. A read or write command was sent to a transponder (UID) and one of the following conditions was met at the same time: • Only 1 transponder at a time can be processed with FB 45. • With FB 45 and FB 55: there is more than one transponder with the same EPC-ID in the antenna field of the reader. Countermeasures: • with FB 55: Increase the value in multitag or decrease the number of transponders in the field. • with FB 55 (with MOBY_mode = 7): There is one or more transponder in the antenna field for which the content of the "FF00 – FF03" addresses of the EPC-ID does not match (uniqueness when accessing transponders using a UID with the length of 8 bytes). • Power supply of the transponder in the limit range: Due to short-term power shortage, a transponder loses its communication status (session) and the identical EPC-ID is sent a second time as soon as power is above the limit value again. Increase the reader's radiated power and/or reduce the distance between antenna and transponder until this effect no longer occurs.

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Error code (B#16#..)	Flashing of ERR LED	Description
1E	30x	Wrong number of characters in the command message frame.
1F	31	Active command canceled by "RESET ("init_run" or "cancel") or bus connector removed • Communication with the transponder was aborted by "init_run" • This error can only be reported if there is an "init_run" or "cancel"

*) You will find the meaning of the error numbers in the EPC Global Class 1 Gen 2 document, Annex I.

error_FB

Table 9- 2 Error variable "error_FB"

Error code (B#16#...)	Description
00	No error; default value if everything is ok
01	"Params_DB" is not available in SIMATIC
02	"Params_DB" is too small • UDT 10/11 was not used during definition • "Params_DB" must be 300 bytes in length (for each channel) • "Params_DB", "Params_ADDR" - check that they are correct
03	The DB after the "command_DB_number" pointer is not available in the SIMATIC controller.
04	The "command_DB" on the SIMATIC controller is too small • UDT 20/21 was not used during command definition • The last command in the "command_DB" is a chained command; reset the chaining bit • Check the "command_DB_number/command_DB_address" command pointer
05	Invalid command type • Check the "command_DB_number/command_DB_address" command pointer • Check the actual values in the "command_DB" – "init_run" needs to be executed

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Error code (B#16#...)	Description
06	Unexpected acknowledgement received. The parameters of the command and acknowledgement frame do not match ("command", "length", "address_MDS"). • The user changed the "command_DB_number/-_address" pointer during command execution. • The user changed the command parameters in the MOBY CMD data block (UDT 20) during command execution. • Check the parameter assignment of "ASM_address" and "ASM_channel". "ASM_address" and "ASM_channel" have the same parameter assignment for different channels. • The acknowledgement counter and command counter between the CM and FB are no longer synchronized – "init_run" needs to be executed
07	The "MOBY_mode" or "MDS_control" parameter (defined in UDT 10) has an invalid value
08	A bus error has occurred that is signaled by system functions SFB 52/53. More information on this error is available in the "error_BUS" variable. • "ASM_address" or "ASM_channel" not available • "init_run" needs to be executed
09	The CM has failed. • Loss of power on CM • PROFIBUS connector removed or PROFIBUS cable interrupted • "ASM_address" or "ASM_channel" not available This error is indicated if the "ASM_failure" bit was set in OB 122. OB 122 is called if FB 45 can no longer access the cyclic word for the CM.
0A	Another "init_run" was started while "init_run" was executing without waiting for "ready" • "init_run" must not be not set cyclically • The same physical channel/reader is used in two (or more) UDT 10 structures. Check "ASM_address" and "ASM_channel" in all UDT 10 structures.
0B	"init_run" cannot be executed; cyclic process image for the CM is disrupted; FB 45 reports a timeout of the process image for the CM The timeout time can be adapted in DBB 47 of UDT 10 if required. The default value is 50 (dec.) = 2 seconds. Greater values (255 max.) increase the timeout time. • "ASM_address" in UDT 10 has bad parameter settings. The "ASM_address" may be on the wrong module. • "ASM_channel" setting is ≥16 or ≤0 • CM hardware/firmware is faulty. • The same physical channel/reader is used in two (or more) UDT 10 structures. Check "ASM_address" and "ASM_channel" in all UDT 10 structures.

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Error code (B#16#...)	Description
0C	Area length error on block move for FB 45. • "DAT_DB" does not exist or is set too small. "DAT_DB_number" and "DAT_DB_address" in UDT 20 need to be checked • Write command with length = 0 was sent • "init_run" needs to be executed
0D	An "init_run" was not completed correctly. The process image is inconsistent. This message is equivalent to a timeout. A timeout is reported 15s after starting "init_run". This time can be adjusted when necessary in DBW 44. • Execute "init_run" again • Turn CM off and on again • The "RUN-STOP" switch on the CPU was pressed rapidly several times in succession (particularly with slow PROFIBUS baud rates) • The same physical channel/reader is used in two (or more) UDT 10 structures. Check "ASM_address" and "ASM_channel" in all UDT 10 structures.

error_BUS

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Note

The following table of bus errors does not claim to be complete. If you receive any messages that are not documented here, you will find them in the manual "System and standard functions S7-300/400, volume 1/2 (http://support.automation.siemens.com/WW/view/en/44240604)".

Table 9- 3 Error variable "error_BUS" when operating via PROFIBUS/PROFINET

Error code (W#16#...)	Description
800A	CM is not ready (temporary message) • This message is received by a user who is not using FB 45 and is querying the CM acyclically in very quick succession.
8x7F	Internal error in parameter x. Cannot be remedied by the user.
8x22 8x23	Area length error when reading a parameter. Area length error when writing a parameter. This error code indicates that parameter x is partially or completely outside the operand range or the length of a bit array for an "ANY" parameter is not divisible by 8.
8x24 8x25	Area error when reading a parameter. Area error when writing parameter. This error code indicates that parameter x is in an area not allowed for the system function.
8x26	Parameter contains a time cell number that is too high.

Error code (W#16#...)	Description
8x27	Parameter contains a counter cell number that is too high.
8x28 8x29	Alignment error when reading a parameter. Alignment error when writing a parameter. The reference to parameter x is an operand whose bit address is not equal to 0.
8x30 8x31	The parameter is located in the write-protected global DB. The parameter is located in the write-protected instance DB.
8x32 8x34 8x35	The parameter contains a DB number that is too high. The parameter contains an FC number that is too high. The parameter contains an FB number that is too high.
8x3A 8x3C 8x3E	The parameter contains a DB number that is not loaded. The parameter contains an FC number that is not loaded. The parameter contains an FB number that is not loaded.
8x42 8x43	An access error occurred while the system was attempting to read a parameter from the I/O area of the inputs. An access error occurred while the system was attempting to write a parameter to the I/O area of the outputs.
8x44 8x45	Error on nth (n > 1) read access after an error occurred. Error on nth (n > 1) write access after an error occurred.
8090	Specified logical base address is invalid: There is no assignment in SDB1/SDB2x, or it is not a base address.
8092	A type other than "BYTE" has been specified in an "ANY" reference.
8093	The area identifier contained in the configuration (SDB1, SDB2x) of the logical address is not permitted for these SFCs. Permitted: • 0 = S7-400 • 1 = S7-300 • 2, 7 = DP modules
80A0	Negative acknowledgment when reading from module; FB fetches acknowledgment although no acknowledgment is ready. A user who is not using the FB 45 would like to fetch DS 101 (or DS 102 to 104) although no acknowledgment is available. • Execute an "init_run" for resynchronization between CM and application
80A1	Negative acknowledgment while writing to the module. FB sends command although a CM is unable to receive a command
80A2	DP protocol error with layer 2 • DP-V1 mode must be set in the header module for distributed I/O. • Possible hardware defect
80A3	DP protocol error in Direct-Data-Link-Mapper or User-Interface/User. Could be a hardware defect.
80B0	• SFC not possible for module type. • Data record unknown to module. • Data record number ≥ 241 is not allowed. • Data records 0 and 1 are not permitted for SFB 52/53 "WR_REC".
80B1	The length specified in the "RECORD" parameter is wrong.
80B2	The configured slot is not occupied.

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Error code (W#16#...)	Description
80B3	Actual module type is not the expected module type specified in "SDB1"
80C0	• RDREC: The module has the record, but there is no read data there yet. • WRREC: CM is not ready to receive new data – Wait until the cyclic counter has been incremented
80C1	The data of the preceding write job on the module for the same data record have not yet been processed by the module.
80C2	The module is currently processing the maximum possible number of jobs for a CPU.
80C3	Required resources (memory, etc.) are currently in use. This error is not reported by the FB 45. If this error occurs, the FB 45 waits until the system is able to provide resources again.
80C4	Communication error • Parity error • SW ready not set • Error in block length management • Checksum error on CPU side • Checksum error on module side
80C5	Distributed I/O not available.

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9.2 Flashing codes RF640R/RF670R

Flashing of ERR LED		Error description
Number	Repetitions	
Lit constantly	Permanent	Reader inactive, no configuration data
3	Permanent	Antenna 1 not connected or defective
4	Permanent	Antenna 2 not connected or defective
5	Permanent	Antenna 3 not connected or defective
6	Permanent	Antenna 4 not connected or defective
11	3 times	Reading of user-defined memory has failed
12	3 times	Writing of user-defined memory has failed
13	3 times	The "SendCommand" function has failed
14	3 times	Wrong or missing password
15	3 times	Writing the transponder ID failed
16	3 times	LOCK has failed
17	3 times	KILL has failed
18	3 times	Access to impermissible memory areas
19	3 times	Too many transponders in the antenna field
20	Permanent	General software errors
29	3 times	Invalid frame; Bad frame parameters
30	3 times	Incorrect message frame format
31	3 times	The "SetReadProtect" NXP function has failed
32	3 times	The "ResetReadProtect" NXP function has failed
33	3 times	General error during identification of transponders (inventory)

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The LED states are described in the section Status display (Page 179).

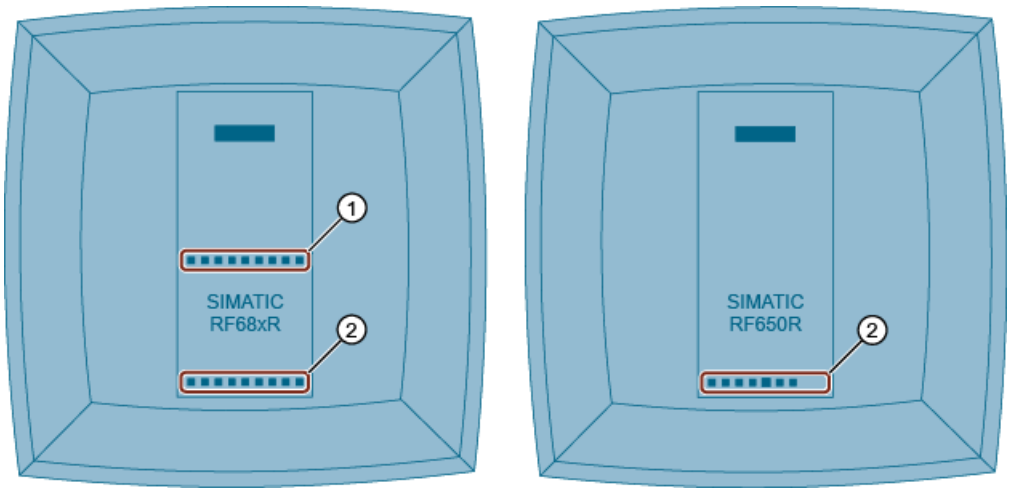
9.3 Error messages RF640R/RF670R

A description of the RF640R/RF670R error codes can be found in the "SIMATIC RF Function Manual".

9.4 LED displays RF650R/RF680R/RF685R

Note that the RF650R reader does not provide an LED status display. With the help of the LED displays, you can read out the status and the error messages of the RF680R/RF685R readers.

The LED status display is in the middle on the front of the reader. The LED operating display is at the bottom on the front of the reader.



① LED status display (ST1 - ST9) - RF680R/RF685R only

② LED operating display

- RUN/STOP (R/S) — Shows whether the reader is ready for operation.
- ERROR (ER) — Indicates whether an error has occurred.
- MAINTENANCE (MAINT) — Shows whether the reader needs maintenance.
- POWER (PWR) — Shows whether the reader is supplied with power.
- PRESENCE (PRE) - RF650R only — Shows whether one or several transponders are located in the antenna field.
- LINK 1 (LK1) — Shows that there is a connection via Ethernet interface "1".
- RECEIVE/TRANSMIT 1 (R/T1) — Shows that data is being sent and/or received via Ethernet interface "1".
- LINK 2 (LK2) - RF680R/RF685R only — Shows that there is a connection via Ethernet interface "2".
- RECEIVE/TRANSMIT 2 (R/T2) - RF680R/RF685R only — Shows that data is being sent and/or received via Ethernet interface "2".

Figure 9-1 LED displays of the reader

With the LED operating display, you can read out the various operating statuses of the readers. The LED status display of the RF680R and RF685R readers has several functions. Among other things, the status display provides the following functions:

REVIEW

- Error display

  If there is an error, the actual error is indicated by the lighting/flashing pattern. You will find more information on error messages in the section "xx".

- Display of RF activity

  Indicates that one or more transponders were detected. This function is indicated by the RF650R reader using the PRE LED.

- Indication of the quality of the antenna alignment (RSSI)

  When aligning the antenna, the status display indicates the RSSI value with which the transponder was detected. You will find more information on antenna alignment in the section "xx".

9.4.1 LED operating display

The LED displays indicate the current reader status according to the following scheme:

Table 9- 4 Display of the reader status with the LEDs

Operating display LEDs									Status display LEDs	Meaning
R/S	ER	MT	P	PRE	LK1	R/T 1	LK2	R/T 2		
○	○	○							○○○○○○○○	Reader turned off
●	●	●							●●●●●●●●	Reader turned on (after startup)
●	n. r.	n. r.							n. r.	Reader ready for operation
☼	n. r.	n. r.							n. r.	Reader working

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9.4.2 Error display by LEDs

The display of the error messages using the LEDs is described in the section "Error messages RF640R/RF670R (Page 479)".

Accessories

10

10.1 Wide-range power supply unit for SIMATIC RF systems

10.1.1 Features

Wide-range power supply unit for SIMATIC RF systems	
	(1) DC output 1 (2) DC output 2 (3) Mains connection
Features	
• Wide-range input (3) for use worldwide • Dimensions without mains cable: 175 x 85 x 35 mm • Dimensions including mains cable: 250 x 85 x 35 mm • CE-compliant (EU and UK versions) • UL-certified for US and Canada (US version) • Mechanically and electrically rugged design • Secondary side (1), (2): 24 V DC / 3 A • Short-circuit and no-load stability • Suitable for frame mounting • 3 versions for use in the EU, UK, US	

REVIEW

Description

The wide-range power supply unit for SIMATIC RF systems is a universal compact power supply and provides the user with an efficient, cost-saving solution for many different mid-range power supply tasks.

The primary switched power supply is designed for use on single-phase AC systems. The two DC outputs (sockets) are connected in parallel and protected by a built-in current limiting circuit against overload and short-circuits.

The device is vacuum-cast and prepared for Safety Class 2 applications. The EU and UK versions satisfy the low-voltage guideline as well as the current EU standards for CE conformity. Furthermore, the US version has been UL-certified for the US and Canada.

10.1.2 Scope of supply

- Wide-range power supply unit for SIMATIC RF systems
- 2 m mains cable (country-specific)
- Protective cover for flange outlet
- Operating Instructions

REVIEW

10.1.3 Ordering data

Wide-range power supply unit for SIMATIC RF-systems (100 - 240 VAC / 24 VDC / 3 A) with 2 m connecting cable with country-specific plug	EU: 6GT2898-0AA00 UK: 6GT2898-0AA10 US: 6GT2898-0AA20
24 V connecting cable for SIMATIC RF640R/RF670R, length 5 m	6GT2891-0NH50

Note

Risk of confusion

Note that you cannot use the 24 V connecting cables of the discontinued RF660R reader for the RF640R and RF670R readers.

10.1.4 Safety Information

WARNING

Danger to life

It is not permitted to open the device or to modify the device.

The following must also be taken into account:

- Failure to observe this requirement shall constitute a revocation of the CE approval, UL certification for the US and Canada as well as the manufacturer's warranty.
- For installation of the power supply, compliance with the DIN/VDE requirements or the country-specific regulations is essential.
- The field of application of the power supply is limited to "Information technology in electrical office equipment" within the scope of validity of the EN 60950/VDE 0805 standard.
- When the equipment is installed, it must be ensured that the mains socket outlet is freely accessible.
- The housing can reach a temperature of +25 °C during operation without any adverse consequences. It must, however, be ensured that the power supply is covered in the case of a housing temperature of more than +25°C to protect persons from contact with the hot housing. Adequate ventilation of the power supply must be maintained under these conditions.

Note

The wide-range power supply unit must only be used for SIMATIC products in the specifically described operating range and for the documented intended use.

If the wide input range power supply for SIMATIC RF systems is used for an end product other than the SIMATIC RF600 system, the following must be taken into account:

- The electric strength test of the end product is to be based upon a maximum working voltage of: Transition from primary to SELV: 353 VDC, 620 Vpk
- The following secondary output circuits are SELV (low voltage; SELV = Safety Extra Low Voltage): all
- The following secondary output circuits are at non-hazardous energy levels: all
- The power supply terminals and/or connectors are suitable for field wiring if terminals are provided.

- The maximum investigated branch circuit rating is: 20 A
- The investigated pollution degree is: 2

WARNING

If the wide input range power supply for SIMATIC RF systems is connected to an end product other than end products of the RF600 family, the end user is responsible and liable for operation of the system or end product that includes the wide input range power supply for SIMATIC RF systems.

WARNING

Alterations to the SIMATIC RF600 components and devices as well as the use of SIMATIC RF600 components with third-party RFID devices are not permitted.

Failure to observe this requirement shall constitute a revocation of the radio equipment approvals, CE approval and manufacturer's warranty. Furthermore, the compliance to any salient safety specifications of VDE/DIN, IEC, EN, UL and CSA will not be guaranteed.

Safety notes for the US and Canada

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The SIMATIC RF640R/RF670R reader may only be operated with the wide range power supply unit for SIMATIC RF systems - as an optional component – or with power supply units that are UL-listed according to the safety standards specified below:

- UL 60950-1 - Information Technology Equipment Safety - Part 1: General Requirements
- CSA C22.2 No. 60950 -1 - Safety of Information Technology Equipment.

WARNING

The compliance of the SIMATIC RF600 system to the safety standards mentioned above will not be guaranteed if neither the wide-range power supply unit for SIMATIC RF systems°nor power supplies listed according to the safety standards above are used.

Safety information for Korea

⚠ WARNING

The SIMATIC RF640R/RF670R Reader may only be operated with power supplies that have received KETI approval. There is currently no KETI approval for the wide-range power supply (6GT2898-0AAx0). This is why the wide-range power supply may not be operated in South Korea.

To use the SIMATIC RF640R/RF670R Reader in South Korea, you need a power supply (24 V DC / 3 A). This power supply must meet the requirements of the application field and have a KETI approval. You also need the connection cable for the SIMATIC RF640R/RF670R (6GT2891-0NH50).

For the required pin assignments of the DC output for connecting the power supply, see section Pin assignment of DC outputs and mains connection (Page 490). You can find the pin assignment of the DC inputs for the reader in sections Pin assignment for power supply (Page 138) and Pin assignment for power supply (Page 185).

10.1.5 Connecting

REVIEW

- There are three different (country-specific) mains cables for the EU, UK and US.
  The appropriate mains cable must be connected to the primary input of the power supply.

  Note

  It is only permissible to insert or remove the mains cable when the power supply is de-energized.

- The wide-range power supply unit has total insulation (Safety Class 2), IP65
- It can be mounted using four fixing holes.

10.1.6 Technical specifications

Table 10- 1 General technical specifications

Insulation stability (prim./sec.) $U_{ins\ p/s}$		3.3 kV_{AC}
Insulation resistance R_{ins}		>1 GΩ
Leakage current I_{leak}	U_{in} = 230 V_{AC}, f = 50 Hz	< 200 µA
Safety class (SELV)	Designed for installation in devices of Safety Class 2	
Mains buffering t_h	U_{in} = 230 V_{AC}	≥ 50 ms
Ambient temperature		-25 °C to +55 °C
Surface temperature	Module top, center	Max. 96 °C
Storage temperature		-40 °C to +85 °C
Self-heating on full-load		max. 45 K
Interference immunity ESD HF fields Burst Surge HF injection Mains quality test	EN 61000-4-2, 4-3 up to 4-6, 4-11	 Air discharge: 15 kV 10 V/m symmetrical: 2 Symmetrical: 1 10 V_{rms}
Cooler		Free convection
Dimensions L x W x H		175 mm x 85 mm x 35 mm
Weight		720 g
Housing / casting		UL 94-V0
Power supply class	according to CSA	Level 3
Degree of protection	IP65	
MTBF in years		255

Table 10- 2 Technical specifications for the input

Rated input voltage U_{in}	EN 60950 / UL 60950	100 to 240 VAC 120 to 353 VDC
Input voltage range U_{in}		94 to 264 VAC 120 to 375 VDC (UL: 353 V_{DC})
Input frequency f_{in}		50/60 Hz
Radio interference level		EN 55011/B
Switching frequency f_{sw}		approx. 70 kHz typ.
Length of cable		2 m

Table 10- 3 Technical specifications of the output

Output voltage tolerance ΔU_{out}	U_{in} = 230 V_{AC}	$U_{out\ nom}$ ≤ +2 %/-1 %
Overvoltage protection		$U_{out\ nom}$ +20 % typ.
Noise ΔU_{LF}	U_{in} = min., BW: 1 MHz	≤ 1 % U_{out}

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Noise ΔU_{HF}	U_{in} = min., BW: 20 MHz	≤ 2 % U_{out}
Line Regulation Load Regulation	U_{in} = min./max. I_{out} = 10...90...10 %	≤ 1,0 % ≤ 1,0 %
Short-circuit current I_{max}	I_{nom} = 4 A (+50°C)	105 ... 130 % I_{nom}
Settling time t_R load variations	I_{out} = 10...90...10 %	< 5 ms
Temperature coefficient ε	T_A = -25 °C to +70 °C	0.01 %/K
Overload behavior P_{over}		Constant current
Short-circuit protection/ No-load response		Continuous/no-load stability
Derating	T_A > +50 °C to +70 °C	max. 2 %/K
Connector type	Flanged connector Binder, Order no.: 09-3431-90-04	4 pins

Table 10- 4 Output configurations

Input	Outputs U1 = U2	ILoad = I1 + I2	Efficiency (%)	Remarks
110 VAC	24 VDC	0 A		No-load stability
110 VAC	24 VDC	3 A	≥ 88	
220 VAC	24 VDC	0 A		No-load stability
220 VAC	24 VDC	3 A	≥ 90	

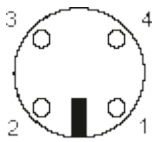
REVIEW

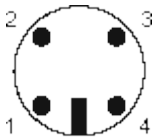
Table 10- 5 Compliance with standards

Designation	Standard	Values
Electrical safety	EN 60950 / UL 60950 / CAN/CSA 22.2 950, 3 Edition	
Conducted interference	EN 61000-6-3 EN 55011	Class B
Emission	EN 61000-6-3 EN 55011	Class B

All values are measured at full-load and at an ambient temperature of 25 °C (unless specified otherwise).

10.1.7 Pin assignment of DC outputs and mains connection

DC outputs	Assignment
	(1) Ground (0V)
	(2) +24 V DC
	(3) +24 V DC
	(4) Ground (0V)

Mains connection	Assignment
	(1) 100 to 240 V AC
	(2) n.c.
	(3) 100 to 240 V AC
	(4) n.c.

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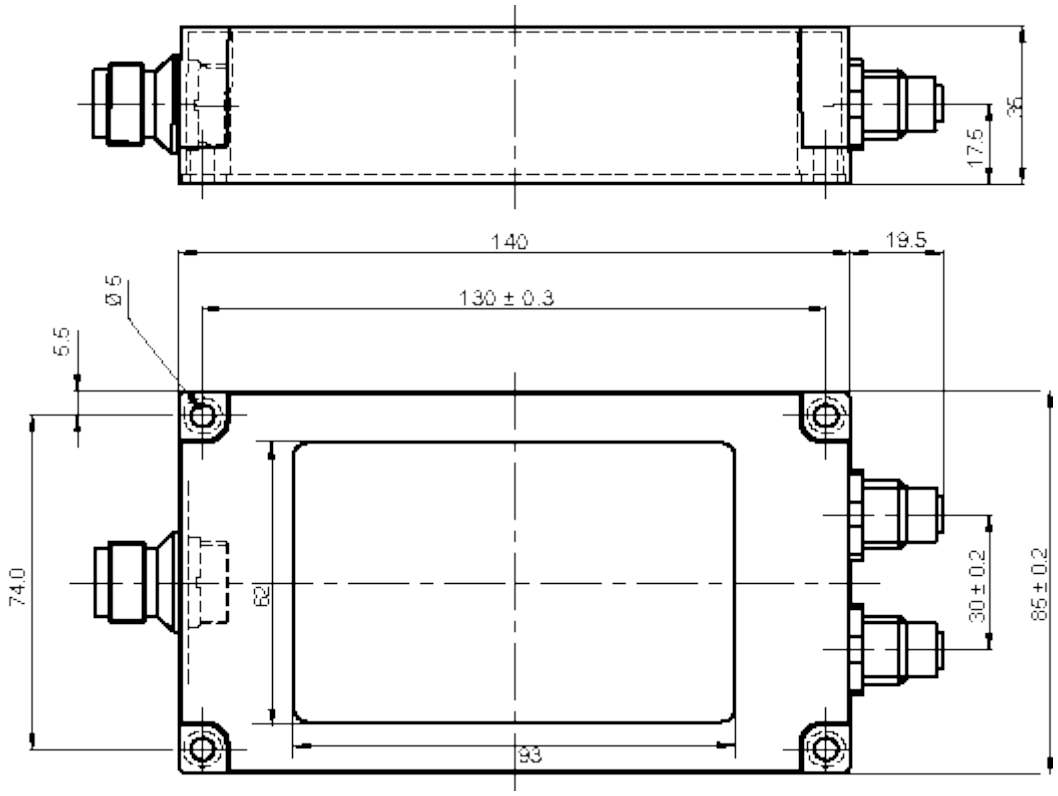
10.1.8 Dimension drawing



Units of measurement:

All dimensions in mm

REVIEW

10.1.9 Certificates and approvals

Table 10- 6 Wide-range power supply unit for SIMATIC RF systems 6GT2898-0AA00 - Europe, 6GT2898-0AA10 - UK

Certificate	Description
CE	CE approval to 2004/108/EC EMC 73/23/EEC LVD

Table 10- 7 Wide-range power supply unit for SIMATIC RF systems 6GT2898-0AA20 - USA

Standard	
c UL us	This product is UL-certified for the US and Canada. It meets the following safety standards: UL 60950-1 - Information Technology Equipment Safety - Part 1: General Requirements CSA C22.2 No. 60950 -1 - Safety of Information Technology Equipment UL Report E 205089

REVIEW

10.2 The PC adapter for SIMATIC RF-DIAG

10.2.1 Description

PC adapter for SIMATIC RF-DIAG	
	① USB interface ② RS-422 – CM / wide-range power supply unit ③ RS-422 – RF reader

The SIMATIC RF-DIAG product consists of a CD with software and documentation and a hardware packet. The hardware packet consists of a PC adapter for SIMATIC RF-DIAG, a USB connecting cable and an RS-422 cable.

The PC adapter for SIMATIC RF-DIAG is a converter from USB to RS-422. Communication between the PC and reader can be established using the PC adapter.

REVIEW

Characteristics

- RS-422 to USB converter for communication with the RF620R and RF630R
- Dimensions without connecting cables: 101 x 63 x 35 mm
- CE-compliant (EU and UK versions)
- FCC-compliant for use in the USA and Canada
- Mechanically and electrically rugged design
- RS-422 interface
  - With 24 VDC / 3 A for CM or wide-range power supply unit
  - With 24 VDC / 3 A for reader
- Short-circuit proof

Highlights

- Diagnostics via a PC with the reader supplied with power from the system
- IP65 degree of protection
- Can be used in high temperature ranges
- Use in productive operation possible
- Switchover to diagnostics mode "on the fly" (parallel to regular operation)

Note

Protection from environmental influences

The IP65 degree of protection of the PC adapter is only valid if the USB protective cap is fitted and the corresponding RS-422 cable is connected. During diagnostics, this degree of protection is not present.

10.2.2 Pin assignment of the RS-422 interface

REVIEW

Pin assignment for connection to the CM or wide-range power supply unit

Pin assignment of the connector for PC adapter and CM or wide-range power supply unit

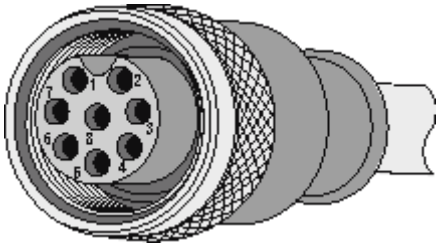
Table 10- 8 RS-422 interface of the PC adapter (male connector)

Pin	Pin Device end 8-pin M12	Assignment for CM	Assignment for wide-range power supply unit
	1	+ 24 V	+ 24 V
	2	- Transmit	Free
	3	0 V	0 V
	4	+ Transmit	Free
	5	+ Receive	Free
	6	- Receive	Free
	7	Free	Free
	8	Ground (shield)	Ground (shield)

The knurled bolt of the M12 plug does not contact the shield (reader end).

Pin assignment of the connecting cable between PC adapter and CM or wide-range power supply unit

Table 10- 9 RS-422 connecting cable

View of M12 socket	M12 pin	Core color	Pin assignment for CM	Pin assignment for wide-range power supply unit
	1	White	24 VDC	24 VDC
	2	Brown	TX neg	Not used
	3	green	GND	GND
	4	Yellow	TX pos	Not used
	5	gray	RX pos	Not used
	6	pink	RX neg	Not used
	7	Blue	Not used	Not used
	8	Red	Ground (shield)	Ground (shield)

Pin assignment for connecting to the RF readers

Pin assignment of the connector for PC adapter and UHF reader

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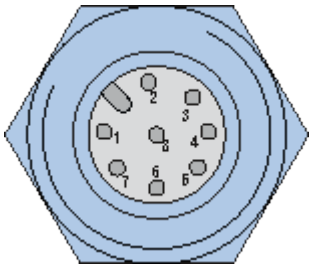
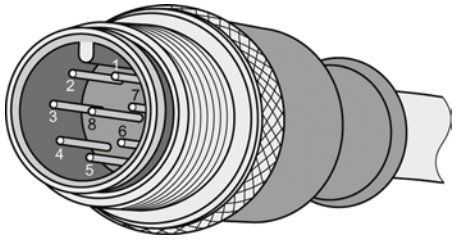
Table 10- 10 RS-422 interface of the PC adapter (female connector)

Pin	Pin Device end 8-pin M12	Assignment for the RF readers
	1	+ 24 V
	2	- Transmit
	3	0 V
	4	+ Transmit
	5	+ Receive
	6	- Receive
	7	Free
	8	Ground (shield)

The knurled bolt of the M12 plug does not contact the shield (reader end).

Pin assignment of the connecting cable between PC adapter and UHF reader

Table 10- 11 RS-422 connecting cable

View of M12 plug	M12 pin	Wire color	Pin assignment
	1	White	24 VDC
	2	Brown	TX neg
	3	green	GND
	4	Yellow	TX pos
	5	gray	RX pos
	6	pink	RX neg
	7	Blue	Not used
	8	Red	Ground (shield)

Pin assignment for connection to the PC

Table 10- 12 USB 2.0 mini-B connector socket of the PC adapter

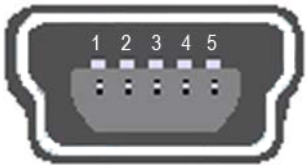
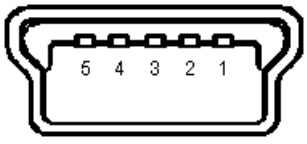
View of connection socket	Pin Device side	Assignment
	1	+ 5 V
	2	Data -
	3	Data +
	4	ID (not used)
	5	GND

Table 10- 13 USB 2.0 mini-B plug of the connecting cable

View of mini-B plug	Pin Device side	Wire color	Assignment
	1	Red	+ 5 V
	2	White	Data -
	3	green	Data +
	4	-	ID (not used)
	5	Black	GND

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10.2.3 Technical specifications

Table 10- 14 Mechanical data

Property		Description
Weight		310 g
Dimensions (L x W x H)		101 × 63 × 35 mm
Enclosure material		Aluminum (painted)
Housing color		Black
Installation		No securing aids
Interfaces		
	RS422	• 1 x pin (8-pin M12, connection to CM/wide-range power supply) • 1 x socket (8-pin M12, connection to the reader)
	USB	USB 2.0 Mini-B
MTBF in years		$1.1x10^3$

Table 10- 15 Software interfaces

Property	Description
Software – RS-422	SIMATIC S7 / TIA
Software – USB • RF600	• 3964R & RF-DIAG

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Table 10- 16 Electrical data

Property	Description
Power supply of the PC adapter via USB (during operation) • Nominal value • Permitted range	• 5 V DC • 4.0 to 5.25 VDC
Power supply of the RF readers via RS-422 • Nominal value • Permitted range	• 24 VDC • 20 to 30 VDC
Current consumption • Connection via USB and RS-422 • No connection via USB	• Via 5 VDC, approx. 30 mA; 24 VDC, approx. 15 mA • Via 24 VDC, ≤ 5 mA
Transmission rates USB / RS-422	• 19.2 Kbps • 57.6 Kbps • 115.2 Kbps

Table 10- 17 Ambient conditions

Property	Description
Temperature range during operation	-25 °C to +70 °C
Temperature range during storage	-40 °C to +85 °C
Shock resistant to EN 60068-2-27 Vibration resistant to EN 60068-2-6	50 g, [1] 20 g, [1]
Degree of protection in accordance with EN 60529	IP65 [2]

[1] The values for shock and vibration are maximum values and must not be applied continuously nor when the USB plug is plugged in.

[2] Only when the USB protective cap is fitted and the corresponding RS-422 cables are connected.

REVIEW

10.2.4 Dimension drawing

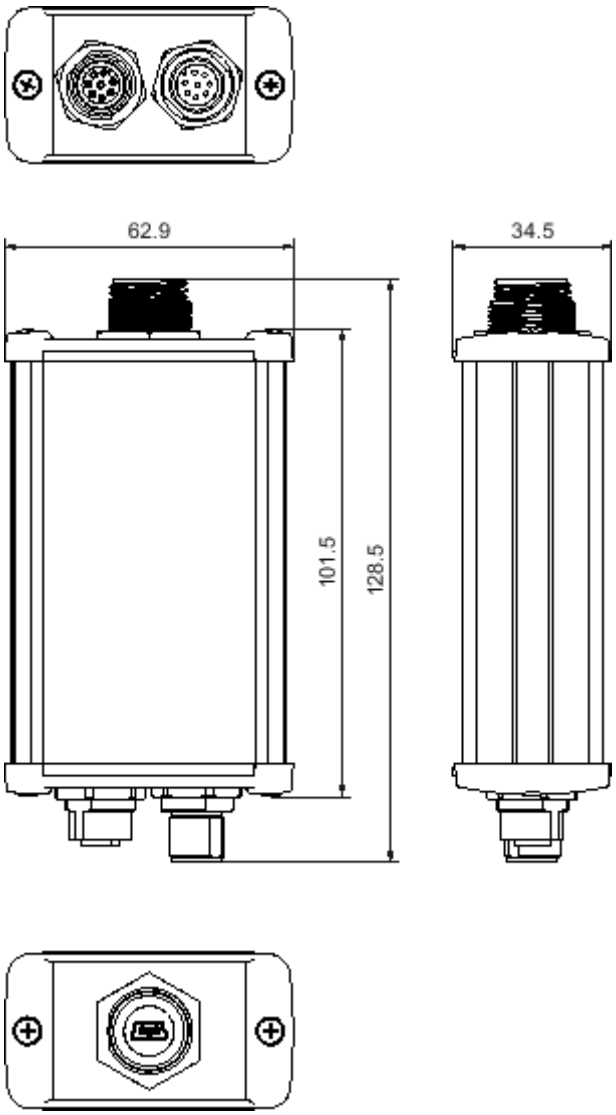

Figure 10-1 Dimension drawing of the PC adapter for SIMATIC RF-DIAG (all dimensions in mm)

When the USB protective cap is screwed on, the length of the adapter is 134 mm. The tolerances are +/- 1 mm.

REVIEW

10.2.5 Certificates and approvals

Table 10- 18 Certificates and approvals for the PC adapter

Certificate	Description
CE	CE approval complying with 2004/108/EC EMC
FC	FCC Rules, Part 15, Subpart B, Sections 15.107 and 15.109
Industry Canada Radio Standards Specifications	CAN/CSA-CISPR 22-10 - Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement

REVIEW

Appendix A

A.1 Certificates and approvals

Notes on CE marking

The following applies to the system described in this documentation:
The CE marking on a device is indicative of the corresponding approval:

DIN ISO 9001 certificate

The quality assurance system for the entire product process (development, production, and marketing) at Siemens fulfills the requirements of ISO 9001 (corresponds to EN29001: 1987).

This has been certified by DQS (the German society for the certification of quality management systems).

EQ-Net certificate no.: 1323-01

Table A- 1 FCC IDs: NXW-RF660, NXW-RF620R, NXW-RF630R, IC: 267X-RF620R, IC: 267X-RF630

Standards	
FC Federal Communications Commission	FCC Title 47, Part 15.sections 15.247 Radio Frequency Interference Statement This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules.
Industry Canada Radio Standards Specifications	RSS-210 Issue 6, Sections 2.2, A8
c UL us	This product is UL-certified for the USA and Canada. It meets the following safety standard(s): UL 60950-1 - Information Technology Equipment Safety - Part 1: General Requirements CSA C22.2 No. 60950 -1 - Safety of Information Technology Equipment UL Report E 205089

Certification for the USA, Canada and Australia

Safety

One of the following markings on a device is indicative of the corresponding approval:	
	Underwriters Laboratories (UL) to UL 60950 Standard (I.T.E), or to UL508 (IND.CONT.EQ)
	Underwriters Laboratories (UL) according to Canadian standard C22.2 No. 60950 (I.T.E) or C22.2 No. 142 (IND.CONT.EQ)
	Underwriters Laboratories (UL) according to standard UL 60950, Report E11 5352 and Canadian standard C22.2 No. 60950 (I.T.E) or UL508 and C22.2 No. 142 (IND.CONT.EQ)
	UL recognition mark
	Canadian Standard Association (CSA) per Standard C22.2. No. 60950 (LR 81690) or per C22.2 No. 142 (LR 63533)
	Canadian Standard Association (CSA) per American Standard UL 60950 (LR 81690) or per UL 508 (LR 63533)

EMC

USA	
Federal Communications Commission Radio Frequency Interference Statement	This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.
Shielded Cables	Shielded cables must be used with this equipment to maintain compliance with FCC regulations.
Modifications	Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.
Conditions of Operations	This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

CANADA	
Canadian Notice	This Class B digital apparatus complies with Canadian ICES-003.
Avis Canadien	Cet appareil numérique de la classe b est conforme à la norme NMB-003 du Canada.

AUSTRALIA	
	This product meets the requirements of the AS/NZS 3548 Norm.

A.2 Service & support

Technical Support

You can access technical support for all IA/DT projects via the following:

- Phone: + 49 (0) 911 895 7222
- Fax: + 49 (0) 911 895 7223
- Web form for support request (http://www.siemens.com/automation/support-request)
- Internet: E-mail (mailto:support.automation@siemens.com)

Contacts

If you have any further questions on the use of our products, please contact one of our representatives at your local Siemens office.

The addresses are found on the following pages:

- On the Internet (http://www.siemens.com/automation/partner)
- In Catalog CA 01
- In the catalog ID 10 specially for Industrial Identification Systems

Service & support for industrial automation and drive technologies

You can find various services on the Support home page (http://www.siemens.com/automation/service&support) of IA/DT on the Internet.

There you will find the following information, for example:

- Our newsletter containing up-to-date information on your products.
- Relevant documentation for your application, which you can access via the search function in "Product Support".
- A forum for global information exchange by users and specialists.
- Your local contact for IA/DT on site.
- Information about on-site service, repairs, and spare parts. Much more can be found under "Our service offer".

SIMATIC documentation on the Internet

A guide to the technical documentation for the various SIMATIC products and systems is available on the Internet:

SIMATIC Guide manuals (http://www.siemens.com/simatic-tech-doku-portal)

RFID homepage

For general information about our identification systems, visit RFID home page (http://www.siemens.com/ident/rfid).

Online catalog and ordering system

The online catalog and the online ordering system can also be found on the Industry Mall home page (http://www.siemens.com/industrymall/en).

Training center

We offer appropriate courses to get you started. Please contact your local training center or the central training center in

D-90327 Nuremberg.

Phone: +49 (0) 180 523 56 11
(€ 0.14 /min. from the German landline network, deviating mobile communications prices are possible)

For information about courses, see the SITRAIN home page (http://www.sitrain.com).

Glossary

Active field

Area with minimum field strength containing the sensing range. Within this sensing range, data can be read from the tag or written to the tag.

Active surface

See active field

See active field

Active surface

See active field

See active field

Active tag/transponder

Active transponders are battery-operated, i.e. they obtain the energy required to save data on the microchip from a built-in battery. They are usually in an idle state and do not transmit data in order to increase the energy source's service life. The transmitter is only activated when it receives a special activation signal.

AM

Amplitude modulation; data are present in the changes in carrier frequency amplitude.

Amplitude modulation

See AM

AS

See Automation system

ASM

Interface module, see Communication modules

Automation system (AS)

A programmable logical controller (PLC) of the SIMATIC S7 system, comprising a central controller, a CPU and various I/O modules.

Battery-free data storage unit

Mobile data storage units which operate without batteries. (See transponder). Power is supplied to the data storage unit across an electromagnetic alternating field.

Baud

Unit (digits per second).

Baud rate

The baud rate describes the data transmission's digit rate.

Byte

A group of eight bits

CE guidelines

See CE Label

CE Label

Communauté Européenne (product mark of the European Union)

Communication modules

Communication modules are used to integrate the identification systems in SIMATIC or SINUMERIK systems, or to connect them to PROFIBUS, PROFINET, PC or any other system. Once supplied with the corresponding parameters and data, they handle data communication. They then make the corresponding results and data available. Suitable software blocks (FB/FC for SIMATIC; C libraries for PCs with Windows) ensure easy and fast integration in the application.

Continuous Wave

See CW

CW

Continuous Wave; data are present in the carrier frequency which is switched on and off.

Data rate

The rate at which data are exchanged between the tag and reader. Typical units are bits per second or bytes per second.

Data transfer rate

Number of characters which can be transmitted from a tag to a reader within a defined time. Baud rates are also used to specify how fast a reader can read information.

Data transmission rate

Unit of measurement for the volume of data transmitted within a unit of time, e.g. bytes/s, see also Baud

dB

See Decibel

dBm

Dimensional unit for the transmitted power in the logarithmic relation to 1 mW (Milliwatt).

0dBm = 1mW, +23dBm = 200mW, +30dBm = 1W.

dBr

dB(relative); a relative difference to a reference value

Decibel (dB)

Unit of measurement for the logarithmic relationship between two variables.

Dense Reader Mode (DRM)

In this mode, tag readability is increased through the application of interference-reducing measures.

DRM is only defined for Gen 2 and does not function with other tag types.

Detuning

UHF antennas are tuned to receive a particular electromagnetic wavelength from the reader. If the antenna is too close to metal or a metallic material, it can be detuned, making the performance deteriorate.

Distant field communication

RFID antennas emit electromagnetic waves. If a tag is more than a full wavelength away from the reader's transmitting antenna, it is in a "distant field". If it is within a full wavelength, this is known as the "near field".

The wavelength of UHF-RFID systems is approx. 33 cm.

The distant field signal is attenuated with the square of the distance from the antenna, whereas the near field signal is attenuated with the cube of the distance from the antenna.

Passive RFID systems based on distant field communication (UHF and microwave systems) have a greater read range than systems based on near field communication (typically low-frequency and high-frequency systems).

Dwell time

The dwell time is the time in which the transponder dwells within the sensing range of a reader. The reader can exchange data with the transponder during this time.

Dynamic mode

In dynamic mode, the data carrier moves past the reader at a traversing rate which depends on the configuration. Various checking mechanisms ensure error-free data transfer even under extreme environmental conditions.

EAN

European article number. Standardized barcode used in Europe, Asia and South America. Is administered by EAN International.

EBS

Equipotential **B**onding **S**trip

Effective Isotropic Radiated Power

See EIRP

Effective Radiated Power

See ERP.

EIRP

Effective Isotropic Radiated Power; unit of measurement for the transmission power of antennas (referred to an isotropic radiator) mainly used in the USA. EIRP is specified in Watt, and is not equal to ERP. (0dbi = - 2.14 dBm)

Electromagnetic compatibility (EMC)

Electromagnetic compatibility is the ability of an electrical or electronic device to operate satisfactorily in an electromagnetic environment without affecting or interfering with the environment over and above certain limits.

EMC

See Electromagnetic compatibility

EMC directive

Guidelines for electromagnetic compatibility This guideline relates to any electrical or electronic equipment, plant or system containing electric or electronic components.

EPC

See EPC global

EPC global

Electronic Product Code. Standardized number system for identifying articles with a data width of either 64, 96 or 256 bits.

Equipotential bonding

Potential differences between different parts of a plant can arise due to the different design of the plant components and different voltage levels. It is necessary to compensate for these differences by equipotential bonding: this is done by combining the equipotential bonding conductors of power components and
non-power components on a centralized equalizing conductor (EBS = **E**quipotential **B**onding **S**trip).

ERP

Effective Radiated Power; unit of measurement for the transmission power of antennas (referred to an ideal dipole) mainly used in Europe. ERP is specified in Watt, and is not equal to EIRP. (0dbm = + 2.14 dBi)

ESD directive

Directive for handling **E**lectrostatic **S**ensitive **D**evices

ETSI

European Telecommunications Standard Institute

European Article Numbering

See EAN.

eXtensible markup language

See XML.

FCC

Federal Communications Commission (USA)

FHSS

Frequency Hopping Spread Spectrum; frequency change procedure.

FM

Frequency modulation; data are present in the changes in the frequency of the carrier frequency.

Frequency hopping

Frequency hopping technique Automatic search for free channels.

In frequency hopping, data packets are transferred between the communication partners on constantly changing carrier frequencies. This makes it possible to react to interference from devices transmitting signals in the same frequency range (channel). If an attempt to send a data packet is unsuccessful, the packet can be transmitted again on a different carrier frequency. By default the RF600 uses this procedure (FCC) only in the USA and Canada.

Frequency modulation

See FM.

Frequency Shift Keying

See FSK

FSK

Modulation, Frequency Shift Keying; data are present in the changes between two frequencies.

ICNIRP

International Commission of Non Ionizing Radiological Protection

ICRP

International Commission of Radiological Protection

Interface modules

See communication modules

Interrogator

See readers

ISO

International Standard Organization

ISO 18000

Standard for data exchange of RFID systems between reader and transponder. There are various subdefinitions of this standard for the various approved frequency ranges for RFID. For example, the range 865 ... 868 MHz is described in ISO 18000-6.

LAN

Local Area Network

LBT

Listen Before Talk; the reader only transmits when the channel is free.

License plate

10-digit code that is saved on every RFID tag. The code of the license plate establishes a connection between the item of baggage and the baggage processing system of the airport. As soon as the license plate has been read by the reader, a message is automatically sent to the baggage processing system. This message contains important data regarding the flight and destination of the item of baggage. Using this data, the item of baggage can be successfully sorted by the baggage processing system of the airport.

Limit distance

The limit distance is the maximum clear distance between reader antenna and transponder at which the transmission can still function under normal conditions.

Mass recording

The capability of a reader to record several or many transponders quasi-simultaneously and to read the code. Contrary to the multi-tag capability, the reader is not able to specifically address individual tags.

MDS

Mobile data memory, see Transponder.

MES

Manufacturing Execution System

Metal-free area

Distance/area which must be maintained between the transponder and metal in order to prevent interference during data transfer between the transponder and reader.

Mobile Data Memory (MDS)

Mobile data memory, see Transponder

Modulation

Modulation is a procedure with which one or more characteristics (e.g. phase, amplitude, frequency) of a carrier oscillation are modified according to the response of a modulating oscillation.

Multi-tag capability

Multi-tag capability means that a reader can communicate simultaneously with different data carriers. Therefore the reader can specifically address a transponder with its UID (see also mass recording).

Near field communication

RFID antennas emit electromagnetic waves. If a tag is more than a full wavelength away from the reader's transmitting antenna, it is in a "distant field". If it is within a full wavelength, this is known as the "near field".

The wavelength of UHF-RFID systems is approx. 33 cm.

The distant field signal is attenuated with the square of the distance from the antenna, whereas the near field signal is attenuated with the cube of the distance from the antenna. Passive RFID systems based on near field communication (typically low-frequency and high-frequency systems) have a greater read range than systems based on distant field communication (typically UHF and microwave systems).

Passive tag

If electromagnetic waves from the reader reach the tag antenna, the energy is converted by the antenna into electricity which provides the tag chip with current. The tag is able to return information stored on the chip. Passive tags do not usually have a battery. A battery is required if the tag has a RAM, but the battery is only used to save information in the RAM. In particular, the battery is not used for data exchange between reader and transponder.

Passive tag/transponder

A tag without its own power supply. Passive transponders obtain the energy required to supply the microchips from the radio waves they receive.

PDM

Pulse duration modulation; data are present in the pulse duration.

Phase modulation

See PM

PLC

Programmable Logic Controller, see PLC.

Programmable logic controller; electronic device used in automation engineering for open-loop and closed-loop control tasks. The typical modules of a PLC are the CPU, power supply (PS) and various input/output modules (I/O).

Programmable controller: The programmable logical controllers (PLC) of the SIMATIC S5 system consist of a central controller, one or more CPUs, and various other modules (e.g. I/O modules).

PLC

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Programmable controller: The programmable logical controllers (PLC) of the SIMATIC S5 system consist of a central controller, one or more CPUs, and various other modules (e.g. I/O modules).

PM

Phase modulation; data are present in the changes in carrier frequency phase.

Programmable Logic Controller

See PLC.

Programmable Logic Controllers

See PLC

Protocol

A combination of rules which manage communications systems.

Pulse duration modulation

See PDM

Radio Frequency Identification

See RFID.

Read rate

Number of tags which can be read within a defined time.
The read rate can also be used for the maximum rate at which data can be read from a tag. The unit is bits per second or bytes per second.

Reader (also interrogator)

Readers transfer data between mobile data memories (transponders) and the higher-level systems. The data, including the energy required for processing and sending back, are transmitted to the transponder across an electromagnetic alternating field. This principle enables contact-free data transmission, ensures high industrial compatibility and works reliably in the presence of contamination or through non-metallic materials.

Reader talks first

A passive tag communicates in the read field of a reader with the reader. The reader sends energy to the tags which only reply when they are explicitly requested. The reader is able to find tags with a specific serial number commencing with either 1 or 0.
If more than one tag responds, the reader can scan all tags commencing with 01 and subsequently with 010. This is referred to as "walking" on a binary tree, or "tree walking".

Reading range

The distance within which a reader can communicate with a tag. Active tags can cover a greater distance than passive tags because they use a battery to send signals.

Reciprocity

Reciprocity means that a two-way relationship exists between the transmit and receive case of a passive antenna.

RFID

Radio Frequency Identification; a method of identifying items using electromagnetic waves. The reader supplies energy to the tag and communicates with it.

RFID systems

SIMATIC RF identification systems control and optimize material flow and production sequences. They identify reliably, quickly and economically, use non-contact data communication technology, and store data directly on the product. They are also resistant to contamination.

RH circular

Right hand circular polarization

RSSI threshold value

The "Received Signal Strength Indication" (RSSI) is an indicator of the receive field strength of the transponders. When the field strength with which the transponder is received undershoots the set RSSI threshold, the reader ignores the signal of this transponder.

The RSSI threshold value can be activated to limit areas of the antenna fields to those in which transponders should still be accessed. This can be used to avoid undesirable effects, such as range overshoot when reading transponder data.

RTNC

Connector designation (Reverse TNC). Industrial coaxial connector with screw coupling, can be used for frequencies of up to 2 GHz. The mechanical design of the RTNC connector is not compatible with the TNC connector.

RTTE

Radio and Telecommunications Terminal Equipment

SCM

Supply Chain Management

Secondary fields

In addition to the main sensing range (antenna's main direction of transmission) there are secondary fields. These secondary fields are usually smaller than the main fields. The shape and characteristics of the secondary field depend on the metallic objects in the surroundings. Secondary fields should not be used in configuring.

SELV

Safety Extra Low Voltage

Sensing range

Area in which reliable data exchange between transponder and reader is possible due to a particular minimum field strength.

SSB

Single Sideband Modulation. SSB is similar to AM (amplitude modulation), however, only one sideband is sent instead of two sidebands. This saves 50% of the spectrum required in the HF channel without affecting the signal/data rate. For RFID applications, an HF carrier must also be sent to supply energy to the tag. Sending a carrier is many times not required for other SSB applications, since the HF carrier itself does not contain any data.

Static mode

In static mode the transponder is positioned at a fixed distance (maximum: limit distance) exactly above the reader.

Tag

See transponder

Tag talks first

A passive tag communicates in the read field of a reader with the reader. When a tag reaches the field of a reader, it immediately indicates its presence by reflecting a signal.

TARI

Abbreviation of Type A Reference Interval. Duration (period) for representation of a bit with content 0.

TCP/IP

Transmission Control Protocol/Internet Protocol

Telegram cycles

A passive tag communicates in the read field of a reader with the reader. When a tag reaches the field of a reader, it immediately indicates its presence by reflecting a signal. Transmission of a read or write command is implemented in three cycles. They are called "Telegram cycles". One or two bytes of user data can be transferred with each command. The acknowledgment or response transfer (status or read data) takes place in three further cycles.

TNC

Connector designation (Threaded Neill Concelman).

Industrial coaxial connector with screw coupling, can be used for frequencies of up to 2 GHz.

Transceiver (transmitter/receiver)

Combination of transmitter and receiver. A unit which can both send and receive electromagnetic waves.

Transmission distance

Distance between communication module and transponder

Transponder

An invented word from transmitter and responder. Transponders are used on the product, the product carrier, the object, or its transport or packaging unit, and contain production and manufacturing data, i.e. all application-specific data. They follow the product through assembly lines, transfer and production lines and are used to control material flow.

Because of their wireless design, transponders can be used, if necessary, at individual work locations or manufacturing stations, where their data can be read and updated.

Tree walking

See Reader talks first.

UHF

Ultra-high frequency; frequency range from 300 MHz to 3 GHz. UHF RFID tags usually operate between 866 MHz and 960 MHz. This corresponds to a wavelength of approx. 33 cm.

UID

User IDentifier; the UID is an unambiguous number in the transponder, assigned by the manufacturer. The UID is unambiguous, and can usually also be used as a fixed code. The UID is used to specifically address a transponder

Ultra High Frequency

See UHF.

User IDentifier

See UID

VESA

Video Electronics Standards Association (authority that defines standards for the PC industry)

Walking

See Reader talks first.

WLAN

Wireless LAN

writer

See readers

Writing/reading range

See transmission distance

XML

eXtensible markup language; XML is a language derived from SGML with which other languages (document types) can be described. In the meantime, XML is a widely used language for distributing information on the Internet. Data exchange between reader and read station is carried out using XML commands.

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