## Procedure

1. Compare the technical specifications of your antenna with the values required by the SIMATIC RF600 system.

| Values | Example antenna | Required values | OK? |
|---|---|---|---|
| Frequency band | 865 to 870 MHz | 865 to 868 MHz | OK |
| Impedance | 50 Ohm | 50 Ohm | OK |
| VSWR | <1,5 | <1,24 | Not OK |
| Polarization | Circular, right | | OK |
| Antenna gain | 8.5 dBi | >6 dBi | OK |
| Beam width horizontal/vertical | 63° | ≤70° | OK |
| Front-to-back ratio | -18 dB | ≥10 dB | OK |
| Spurious lobe suppression | -16 dB | ≥10 dB | OK |
| Axial ratio | 2 dB | ≤3 dB | OK |
| Maximum power | 6 W | ≥4 W | OK |

Since the specific VSWR value of the antenna does not agree with the value required by the system, you must have this value checked. Therefore contact your antenna vendor or an EMC laboratory.

2. Compare the technical specifications of your cables and connectors with the values required by the system.
For example, you can use cables of type "LMR-195" from the company "TIMES MICROWAVE SYSTEMS". Suitable cables have e.g. an outer diameter of 5 mm. The company offers various designs of cables depending on the requirements. Numerous connectors are also available for their cables.

| Values | Example cable | Required values | OK? |
|---|---|---|---|
| Cable attenuation | 36.5 dB / 100 m at 900 MHz<br>With an assumed length of 10 m, this results in a loss of 3.65 dB. | ≤4 dB | OK |
| Impedance | 50 Ohm | 50 Ohm | OK |

| Values | | Example connector | OK? |
|---|---|---|---|
| Type of plug on reader side | R-TNC socket | R-TNC plug | OK |
| Type of plug on antenna side | N socket | N plug | OK |

3. Parameterize the following values depending on the used reader (see section Overview of parameterization of RF600 reader (Page 198)):
   - **Parameterize the RF660R via configuration software**
     Antenna gain: 8.5 dBi
     Cable loss: 4 dB (due to adaptation and damping losses of the connectors)
   - **Parameterize the RF660R via the XML command "antennaConfig"**
     In the XML command "antenneConfig", the following must be set for the antenna port that is used:
     (antenna number="1 ... 4"), antenna gain (gain="8.5") and cable loss (cableLoss="4.0").
     Cable loss: 4 dB (due to adaptation and damping losses of the connectors)
   - **Parameterizing RF630R via SIMATIC commands**
     Since according to ETSI EN 302 208 V1.2.1 the maximum permissible radiated power is 2 W ERP, none of the transmitting power settings available to the user (**distance_limiting**) can lead to the required maximum permissible radiated power value being exceeded. The exact radiated power of the reader, together with the antenna cables and antenna used, are the result of the value used in **distance_limiting** 0-F and the calculation given in Chapter "Radiated power setting with RF630R".
4. in the configuration software of the RF660R reader:
5. You must subsequently have your desired system requirements measured and verified according to EN 302 308 in an absorber chamber.
   You may only use your SIMATIC RF600 system with the new third-party components when this has been carried out.

## 6.5 Mounting types

### 6.5.1 Overview

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

- SIMATIC RF620R/RF630R/RF670R
- SIMATIC RF660A

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

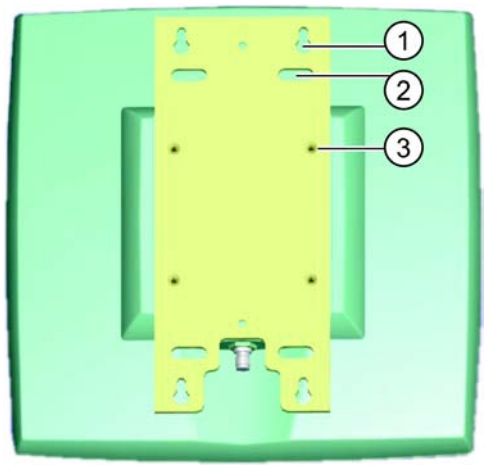
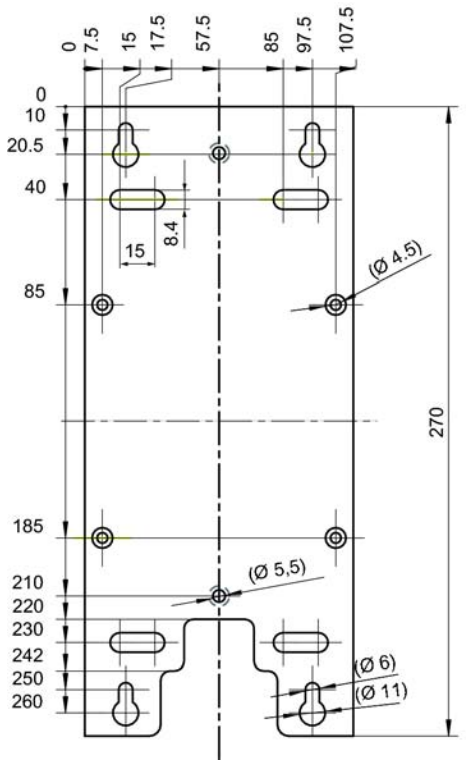
### 6.5.2 Ordering data

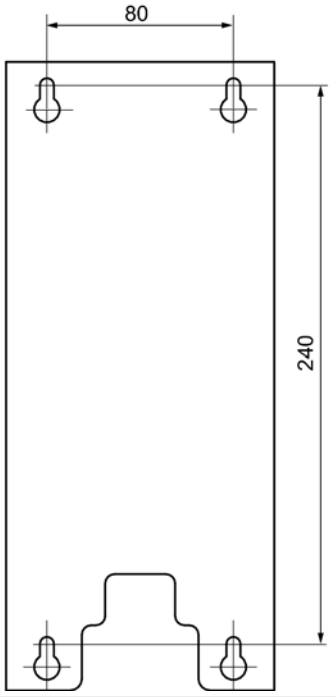
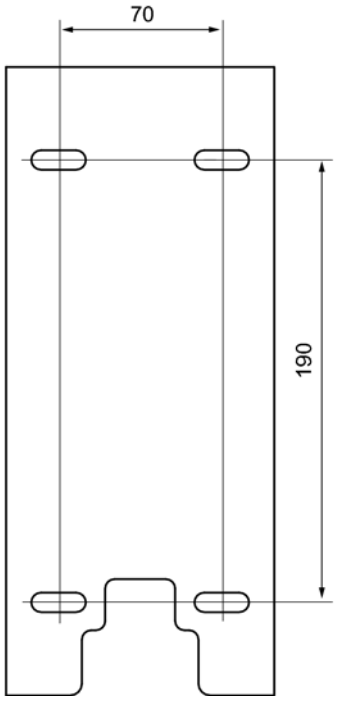
| Description | Machine-Readable Product Code |
|---|---|
| Mounting plate | (supplied with RF660A) |
| Antenna mounting kit | 6GT2890-0AA00 |

## 6.5.3 Mounting with antenna mounting plate

Rigid fixing with an antenna mounting plate is suitable for:

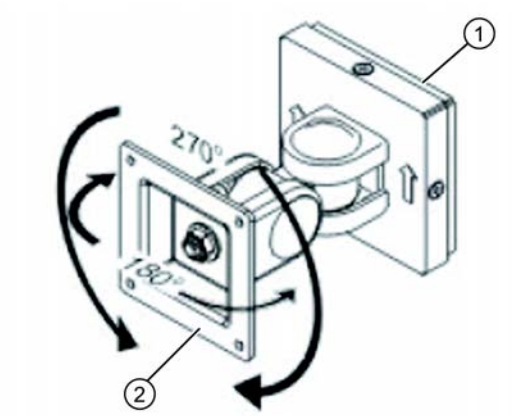
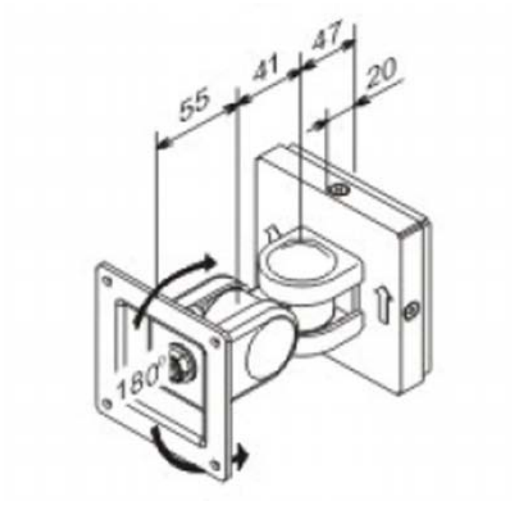
- Wall mounting on solid foundations
- Mast mounting

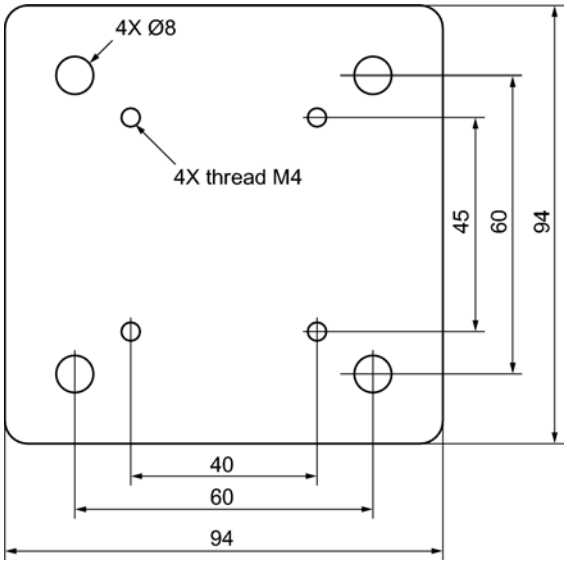
| Antenna with antenna mounting plate | Description |
|---|---|
|  | ① Keyhole for wall mounting (4 x)<br>① Elongated hole for mast mounting (4 x)<br>③ Standardized VESA 100 fixing holes (4 x M4) |
|  | Dimensions for fixing holes<br>All dimensions in mm |

| Antenna with antenna mounting plate | Description |
|---|---|
|  | Template for wall fixing for<br>M6 bolts<br>(hexagon bolts are required) |
|  | Template for mast mounting<br>Mast diameter 60 to 80 mm |

## 6.5.4 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<br>(1) Wall side<br>(2) Antenna side |
|  | Distances for wall mounting |

| Antenna mounting kit | Description |
|---|---|
|  | VESA adapter plate<br>from VESA 75 x 75<br>to VESA 100 x 100<br>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 |

# Transponder/tags

# 7

## 7.1 Overview

### 7.1.1 Tags in different sizes and types

Tags/transponders and labels are available in a variety of shapes, sizes and materials. The pictures below show some examples of tags and labels in different designs.

| Tags in different sizes and types | | |
|---|---|---|
|  |  |  |
|  |  |  |
|  |  |  |
|  |  | |

### 7.1.2 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)

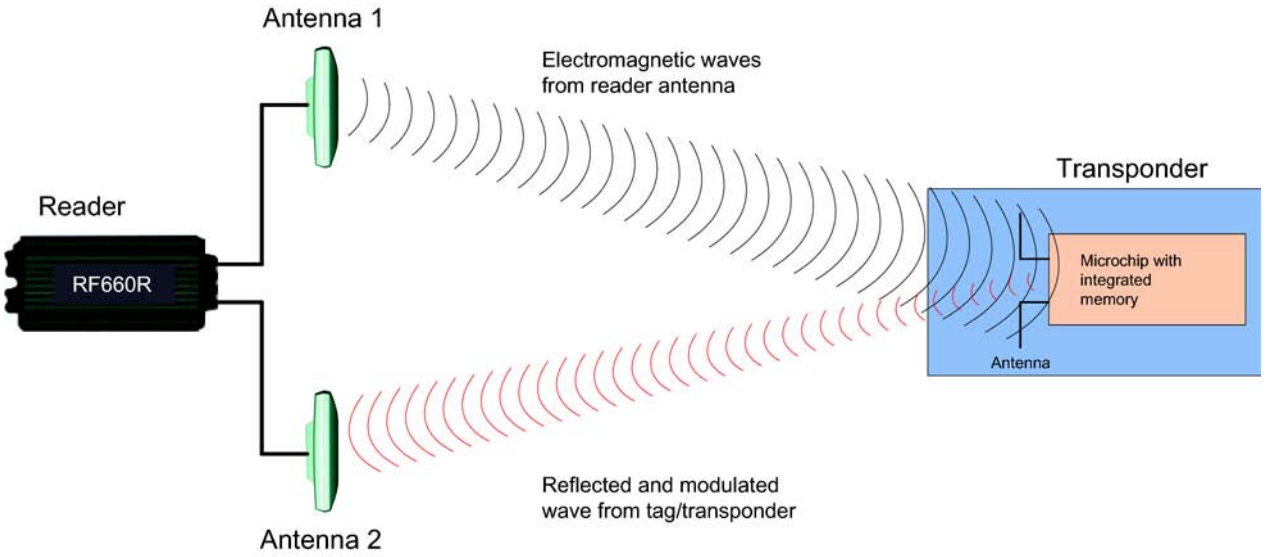



Figure 7-1 Mode of operation of transponders

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.

## 7.1.3 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:**

- ISO 18000-6B with full ISO profile (RF660R, RF610M)
- EPC Global Class 1, Gen 1 with full EPC Global Profile (RF660R, RF610M)
- EPC Global Class 1 Gen 2 with full EPC Global Profile (ISO 18000-6C)

## Support for protocol types using the RF600

Specification of the transponders/tags in accordance with ISO 18000-6 refers to implementation of the air-interface protocols.

There are three variants:

- ISO 18000-6A: Not supported
- ISO 18000-6B: Supported by RF660R, RF610M
- ISO 18000-6C: Supported by RF670R, RF660R, RF620R, RF630R, RF610M
  This variant is identical with EPC Global Class°1 Gen°2 standard.

Table 7-1 Comparison of the ISO 18000-6B and ISO 18000-6A protocol types

| | **Type B** | **Type A** |
|---|---|---|
| Frequency band | 860 to 960 MHz | 860 to 960 MHz |
| Transmission procedure | Bi-phase modulation and Manchester encoding | Pulse Interval Encoding (PIE) |
| Anti-collision techniques | Adaptive binary tree technique | ALOHA technique |
| Protocol | Reader talks first | Reader talks first |
| Supported in RF600 | By RF660R/RF610M | No |

## EPC Global

| EPC Class | Definition | Programming | Supported in RF600 |
|---|---|---|---|
| Class 1 | Passive tags with the following minimum features:<br>• EPC ID (Electronic Product Code IDentifier)<br>• Tag ID<br>• A function which permanently ensures that tags no longer respond.<br>• Optional use or suppression of tags<br>• Optional password-protected access control<br>• Optional USER memory area. | Programming by the customer (cannot be reprogrammed after locking) | Yes |
| Class 2 | Passive tags with the following additional features (in comparison with Class 1 tags):<br>• Extended tag ID,<br>• Extended USER memory area<br>• Authenticated ACCESS access<br>• Additional features | Freely programmable | No |
| Class 3 | Passive tags with the following additional features (in comparison with Class 2 tags):<br>• Source of energy that supplies power to the tag or its sensors<br>• Sensors with optional data logging | | No |
| Class 4 | Active tags with the following features:<br>• EPC ID (Electronic Product Code IDentifier)<br>• Extended tag ID<br>• Authenticated ACCESS access<br>• A source of energy<br>• Communication using an autonomous transmitter<br>• Optional USER memory area.<br>• Optional sensors with or without optional data logging | | No |

Table 7-2 Comparison of EPC Class 1 Gen 1 and Class 1 Gen 2

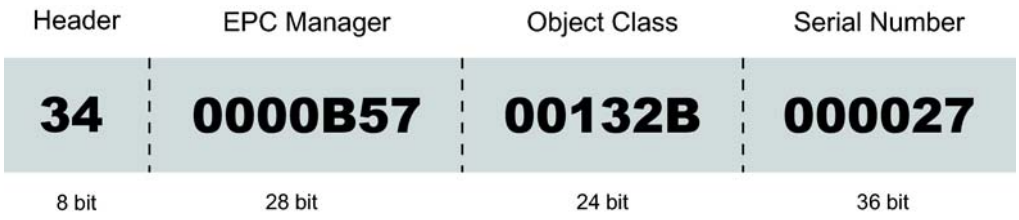
| Property | Class 1 Gen 1 | Class 1 Gen 2 = ISO 18000-6 C |
|---|---|---|
| Frequency | 860-930 MHz | 860-960 MHz |
| Memory capacity | 64 or 96 bits | 96-256 bits |
| Can be programmed on site | Yes | Yes |

| Property | Class 1 Gen 1 | Class 1 Gen 2 = ISO 18000-6 C |
|---|---|---|
| Programming | written once; read many times | Yes |
| Other Features | _ | Reading is faster and more reliable than for Generation 1. Enhanced compliance with global standards. |

## 7.1.4 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

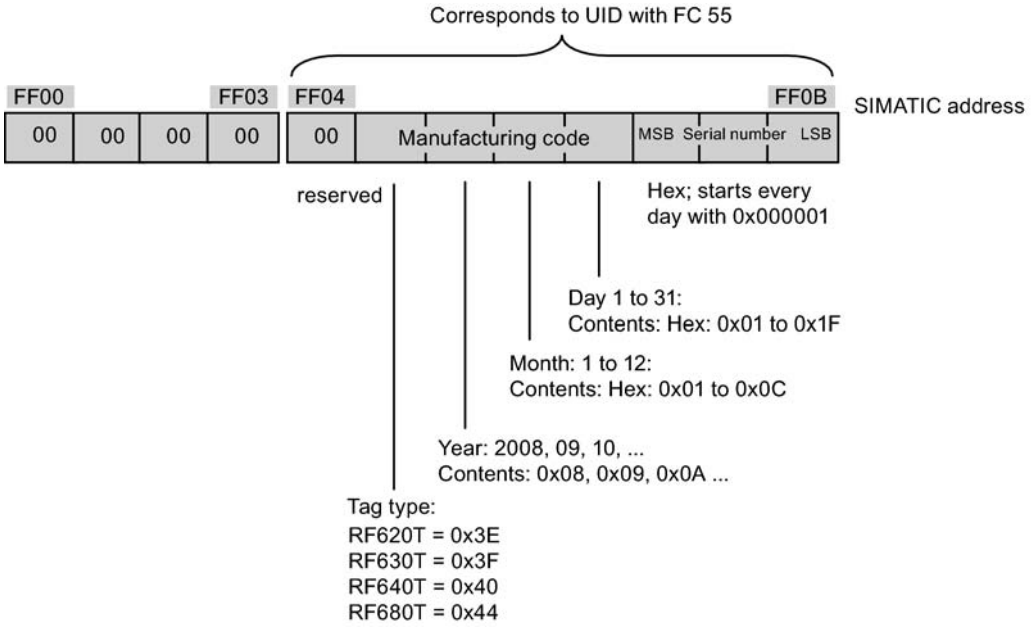



Figure 7-2 Allocation of the EPC ID on delivery of the tag

## 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 | 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 | | | |
| Write range | 0.2 m to 5 m | | | 0.2 m to 5 m |
| Reading range | 0.2 m to 8 m | | | 0.2 m to 5 m |
| Mounting | Self-adhesive **paper labels** for attaching to packaging units, paper or cartons, for example. | | Self-adhesive **plastic labels** for attaching to packaging units, paper or cartons, for example. | |
| | Not suitable for fixing straight onto metal or onto liquid containers | | | |

## 7.2.2 Minimum spacing between labels

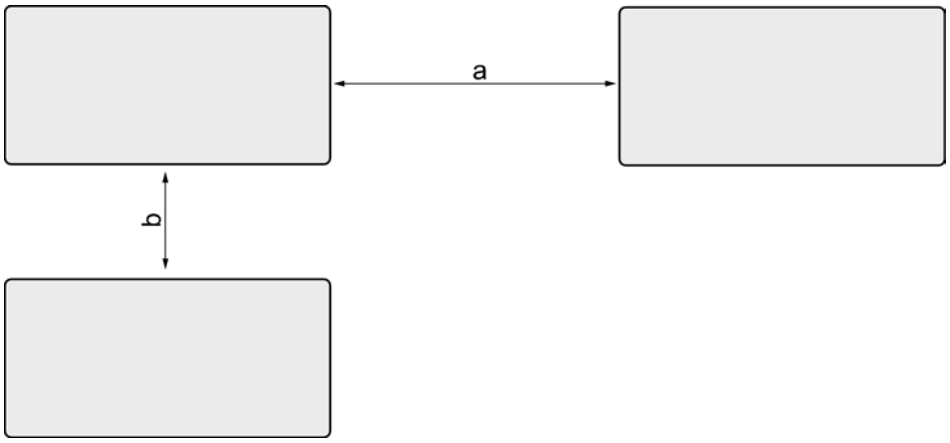



Figure 7-3 Minimum spacing between labels

Table 7-3 Minimum spacing

| Minimum spacing | 6GT2810-2AB00 | 6GT2810-2AB01 | 6GT2810-2AB02 | 6GT2810-2AB03 |
|---|---|---|---|---|
| a | 50 mm | | | |
| b | 50 mm | | | |

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.

## 7.2.3 Memory configuration for smart labels with MLFBs -00, -01, -02

**Note**

**Validity of the memory configuration**

Please note that the following memory configuration only applies to smart labels with the following MLFBs:

- 6GT2810-2AB00
- 6GT2810-2AB01
- 6GT2810-2AB02

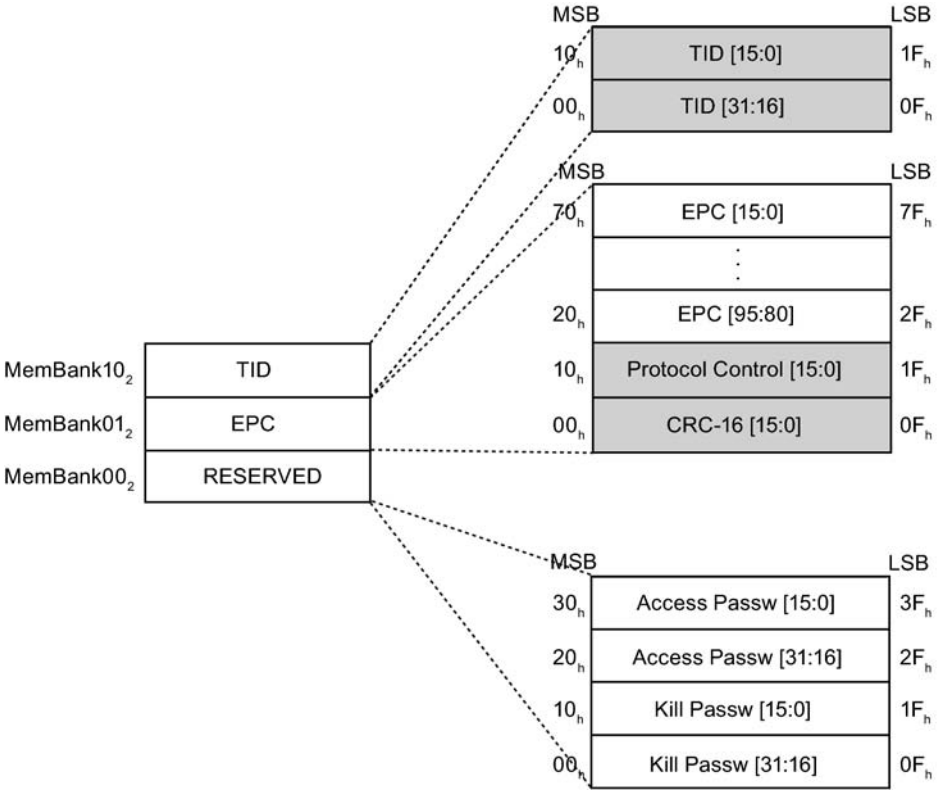
## 7.2.4 Memory configuration

### Memory banks

The memory is divided logically into three different memory banks:

| Memory bank (decimal) | Memory type | Description |
|---|---|---|
| MemBank $10_2$ | TID | Is defined by the manufacturer, contains the class identifier of a tag. |
| MemBank $01_2$ | EPC | Contains the EPC UID, the protocol and the CRC of a tag<br>You can write to the EPC memory area. In the delivery condition, the memory contents can have the following states:<br>• empty<br>• containing the same data<br>• 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 bit) in the memory.




| Color | Mode of access by SIMATIC RF600 reader |
|---|---|
| | Read |
| | Write / read |

### Parameterization

The parameterization possibilities that are available to you for each reader of the RF600 family are outlined in section Overview of parameterization of RF600 reader (Page 325). Detailed information for parameterization as well as examples for describing and reading specific memory areas can be found in the referenced chapters of the documentation.

## 7.2.5 Memory configuration for smart labels with MLFB -03

**Note**

**Validity of the memory configuration**

Please note that the following memory configuration only applies to smart labels with the following MLFB:

- 6GT2810-2AB03

## 7.2.6 Memory configuration

### Memory representation according to EPC

The memory of the ISO 18000-6C G2XM chip is logically divided 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 tag |
| MemBank $01_2$ | EPC | Contains the EPC data, the protocol information and the CRC data of a tag.<br>You can write to the EPC memory area. In the delivery condition, the memory contents can have the following states:<br>• containing the same data<br>• containing different data |
| MemBank $00_2$ | RESERVED | Contains the access password. |

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

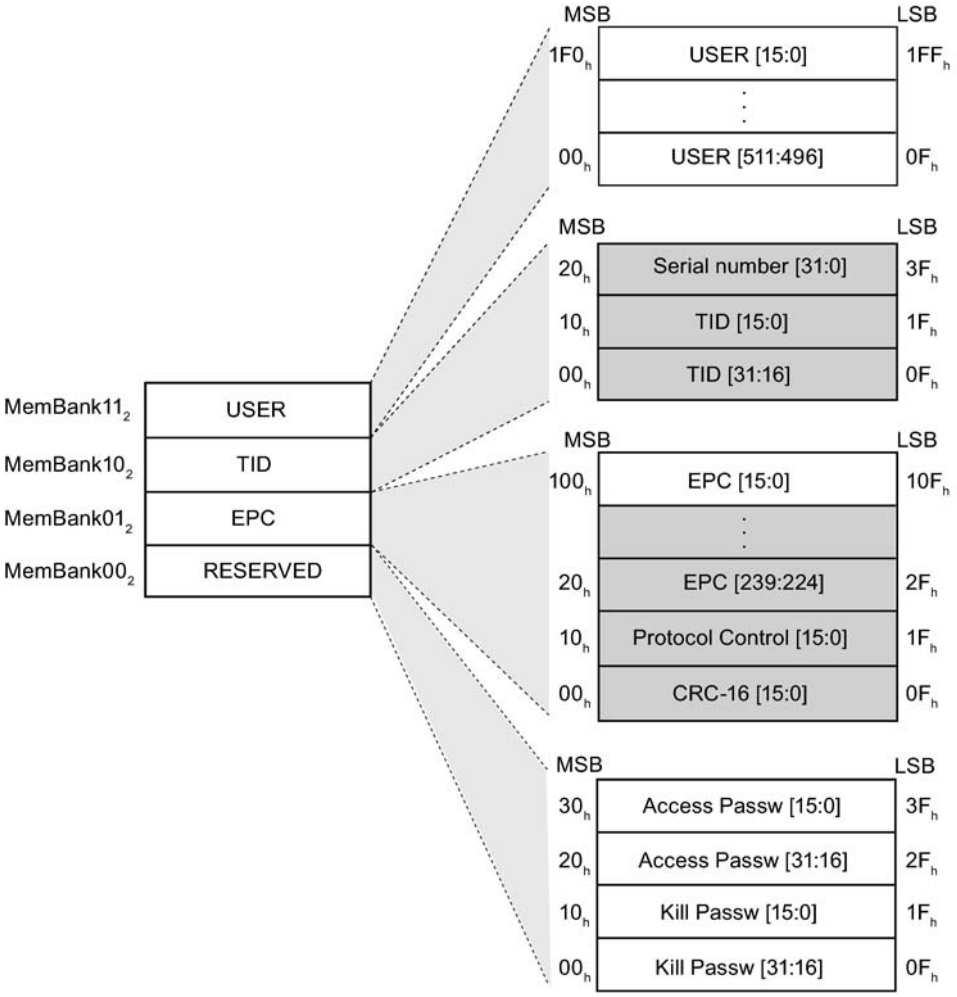



Figure 7-4 Representation of the RF630L memory configuration according to EPC (logical memory map)

## Parameterization

The parameterization possibilities that are available to you for each reader of the RF600 family are outlined in section Overview of parameterization of RF600 reader (Page 325). Detailed information for parameterization as well as examples for describing and reading specific memory areas can be found in the referenced chapters of the documentation.

## 7.2.7 Ordering data

| RF630L transponder | Order No. | Type of delivery |
|---|---|---|
| RF630L transponder,<br>smart label 101.6 mm x 152.4 mm (4" x 6") | 6GT2810-2AB00 | Minimum order amount 1600 items (800 on one roll) |
| RF630L transponder,<br>smart label 101.6 mm x 50.8 mm (4" x 2") | 6GT2810-2AB01 | Minimum order amount 1000 items (1000 on one roll) |
| RF630L transponder,<br>smart label 97 mm x 27 mm | 6GT2810-2AB02 | Minimum order amount 2000 items (2000 on one roll) |
| RF630L transponder,<br>smart label 54 mm x 34 mm | 6GT2810-2AB03 | Minimum order amount 2000 items (2000 on one roll) |

## 7.2.8 Technical data

Table 7-4 Mechanical data

| | 6GT2810-2AB00 | 6GT2810-2AB01 | 6GT2810-2AB02 | 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 | | Printed using heat transfer technique (currently only with Toshiba B-SX4T) | Cannot be printed |
| 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 | 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 | |

| | 6GT2810-2AB00 | 6GT2810-2AB01 | 6GT2810-2AB02 | 6GT2810-2AB03 |
|---|---|---|---|---|
| Frequency range | Europe 865 … 868 MHz | | | |
| | USA 902 … 928 MHz | | | |
| Typical<br>read distance<br>• Paper/cardboard<br>• Plastic film<br>• Plastic (boxes, surface resistance > 10 MΩ<br>• Wood (dry, < 30 % residual humidity)<br>• Glass | • 0.2 m to 8 m<br>• 0.2 m to 8 m<br>• 0.2 m to 4 m<br>• 0.2 m to 4 m<br>• 0.2 m to 4 m | | | • 0.2 m to 5 m<br>• 0.2 m to 5 m<br>• 0.2 m to 3 m<br>• 0.2 m to 3 m<br>• 0.2 m to 3 m |
| Typical<br>write distance<br>• Paper/cardboard<br>• Plastic film<br>• Plastic (boxes, surface resistance > 10 MΩ<br>• Wood (dry, < 30 % residual humidity)<br>• Glass | • 0.2 m to 5 m<br>• 0.2 m to 5 m<br>• 0.2 m to 2.5 m<br>• 0.2 m to 2.5 m<br>• 0.2 m to 2.5 m | | | • 0.2 m to 3 m<br>• 0.2 m to 3 m<br>• 0.2 m to 1 m<br>• 0.2 m to 1 m<br>• 0.2 m to 1 m |
| Minimum spacing between labels<br>• tile<br>• cascade | • 50 mm<br>• 100 mm | | | |
| Energy source | Magnetic energy via antenna, without battery | | | |
| Multi-tag capability | Yes | | | |

Table 7-6 Memory specifications

| | 6GT2810-2AB00 | 6GT2810-2AB01 | 6GT2810-2AB02 | 6GT2810-2AB03 |
|---|---|---|---|---|
| Type | EPC Class 1 Gen2 | | | |
| Memory organization | EPC code 96 bit | | | 96 bits/240 bits |
| Additional user memory | No | | | 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. | | | |

Table 7-7 Environmental conditions

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

## 7.2.9 Dimension drawings

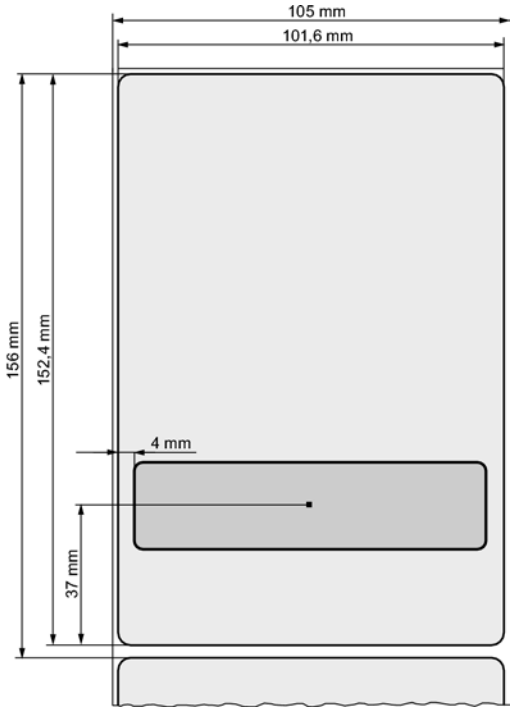



Figure 7-5 SIMATIC RF630L 6GT2810-2AB00 dimension drawing

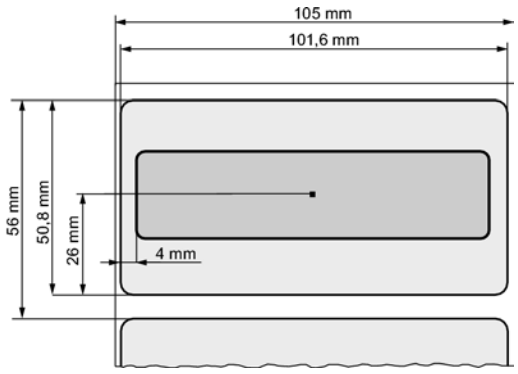



Figure 7-6 SIMATIC RF630L 6GT2810-2AB01 dimension drawing

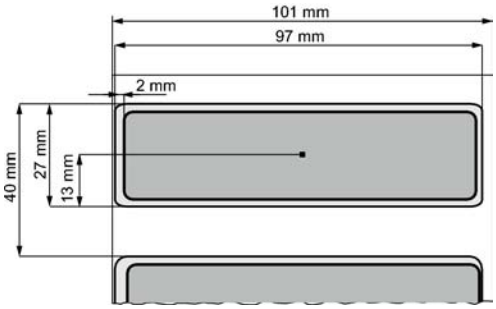



Figure 7-7 SIMATIC RF630L 6GT2810-2AB02 dimension drawing

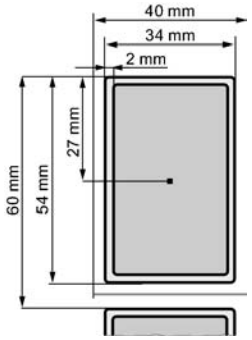



Figure 7-8 SIMATIC RF630L 6GT2810-2AB03 dimension drawing

# 7.3 SIMATIC RF680L Smartlabel

## 7.3.1 Certificates and approvals

| Certificate | Description |
|---|---|
| CE | Compatible with R&TTE directive |
| FCC<br>Federal Communications Commission | Passive labels and transponders comply with the valid regulations; certification is not required. |

## 7.3.2 Dimension drawing

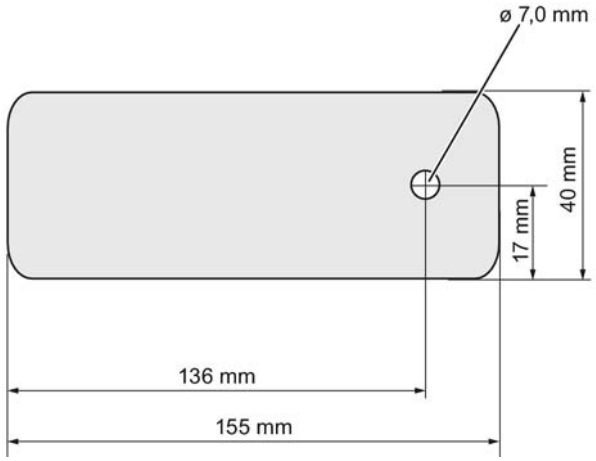



Figure 7-9 Dimension drawing for RF680L (special version)

## 7.3.3 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 (special version) 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 | |
|---|---|---|
|  | Application | Production logistics applications subject to high temperatures:<br>Five hours up to 200 °C |
| | Air interface | according to ISO 18000-6C |
| | Memory | EPC 96 bit/240 bit<br>Add-on-memory 64 bytes |
| | Read/write range | Typically 5 m in connection with:<br>• RF660R readers and<br>• RF660A antennas |
| | | Typically 3 m in connection with:<br>• RF630R readers and<br>• RF660A antennas |
| | | Typically 0.5 m in connection with:<br>• RF630R reader and<br>• RF620A antenna |
| | | Typically 2 m in connection with:<br>• RF620R with integrated antenna |
| | Mounting | Via a hole on the narrow side. Can also be glued by customer. Not suitable for mounting straight onto metal. |

## 7.3.4 Ordering data

| Ordering data | Order no. | Delivery format |
|---|---|---|
| SIMATIC RF680L<br>• Smartlabels 155 x 40 mm<br>• Heat-resistant up to 200 °C | 6GT2810-xxxx | Minimum order quantity 1,000 items |

### 7.3.5 Minimum spacing between labels

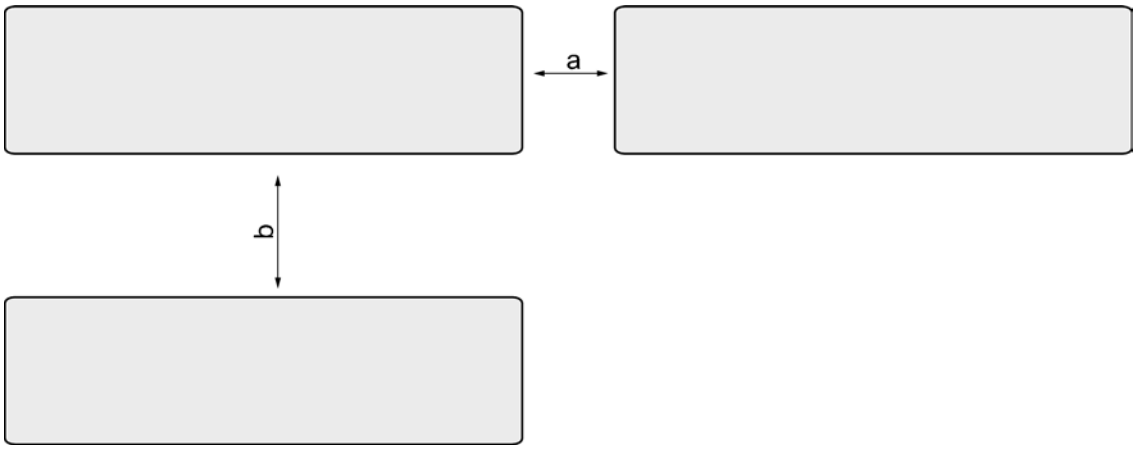



Figure 7-10 Minimum spacing between labels

Table 7-9 Minimum spacing

| Minimum spacing | |
|---|---|
| a | 20 mm |
| b | 50 mm |

## 7.3.6 Memory configuration

### 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.

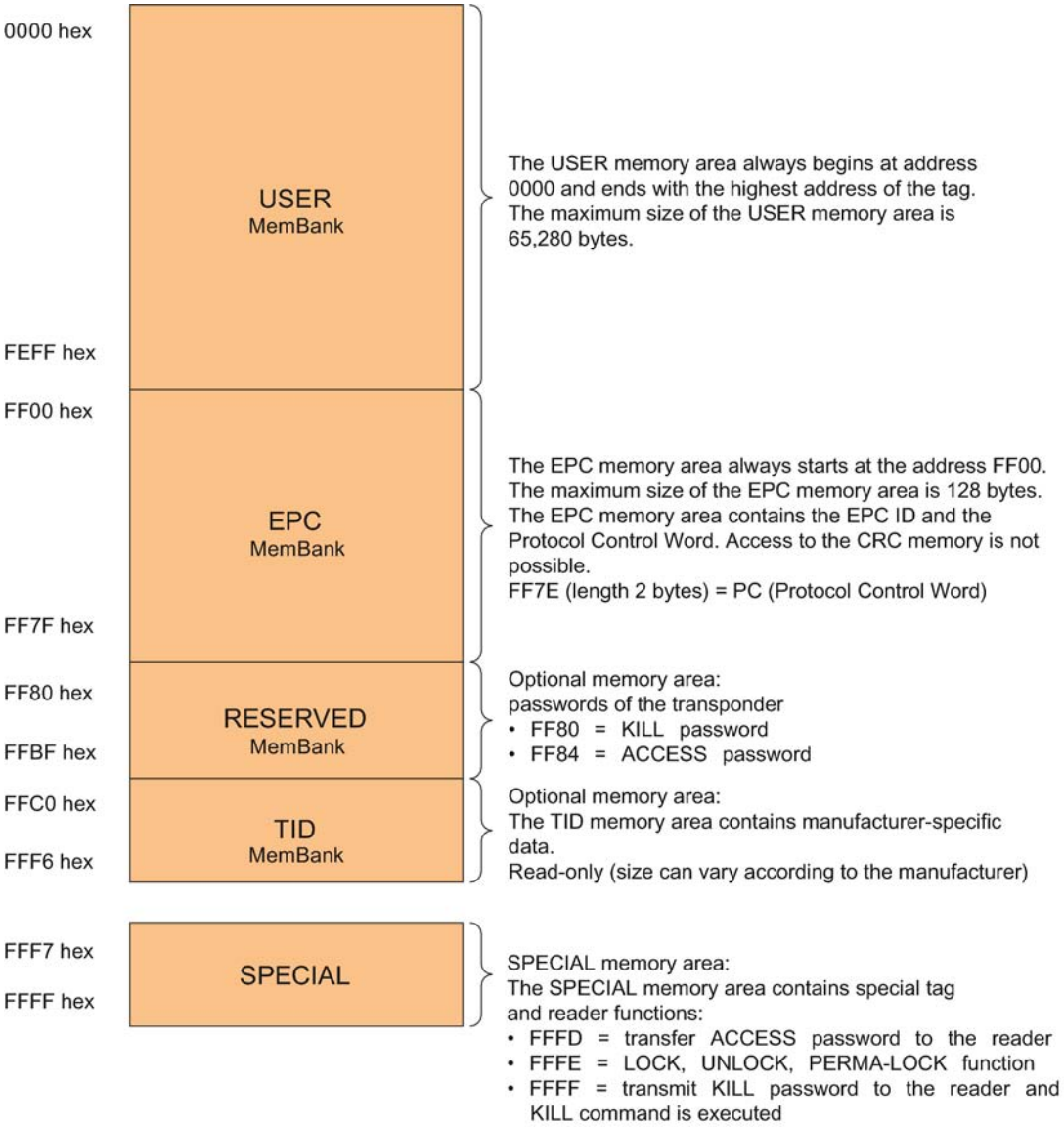



Figure 7-11 SIMATIC memory model

## Memory configuration for RF680L (special version)

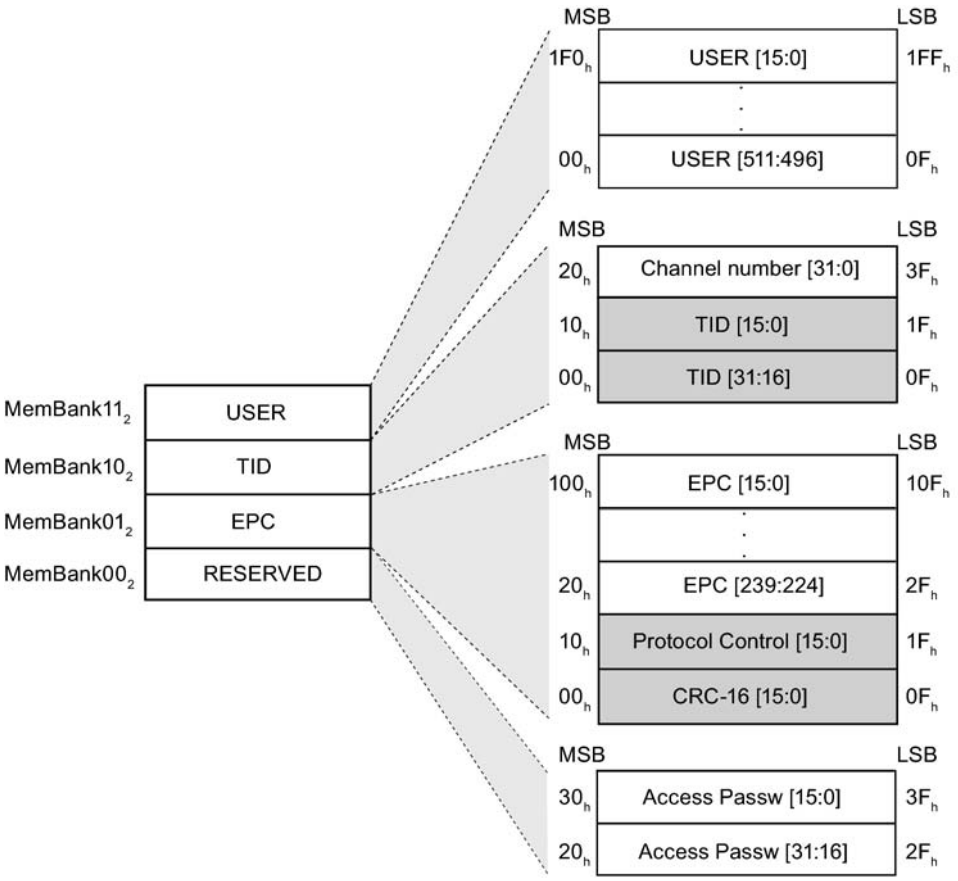
| Tag | User [hex] | EPC | | TID | RESERVED (passwords) | Special | |
|---|---|---|---|---|---|---|---|
| | | Range | Access | | | KILL-PW | Lock function |
| **RF680L** | 00 - 3F | FF00-FF0B (240 bit = FF00-FF1D) | read/ write | FFC0-FFC7 | FF80-FF87 | Yes | Yes |

## Memory representation according to EPC

The memory of the ISO 18000-6C G2XM chip is logically divided 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 tag |
| MemBank $01_2$ | EPC | Contains the EPC data, the protocol information and the CRC data of a tag.<br>You can write to the EPC memory area. In the delivery condition, the memory contents can have the following states:<br>• containing the same data<br>• containing different data |
| MemBank $00_2$ | RESERVED | Contains the access password. |

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




| Color | Access by SIMATIC RF660R / SIMATIC RF610M |
|---|---|
| | Read |
| | Write / read |

Figure 7-12 Representation of the RF680L memory configuration (special version) according to EPC (logical memory map)

## Parameterization

The parameterization possibilities that are available to you for each reader of the RF600 family are outlined in section Overview of parameterization of RF600 reader (Page 325). Detailed information for parameterization as well as examples for describing and reading specific memory areas can be found in the referenced chapters of the documentation.

## 7.3.7 Technical data

### 7.3.7.1 Mechanical data

| Property | Description |
|---|---|
| Dimensions (L x W) | 155 mm x 40 mm |
| Thickness of the paper | 0.3 mm |
| Design | Synthetic paper |
| Antenna material | Aluminum |
| Static pressure | 10 N/mm$^2$ |
| Silicone-free | Yes |
| Type of antenna | Shortened dipole |
| Color | beige |
| Printing | Yes |
| Mounting | Via a hole on the narrow side. Can also be glued by customer. Not suitable for mounting straight onto metal. |
| Weight | Approx. 3 g |

### 7.3.7.2 Electrical data

| Feature | 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 band | Europe 865…868 MHz<br>/ USA 902…928 MHz | | | |
| **Reading range typical** | **RF660R with RF660A** | **RF630R with RF660A** | **RF630R with RF620A** | **RF620R** |
| | 0.2 m ... 5.0 m | 0.2 m ... 3.0 m | 0.2 ... 0.5 m | 0.2 m ... 2.0 m |
| **Write range typical** | **RF660R with RF660A** | **RF630R with RF660A** | **RF630R with RF620A** | **RF620R** |
| | 0.2 m ... 3.0 m | 0.2 m ... 1.8 m | 0.2 m ... 0.3 m | 0.2 m ... 0.7 m |
| Minimum spacing between labels<br>• Vertically<br>• Horizontally | <br>• 50 mm<br>• 20 mm | | | |
| Energy source | Energy via electro-magnetic field via antenna, no battery required | | | |
| Multi-tag capability | Yes | | | |

#### 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

| Feature | Description |
|---|---|
| Temperature range during operation | -25 °C…+85 °C (permanent)<br>+200 °C up to five hours |
| Temperature range during storage | -40 °C … +85 °C |
| Torsion and bending load | Partially permissible |
| Distance from metal | Not suitable for fixing straight onto metal |

## 7.4 SIMATIC RF610T

### 7.4.1 Characteristics

The SIMATIC RF610T 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 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 | |
|---|---|---|
|  | Application | • Simple identification, such as barcode replacement or barcode supplement<br>• Warehouse and distribution logistics<br>• Product identification<br>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<br>Add-on-memory 64 bytes |
| | Read/write range | Typically X°m in connection with: @@@<br>• RF670R reader and<br>• RF660A antennas |
| | | Typically 5 m in connection with:<br>• RF660R readers and<br>• RF660A antennas |
| | | Typically 3 m in connection with:<br>• RF630R readers and<br>• RF660A antennas |
| | | Typically 2 m in connection with:<br>• RF620R with integrated antenna |
| | Mounting | • Suspended by means of cable ties, or similar<br>• Can also be fixed with screws or glued by customer.<br>• Not suitable for mounting straight onto metal. |

## 7.4.2 Ordering data

| Ordering data | Order no. | Delivery format |
|---|---|---|
| SIMATIC RF610T | 6GT2810-2BB80 | Min. order quantity 500 units |

## 7.4.3 Safety instructions for the device/system

| NOTICE |
|---|
| This device/system may only be used for the application instances that have been described in the catalog and the technical documentation "RF600 system manual (http://support.automation.siemens.com/WW/view/en/22437600)", and only in combination with third-party devices and components recommended and/or approved by Siemens. |

### 7.4.4 Minimum spacing between labels

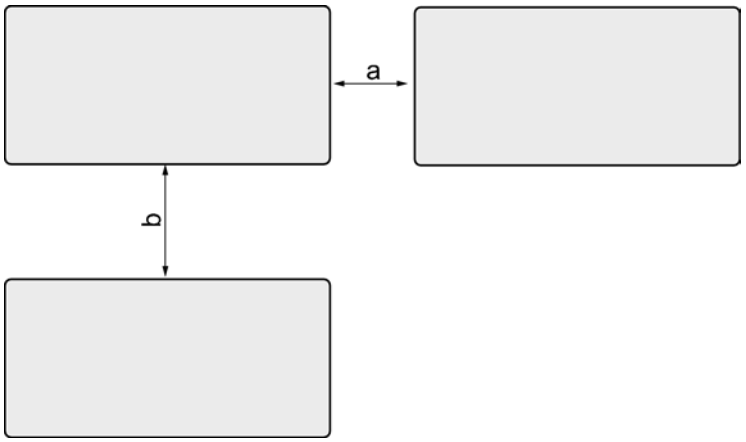



Figure 7-13 Minimum spacing between labels

Table 7-10 Minimum spacing

| Minimum spacing | |
|---|---|
| a | 20 mm |
| b | 50 mm |

## 7.4.5 Memory configuration

### 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.

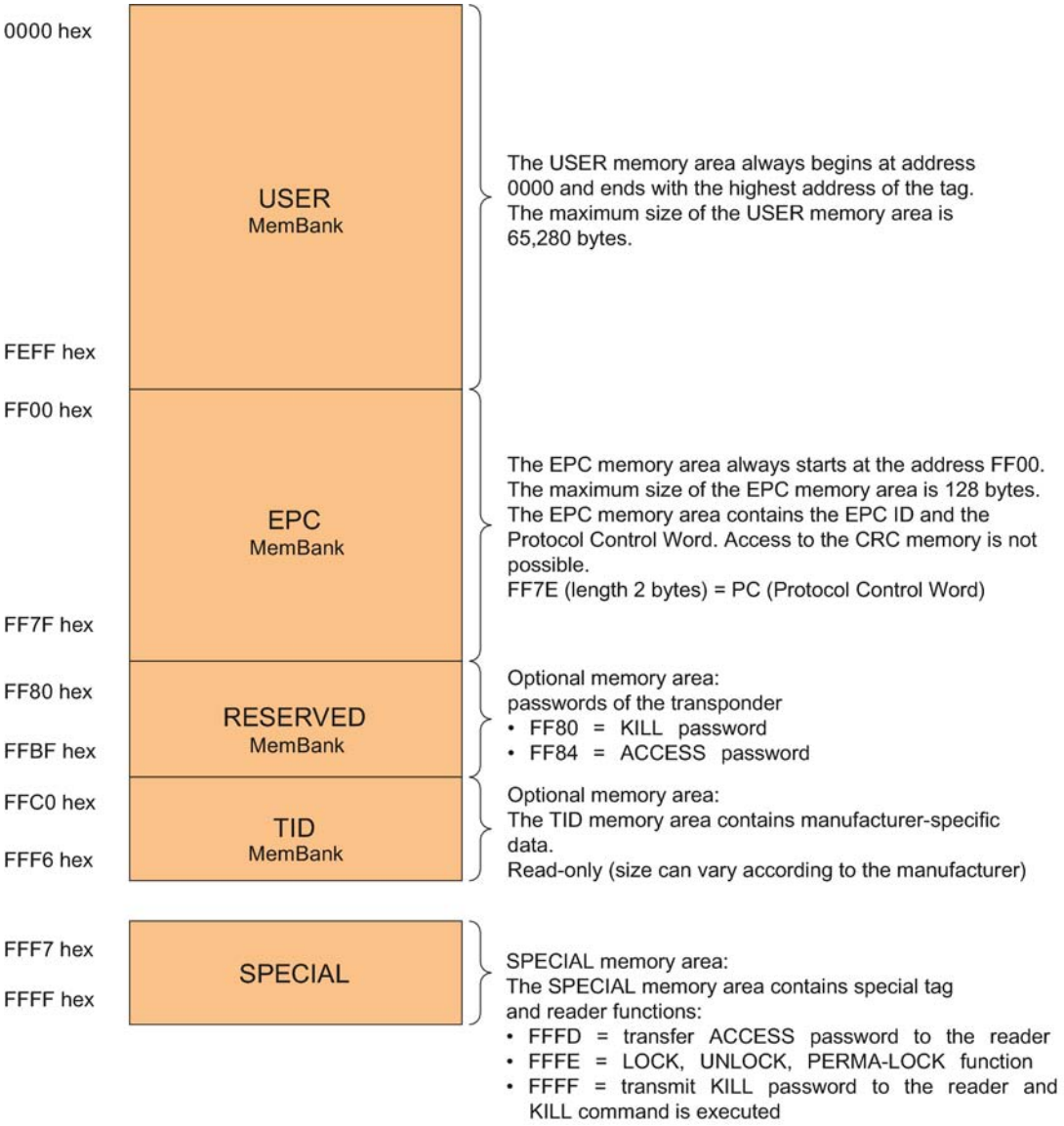



Figure 7-14 SIMATIC memory model

## Memory configuration for RF610T

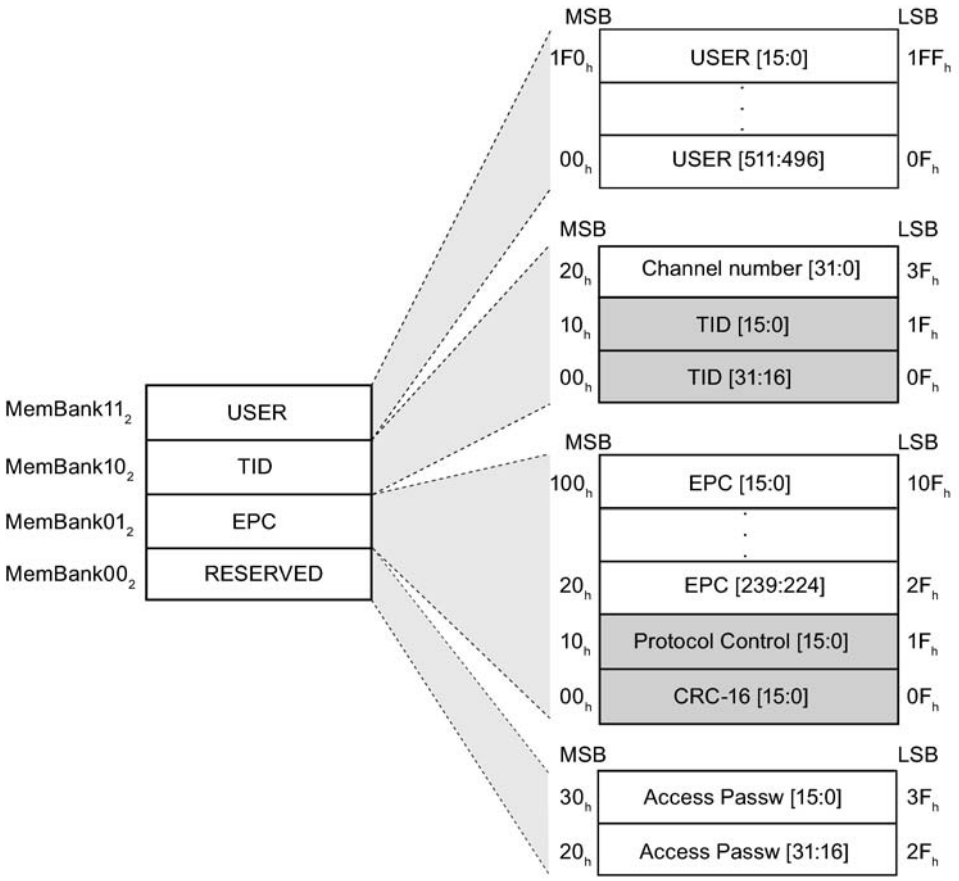
| Tag | User [hex] | EPC | | TID | RESERVED (passwords) | Special | |
|---|---|---|---|---|---|---|---|
| | | Range | Access | | | KILL-PW | Lock function |
| **RF610T** | 00 - 3F | FF00-FF0B (240 bit = FF00-FF1D) | read/ write | FFC0-FFC7 | FF80-FF87 | Yes | Yes |

## Memory representation according to EPC

The memory of the ISO 18000-6C G2XM chip is logically divided 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 tag |
| MemBank $01_2$ | EPC | Contains the EPC data, the protocol information and the CRC data of a tag.<br>You can write to the EPC memory area. In the delivery condition, the memory contents can have the following states:<br>• containing the same data<br>• containing different data |
| MemBank $00_2$ | RESERVED | Contains the access password. |

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




| Color | Mode of access by SIMATIC RF600 reader |
|---|---|
| | Read |
| | Write / read |

Figure 7-15 Representation of the RF610T memory configuration according to EPC (logical memory map)

## Parameterization

The parameterization possibilities that are available to you for each reader of the RF600 family are outlined in section Overview of parameterization of RF600 reader (Page 325). Detailed information for parameterization as well as examples for describing and reading specific memory areas can be found in the referenced chapters of the documentation.

## 7.4.6 Technical data

### 7.4.6.1 Mechanical data

| Property | Description |
|---|---|
| Dimensions (L x W x H) | 86 mm x 54 mm x 0.4 mm |
| Design | PET (polyethylene terephthalate) |
| Antenna material | Aluminum |
| Static pressure | 10 N/m$^2$ |
| Type of antenna | Shortened dipole |
| Color | white |
| Printing | Yes |
| Mounting | • Suspended by means of cable ties, or similar<br>• Can also be fixed with screws or glued by customer.<br>• Not suitable for mounting straight onto metal. |
| Weight | Approx. 3 g |

### 7.4.6.2 Electrical data

| Property | 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 band | Europe 865…868 MHz<br>/ USA 902…928 MHz |

| Reading range typical | RF670R with RF660A @@@ | RF660R with RF660A | RF630R with RF660A | RF620R |
|---|---|---|---|---|
| Paper/cardboard | X m ... X,0 m | 0.2 m ...5.0 m | 0.2 m ...3.0 m | 0.2 m ...2.0 m |
| Plastic film | X m ... X,0 m | 0.2 m ...5.0 m | 0.2 m ...3.0 m | 0.2 m ...2.0 m |
| Plastic | X m ... X,0 m | 0.2 m ...3.0 m | 0.2 m ...2.0 m | 0.2 m ...1.5 m |
| Wood | X m ... X,0 m | 0.2 m ...3.0 m | 0.2 m ...2.0 m | 0.2 m ...1.5 m |
| Glass | X m ... X,0 m | 0.2 m ...3.0 m | 0.2 m ...2.0 m | 0.2 m ...1.5 m |
| **Write distance typical** | **RF670R with RF660A @@@** | **RF660R with RF660A** | **RF630R with RF660A** | **RF620R** |
| Paper/cardboard | X m ... X,0 m | 0.2 m ...3.0 m | 0.2 m ...1.8 m | 0.2 m ...0.7 m |
| Plastic film | X m ... X,0 m | 0.2 m ...3.0 m | 0.2 m ...1.8 m | 0.2 m ...0.7 m |
| Plastic | X m ... X,0 m | 0.2 m ...1.0 m | 0.2 m ...0.7 m | 0.2 m ...0.5 m |
| Wood | X m ... X,0 m | 0.2 m ...1.0 m | 0.2 m ...0.7 m | 0.2 m ...0.5 m |
| Glass | X m ... X,0 m | 0.2 m ...1.0 m | 0.2 m ...0.7 m | 0.2 m ...0.5 m |

| | |
|---|---|
| Energy source | Energy via electro-magnetic field via antenna, no battery required |
| Multi-tag capability | Yes |

### 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 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 | |

### 7.4.6.4 Environmental conditions

| Property | Description |
|---|---|
| Temperature range during operation | -25 °C … +85 °C |
| Temperature range during storage | -40 °C … +85 °C |
| Torsion and bending load | Partially permissible |
| Distance from metal | Not suitable for fixing straight onto metal |
| Degree of protection | IP67 |

## 7.4.7 Certificates and approvals

| Certificate | Description |
|---|---|
| CE | Compatible with R&TTE directive |
| FCC<br>Federal Communications Commission | Passive labels and transponders comply with the valid regulations; certification is not required. |

### 7.4.8 Dimension drawing

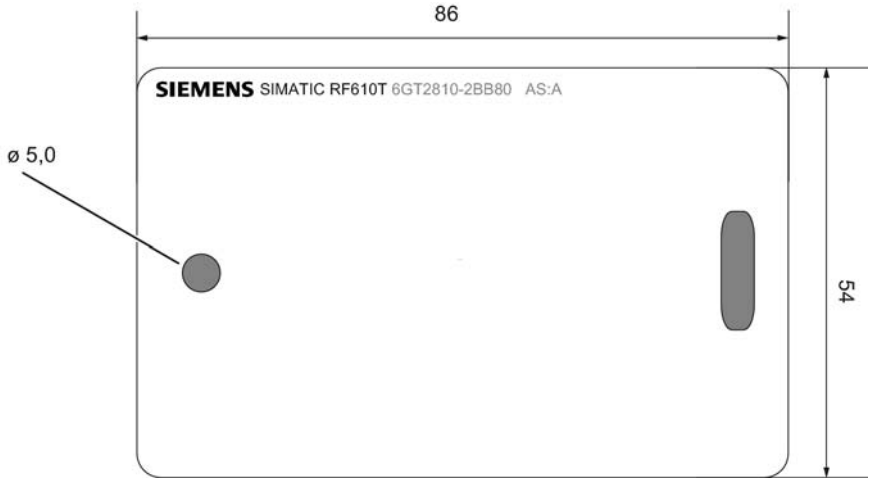



Figure 7-16 Dimensional drawing of SIMATIC RF610T

All dimensions in mm

## 7.5 SIMATIC RF620T

### 7.5.1 Characteristics

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

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 868 MHz (Europe) and 915 MHz (USA) 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 versions | Europe | USA / Canada |
| | | 868 MHz | 915 MHz |
| | Polarization | Linear | |
| | Memory | EPC 96 bit | |
| | Read/write range<br>• with non-metallic carriers<br>• direct on metallic carriers<br>• with spacer on metallic carriers | <br>• typically 0.2 to 6°m<br>• typically 0.2 to 2°m<br>• typically 0.2 to 4 m | |
| | Mounting | • screw, bond<br>• on metal by means of spacers | |
| | ① Labeling area | You can inscribe the transponder itself using laser, or adhere a label to position ①.<br>Possible types of labeling:<br>• Barcode<br>• Inscription in plain text<br>• Data matrix code | |
| | Housing color | Anthracite | |

## 7.5.2 Ordering data

| Ordering data | Order No. |
|---|---|
| SIMATIC RF620T<br>• Frequency 865 MHz to 928 MHz,<br>• UHF Class 1 Gen2 technology (96 bit)<br>• -25 °C to +85 °C operating temperature<br>• Dimensions (L x W x H) 127 x 38 x 6 mm<br>• IP 67 degree of protection | 6GT2810-2HC80 |
| Spacer for SIMATIC RF620T<br>• For attaching to metal surfaces<br>• Dimensions (L x W x H) 155 x 38 x 12 mm | 6GT2898-2AA00 |

## 7.5.3 Planning the use

### 7.5.3.1 Reading range when mounted on non-metallic carriers

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

Table 7-11 Reading range on non-metallic carriers

| Carrier plate material | Reading range |
|---|---|
| Transponder on wooden carrier (dry, degree of moisture < 15%) | typ. 6 m |
| Transponder on plastic carrier | typ. 6 m |
| Transponder on glass | typ. 6 m |
| Transponder on plastic mineral water bottle | typ. 1.2 m |

100% reading range is achieved when mounted in empty, anechoic rooms.

### 7.5.3.2 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.

#### Rotation about the polarization axis

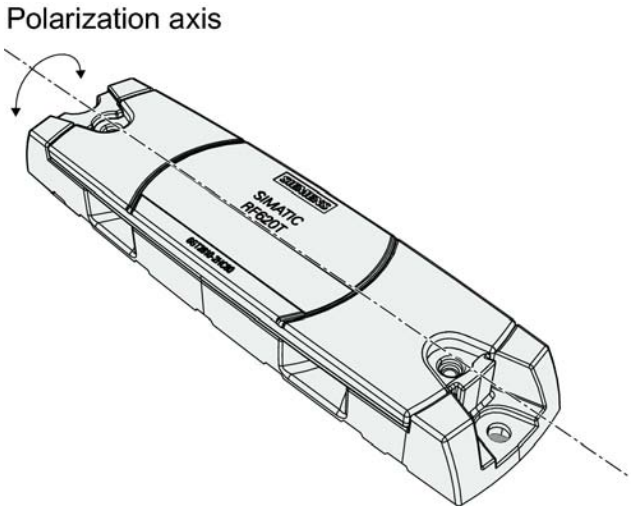



Figure 7-17 Rotation of the transponder about the polarization axis

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

### Rotation orthogonal to the polarization axis

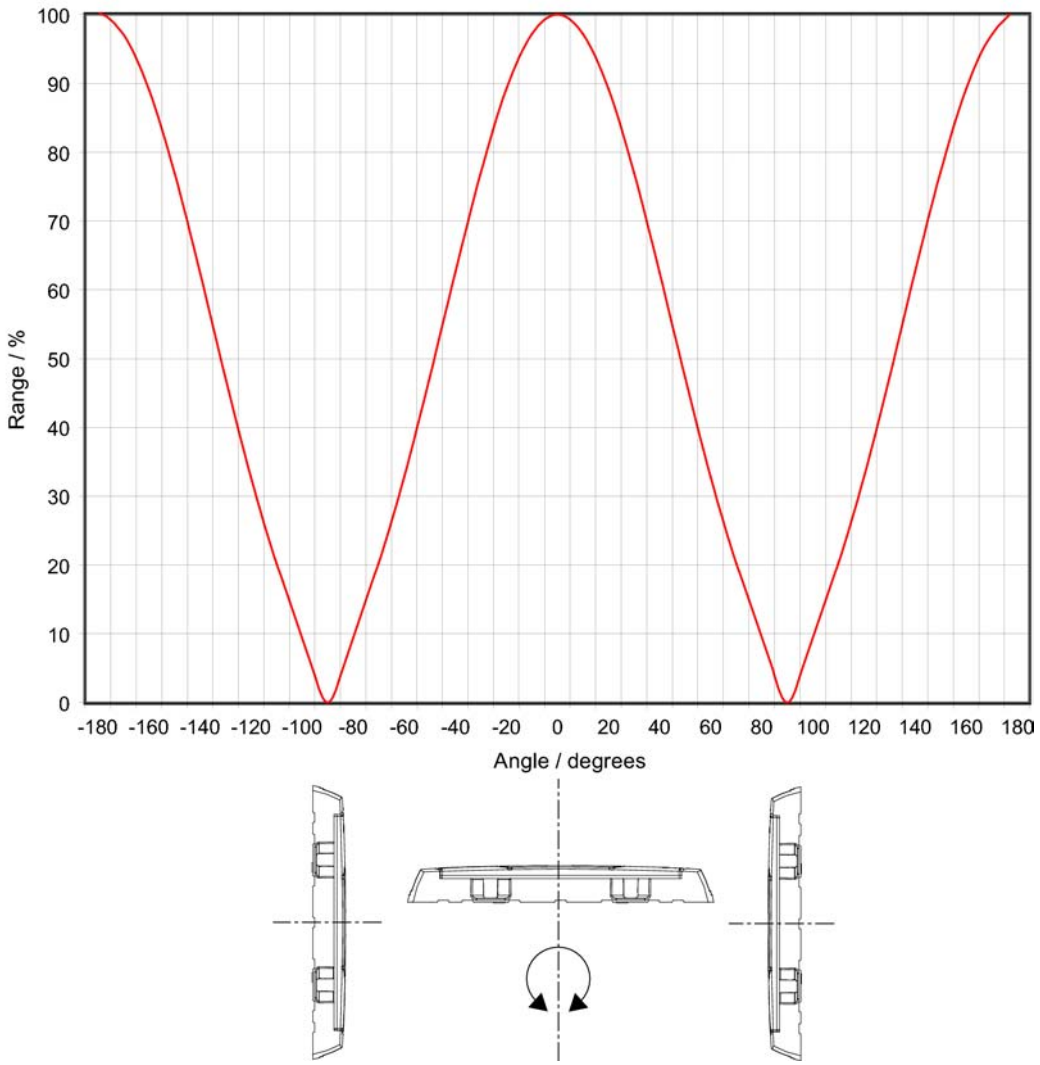



Figure 7-18 Transponder characteristics when rotated orthogonally to the polarization axis (within the tag plane)

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.

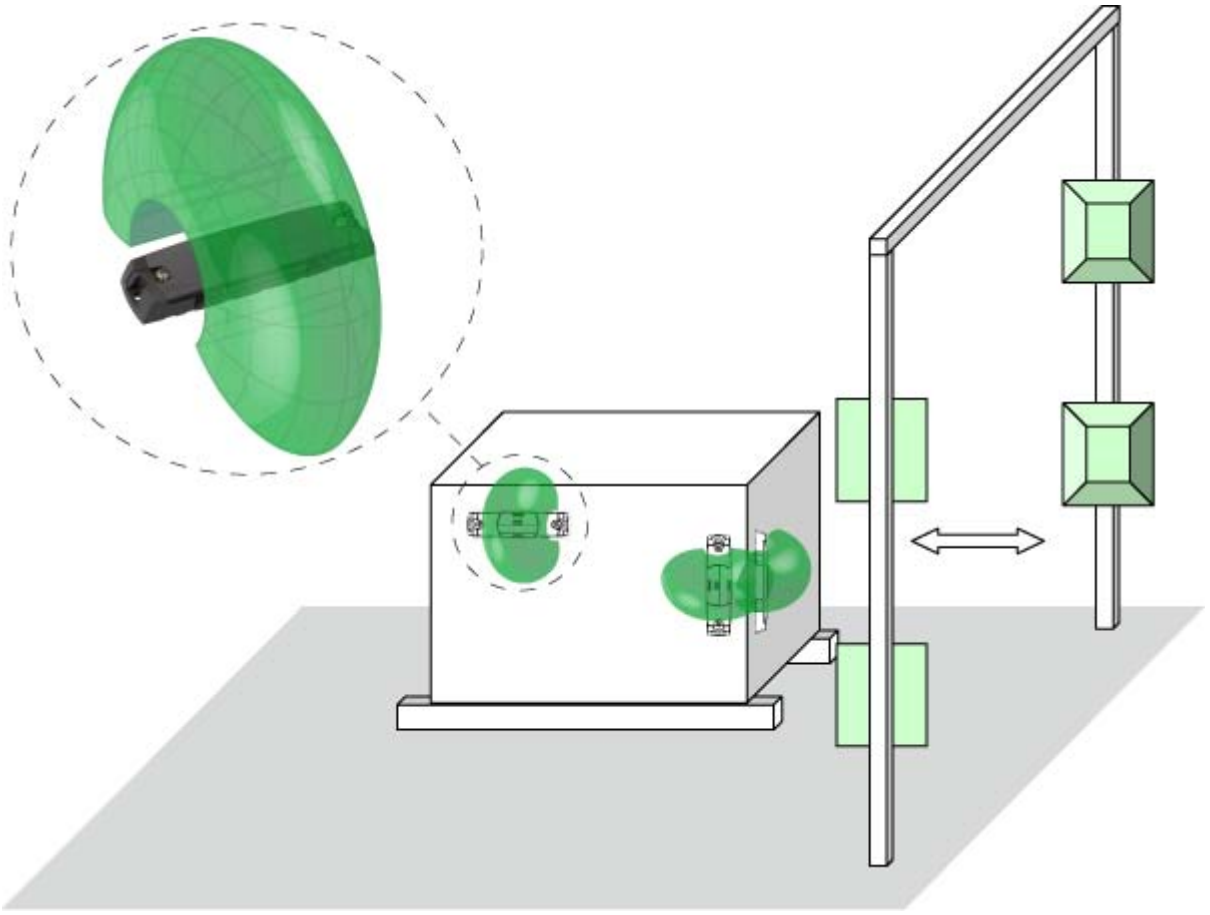


Figure 7-19 Application example for possible orientations of the transponder.

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

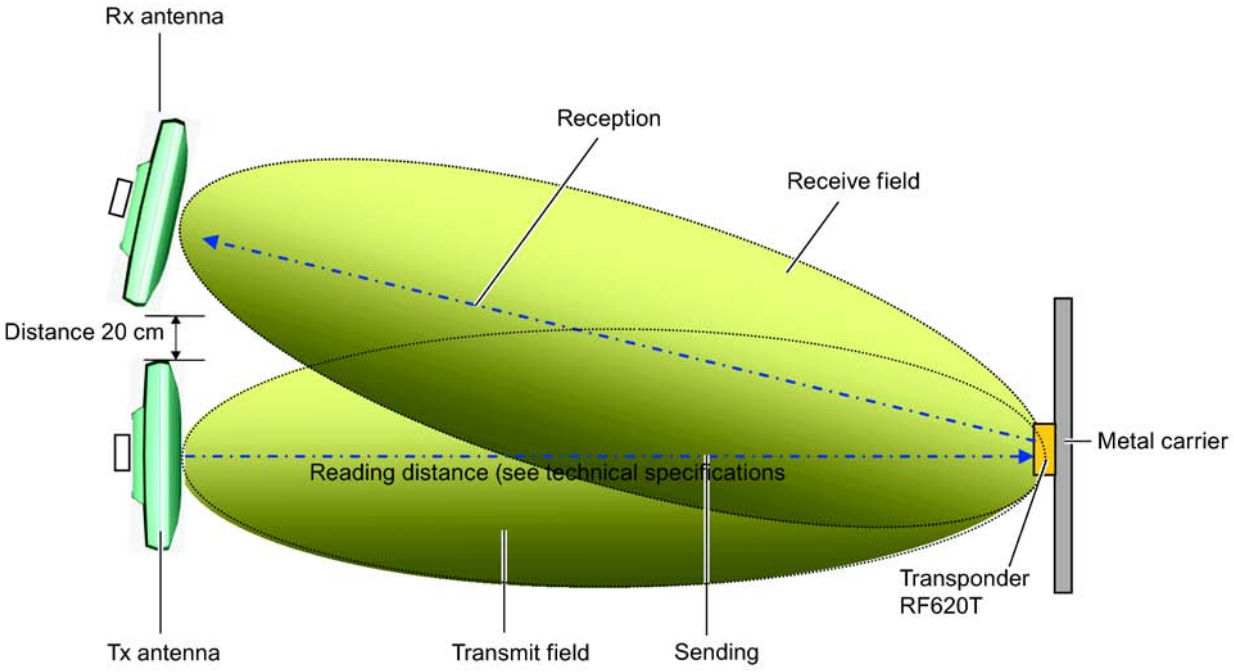



Figure 7-20 Example of optimum antenna/transponder positioning

### 7.5.3.4 Reading 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 centrically mounted on a flat metal plate, which may either be

almost square or circular, it can be aligned in any direction since the transmitting and receiving RF660A antennas operate with circular polarization.

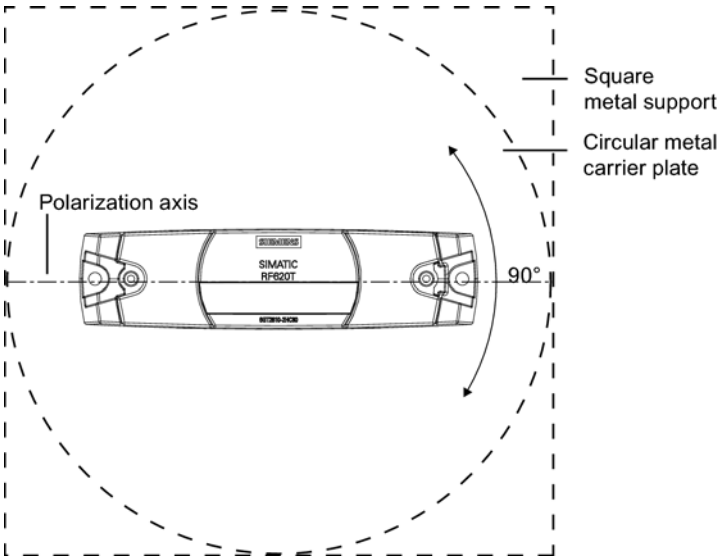



Figure 7-21 Optimum positioning of the transponder on a (square or circular) metal carrier plate

Table 7-12 Reading range with metallic, plane carriers without spacer

| Carrier plate material | Reading range Europe | Reading range USA |
|---|---|---|
| Metal plate at least 300 x 300 mm | typ. 2 m | typ. 1.5 m |
| Metal plate 150 x 150 mm | typ. 1.5 m | typ. 1 m |

Table 7-13 Reading range with metallic, plane carriers with spacer

| Carrier plate material | Reading range Europe | Reading range USA |
|---|---|---|
| Metal plate at least 300 x 300 mm | typ. 4 m | typ. 6 m |
| Metal plate 150 x 150 mm | typ. 2 m | typ. 4.5 m |

The use of spacers on metallic surfaces is therefore recommended.

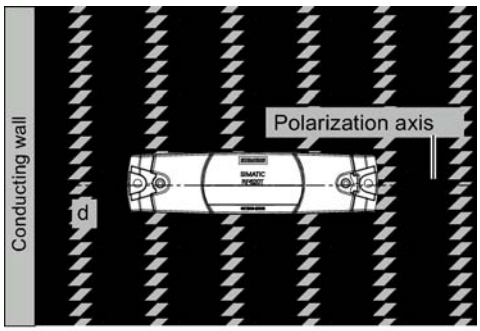
On rectangular carrier plates, the reading distance depends on the mounting orientation of the transponder A 90° rotation of the transponder about the axis of symmetry may result in greater reading distances

### 7.5.3.5 Influence of conducting walls on the reading range

If there are conducting walls or restrictions in the vicinity that could 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 conducting wall. A spacer must be used in any case.

## Reading range: One conducting wall

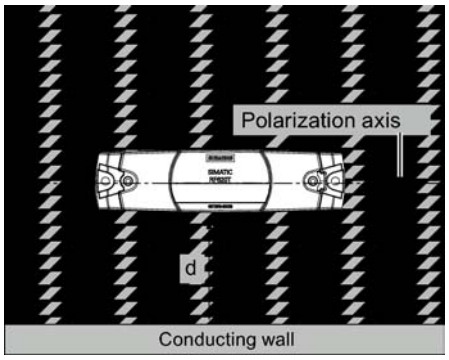
**Dependence of the reading distance when positioned orthogonally to the conducting wall**




Top view

| Distance d | 20 mm | 50 mm | 100 mm | |
|---|---|---|---|---|
| Reading 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 |

**Dependence of the reading distance when positioned parallel to the conducting wall**

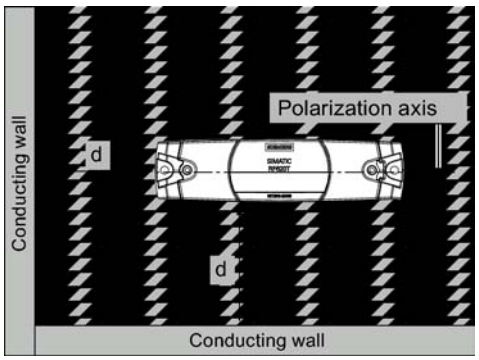



Top view

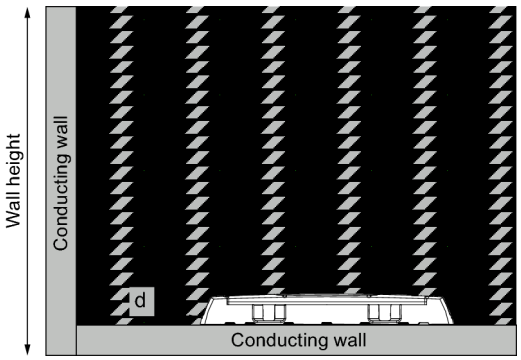
| Distance d | 20 mm | 50 mm | 100 mm | |
|---|---|---|---|---|
| Reading range | Approx. 70 % | Approx. 100% | Approx. 100% | Wall height 20 mm |
| | Approx. 60 % | Approx. 90 % | Approx. 100% | Wall height 50 mm |
| | Approx. 30 % | Approx. 70 % | Approx. 100% | Wall height 100 mm |

### Reading range: Two conducting walls

**Influence on reading range when positioned against two conducting walls**




Top view




Side view

| Distance d | 20 mm | 50 mm | 100 mm | |
|---|---|---|---|---|
| Reading 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 reference values.

## 7.5.3.6 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

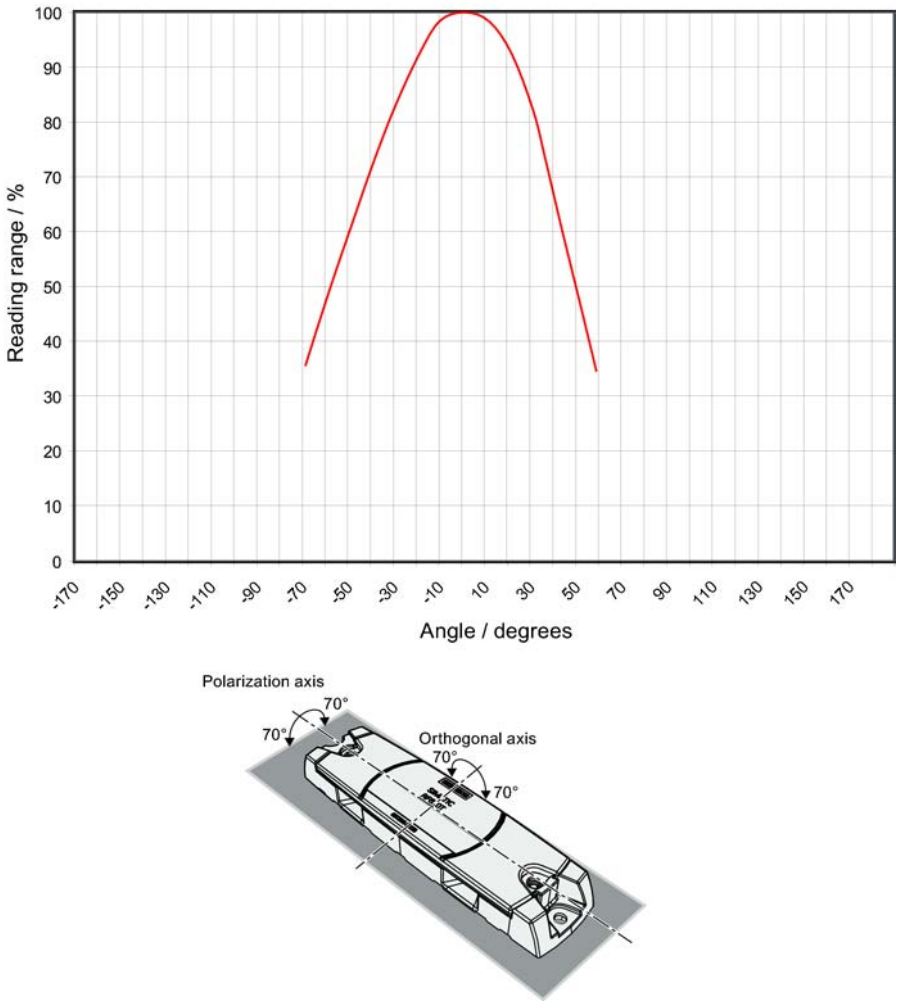



Figure 7-22 Characteristic of the transponder when rotated about the polarization axis or orthogonally to the polarization axis

### 7.5.3.7 Reading 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 dissipativesurface of ESD materials limits the reading 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 7-14 Limited reading range with ESD materials

| Carrier plate material | Reading range |
|---|---|
| Transponder on electrostatic dissipative materials, dimensions 60°x°40 cm<br>(surface resistance 2 x $10^9$ ohm) | Approx. 4 m |
| Transponder on electrostatic conductive materials, dimensions 60 x 40 cm<br>(surface resistance 1 x $10^4$ ohm)<br>Use of spacers | Approx. 1 m<br>Approx. 2 m |

100% reading range is achieved when mounted in empty, anechoic rooms. With multi-tag capability, limitations may result in the reading range.

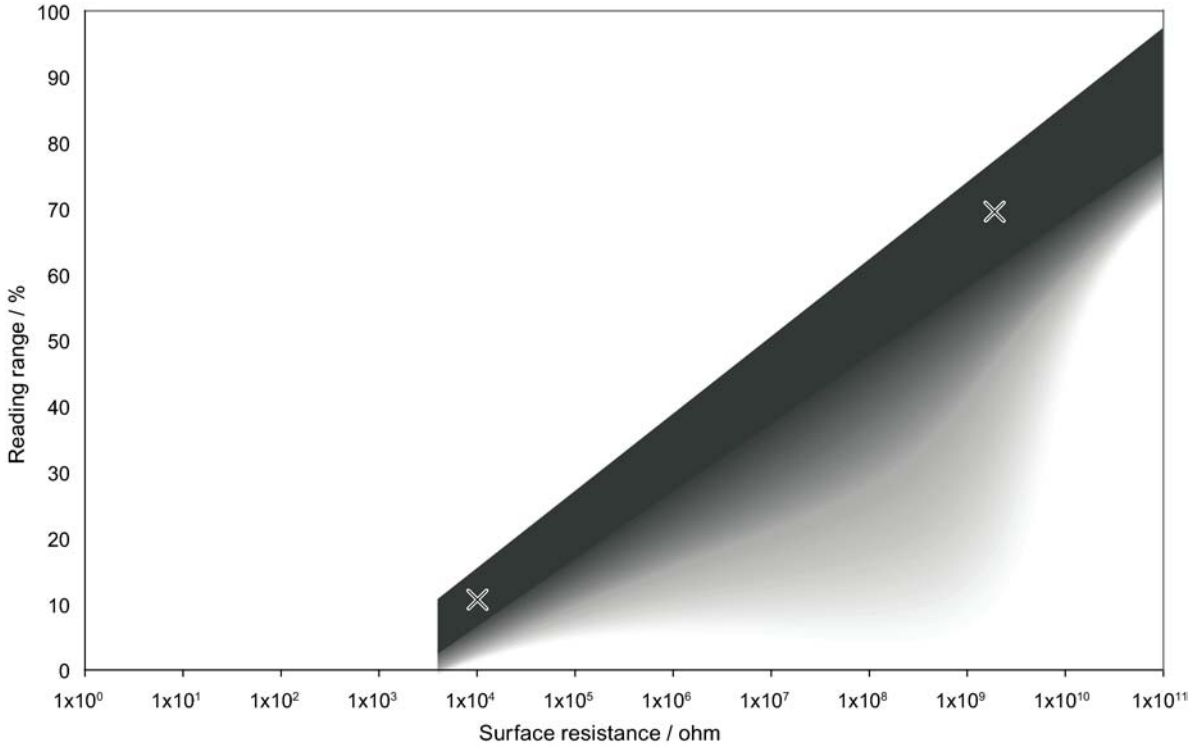



Figure 7-23 Schematic representation of how the reading range depends on the surface resistance of the ESD material

In the representation above, the two reading points with regard to the dependence of the reading range in % on the surface resistance are shown 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.

### 7.5.3.8 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.

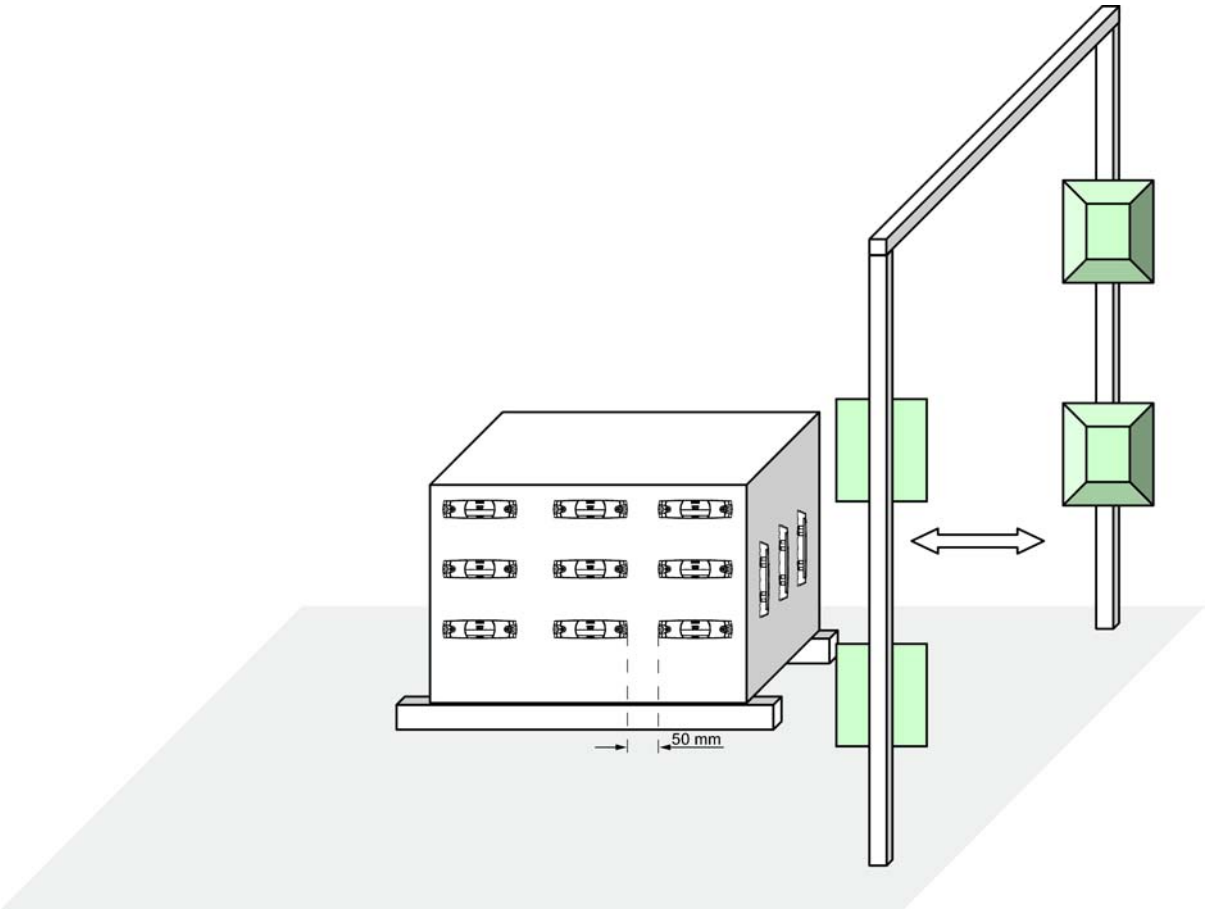



Figure 7-24 Multitag reading

## 7.5.4 Mounting instructions

| CAUTION |
| --- |
| **Level mounting**<br>Please note that both the transponder and the spacer must be mounted on a level surface. |

| CAUTION |
| --- |
| 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 ISO 4762. spring lock and grommet ISO 7092) or glued or secured with tape | |
| Tightening torque | | (at room temperature) < 1.2 Nm | |

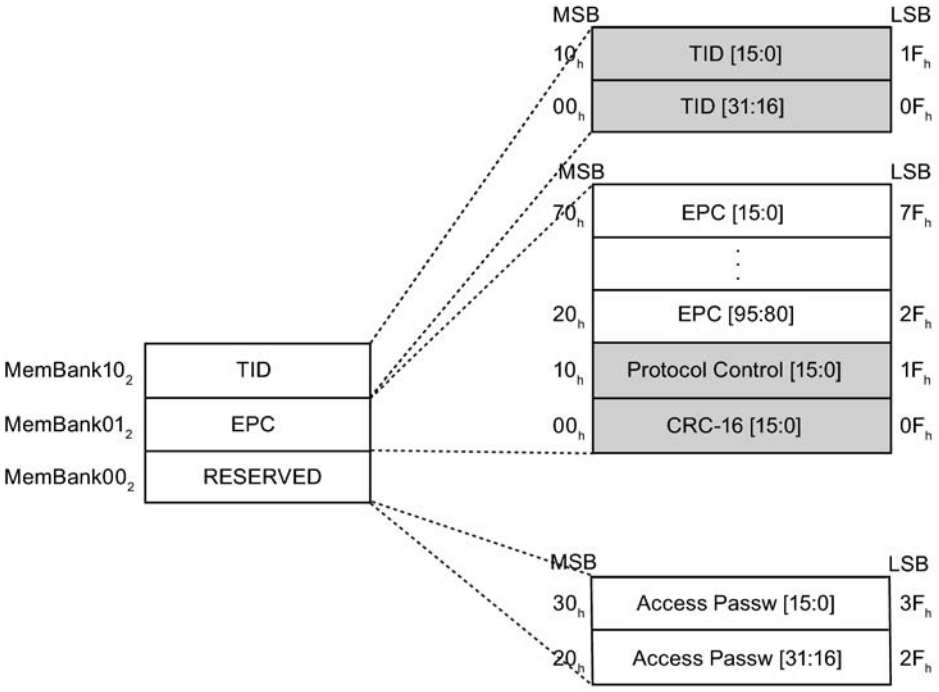
## 7.5.5 Memory configuration

### Memory banks

The memory is divided logically into three different memory banks:

| Memory bank (decimal) | Memory type | Description |
|---|---|---|
| MemBank $10_2$ | TID | Is defined by the manufacturer, contains the class identifier of a tag. |
| MemBank $01_2$ | EPC | Contains the EPC UID, the protocol and the CRC of a tag<br>You can write to the EPC memory area. In the delivery condition, the memory contents can have the following states:<br>• empty<br>• containing the same data<br>• 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 bit) in the memory.




| Color | Mode of access by SIMATIC RF600 reader |
|---|---|
| | Read |
| | Write / read |

### Parameterization

The parameterization possibilities that are available to you for each reader of the RF600 family are outlined in section Overview of parameterization of RF600 reader (Page 325). Detailed information for parameterization as well as examples for describing and reading specific memory areas can be found in the referenced chapters of the documentation.

## 7.5.6 Technical Specifications

### 7.5.6.1 Mechanical data

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

### 7.5.6.2 Electrical data

| Characteristic | Description | |
|---|---|---|
| Europe | USA / Canada | |
| Air interface | According to ISO 18 000/ISO -6 | |
| Frequency band | 865 … 868 MHz | 915 MHz |
| Necessary[2] transmit power | 2 W (ERP) | 4 W (EIRP) |
| Read distance<br>• on non-metallic carriers<br>• on metallic carriers<br>• on conductive plastic<br>• on metal using spacers[1] | <br>• typ. 6 m<br>• Typ. 1 m<br>• typ. 1 m<br>• typ. 4 m | |
| Write distance<br>• non-metallic carriers<br>• on metallic carriers<br>• on conductive plastic<br>• on metal using spacers[1] | <br>• typ. 4 m<br>• Typ. 0.7 m<br>• typ. 0.7 m<br>• typ. 3 m | |

| Characteristic | Description |
|---|---|
| Polarization type | Linear |
| Minimum distance to transmitting antenna | Approx. 0.2 m |
| Energy source | Magnetic energy via antenna, without battery |
| Multi-tag capability | Yes, minimum distance between data carriers ≥ 50 mm |

[1] Metallic surface approx. 30 x 30 cm

[2] For maximum read/write distances

## See also

Reading range when mounted on ESD carrier materials (Page 244)
Reading range when mounted on flat metallic carrier plates (Page 240)
Reading range when mounted on non-metallic carriers (Page 237)

### 7.5.6.3 Memory specifications

| Property | Description |
|---|---|
| Type | EPC Class 1 Gen2 |
| Memory organization | EPC code 96 bit |
| Protocol | ISO 18000-6C |
| Data retention time | 10 years |
| Read cycles | Unlimited |
| Write cycles | 100 000 min. |

### 7.5.6.4 Environmental conditions

| Property | Description |
|---|---|
| Temperature range during operation | -25 °C to +85 °C |
| Temperature range during storage | -40 °C … +85 °C |
| Shock<br>Vibration<br>compliant with EN 60721-3-7 Class 7 M3 | 100 g,<br>50 g |
| Torsion and bending load | Not permissible |
| Degree of protection | IP 67 |

### 7.5.6.5 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 | | ○○○○ | ○○○○ |
| 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 | | ○○○○ | ○○○○ |

| | Concentration | 20 °C | 50 °C |
|---|---|---|---|
| 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 | | ○○○○ | ○○ |
| 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. | ○○○○ | ○○○○ |

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

| Abbreviations | |
|---|---|
| ○○○○ | Resistant |
| ○○○ | Virtually resistant |
| ○○ | Limited resistance |
| ○ | Less resistant |

| Abbreviations | |
|---|---|
| ☐ | Not resistant |
| w. | Aqueous solution |
| k. g. | Cold saturated |

## 7.5.7 Certificates and approvals

### 7.5.7.1 Certificates and approvals

Table 7-15 6GT2810-2HC00 - RF620T UHF container tag

| Certificate | Description |
|---|---|
| CE | CE Approval to R&TTE |

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

| Standards | |
|---|---|
| FCC<br>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.<br>It meets the following safety standard(s):<br>UL 60950-1 - Information Technology Equipment Safety - Part 1: General Requirements<br>CSA C22.2 No. 60950 -1 - Safety of Information Technology Equipment<br>UL Report E 205089 |

## 7.5.8 Dimension drawing

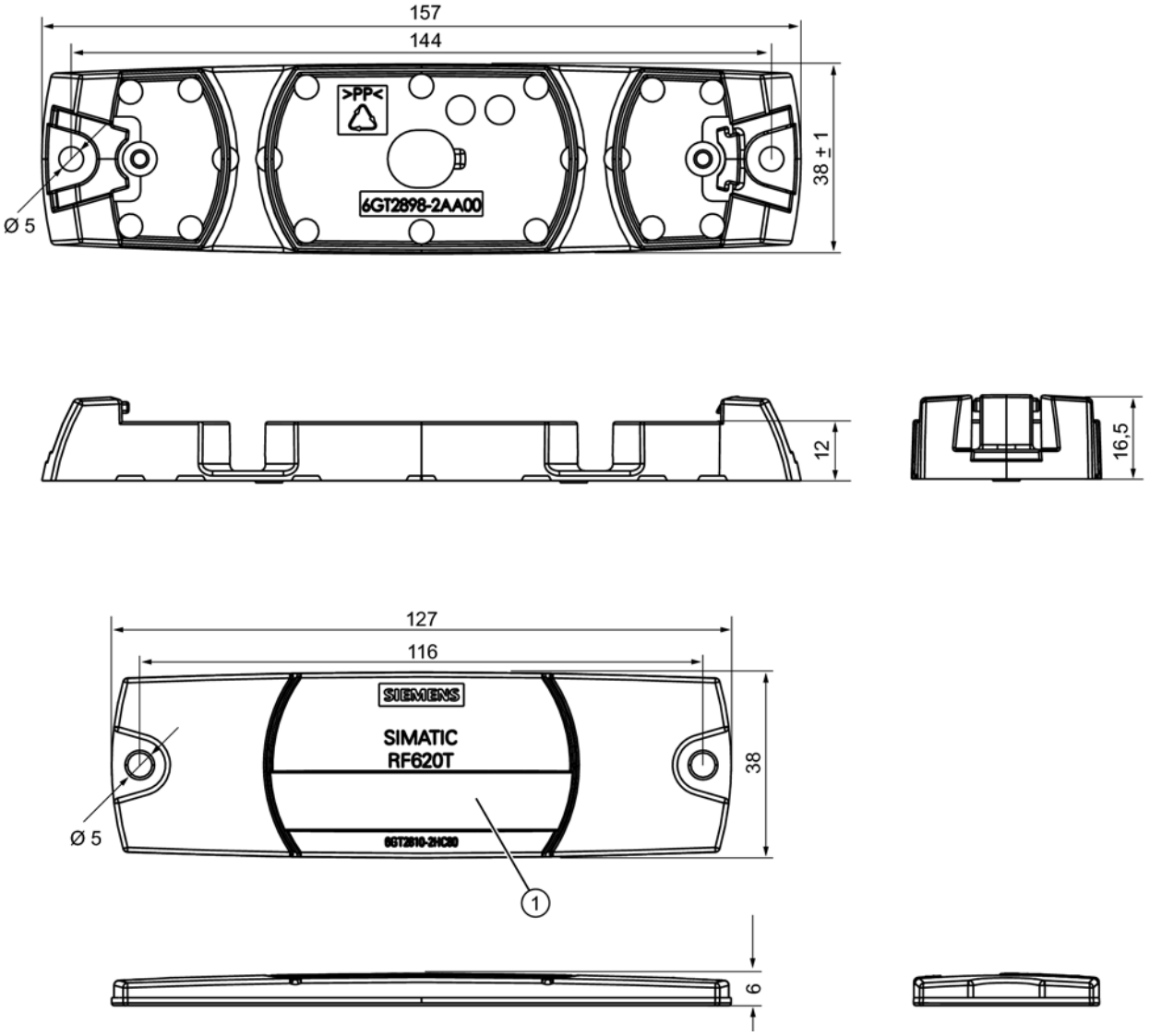



Figure 7-25 SIMATIC RF620T UHF container tag

Units of measurement: All dimensions in mm

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

① Labeling area, see Section Characteristics (Page 235)

# 7.6 SIMATIC RF630T

## 7.6.1 Characteristics

The SIMATIC RF630T transponder is a passive (i.e. battery-free) and maintenance-free, cylindrical data carrier. It operates on the basis of the UHF Class 1 Gen 2 technology and is used for storing the electronic product code (EPC) of 96 bits/240 bits. The transponder also has a 512-bit user memory.

Application areas 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 1.5 m.

| SIMATIC RF630T transponder | Features | | |
|---|---|---|---|
|  | Application | Identification tasks in rugged industrial environments | |
| | Frequency versions | Europe | USA / Canada |
| | | 868 MHz | 915 MHz |
| | Air interface | according to ISO°18000-6C | |
| | Polarization | Linear | |
| | Memory | EPC 96 bit/240 bit<br>Add-on-memory 64 bytes | |
| | Read/write range | Typically X°m/X°m in connection with: @@@<br>• RF670R reader and<br>• RF660A antennas | |
| | | Typically 1.2 m/1.5 m in connection with:<br>• RF660R readers and<br>• RF660A antennas | |
| | | Typically 0.8 m in connection with:<br>• RF630R reader and<br>• RF660A antenna | |
| | | Typically 0.7 m in connection with:<br>• RF620R with integrated antenna | |
| | Installation | Suitable for direct mounting on conductive materials (preferably metal) | |

## 7.6.2 Ordering data

| Ordering data | Order no. |
|---|---|
| SIMATIC RF630T (Europe)<br>• For attaching to metal surfaces<br>• Frequency 865 MHz to 868 MHz | 6GT2810-2EC00 |
| SIMATIC RF630T (USA / Canada)<br>• For attaching to metal surfaces<br>• Frequency 902 MHz to 928 MHz | 6GT2810-2EC10 |

## 7.6.3 Planning application

### 7.6.3.1 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.

#### Positioning of the RF660A antenna in combination with the RF670R/RF630R reader

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

## RF630T application example

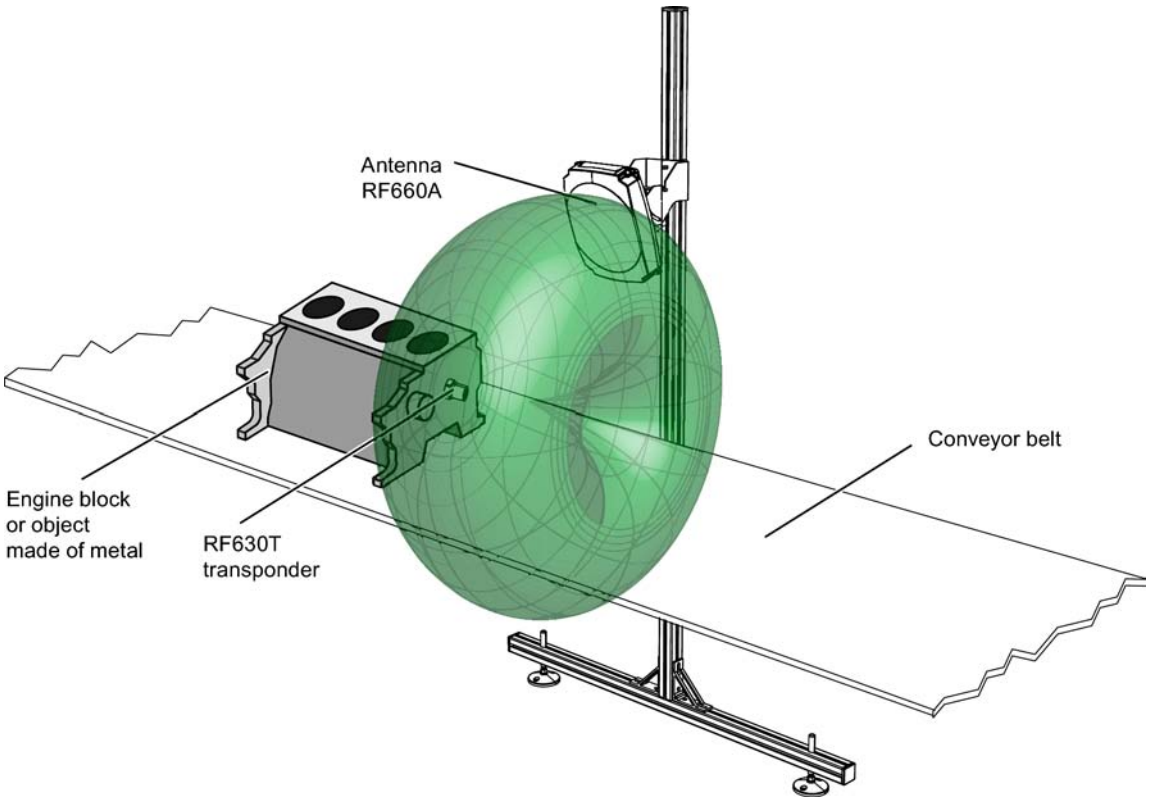



Figure 7-26 RF630T application example

### Positioning of two RF660A antennas (RF660R reader)

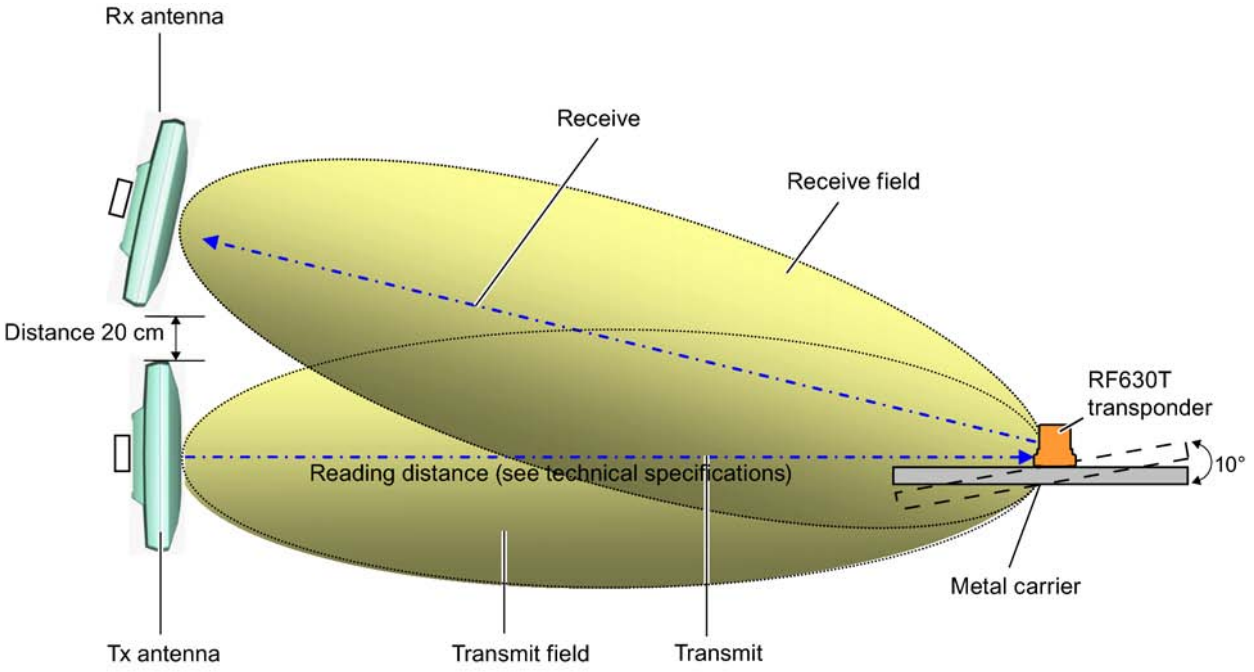



Figure 7-27 Example of optimum antenna/transponder positioning

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

### Positioning of the RF620R reader

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

Please note the different reading ranges for the RF600 readers in SectionElectrical data (Page 267)

## 7.6.3.2 Reading 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 centrally mounted on a flat metal plate, which may either be almost

square or circular, it can be aligned in any direction since the transmitting and receiving RF660A antennas operate with circular polarization.

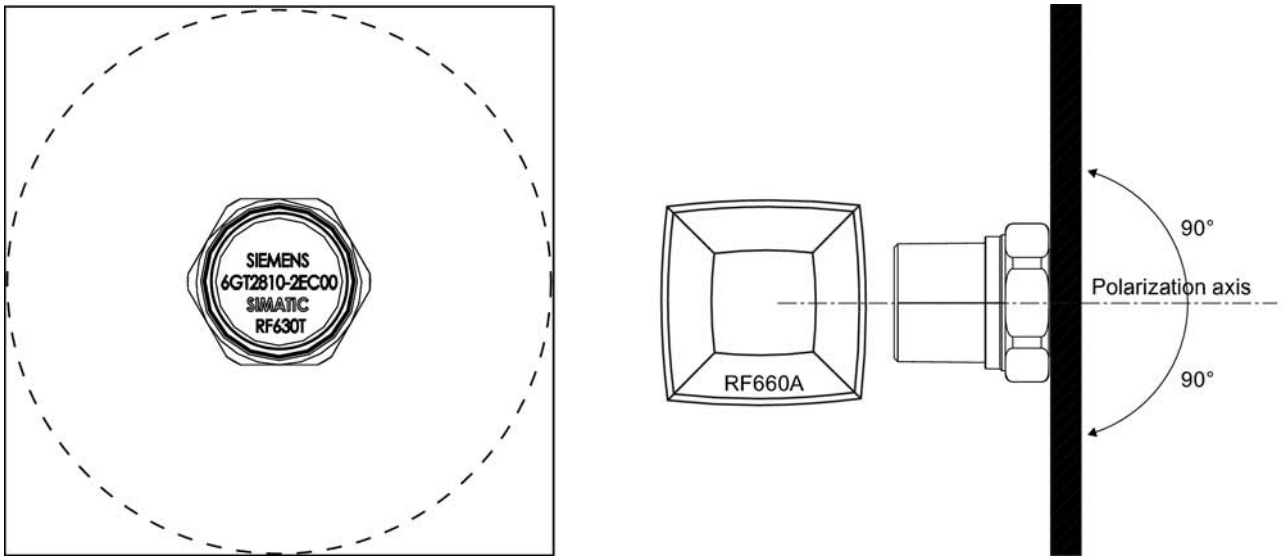



Figure 7-28 Optimum positioning of the transponder on a (square or circular) metal plate

Table 7-17 Reading range on flat metallic carrier plates

| Carrier plate material | Reading 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 % |

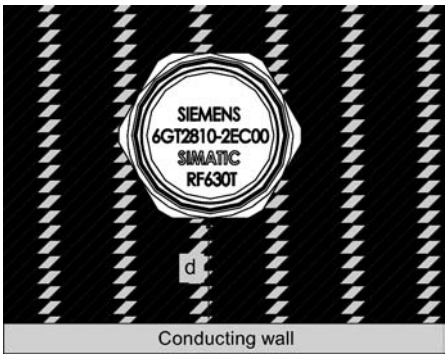
On rectangular carrier plates, the reading distance depends on the mounting orientation of the transponder

### 7.6.3.3 Influence of conducting walls on the reading range

If there are conducting walls or restrictions in the vicinity that could 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 vertical to the conducting wall.

## Reading range: One conducting wall

**Influence on reading range when positioned against one conducting wall**

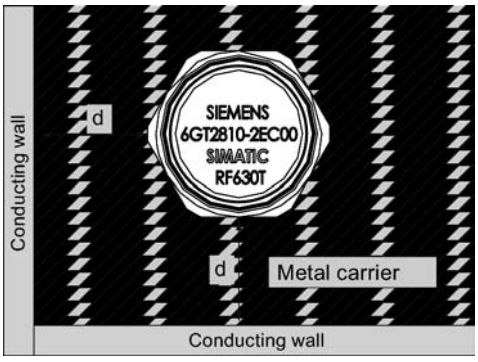


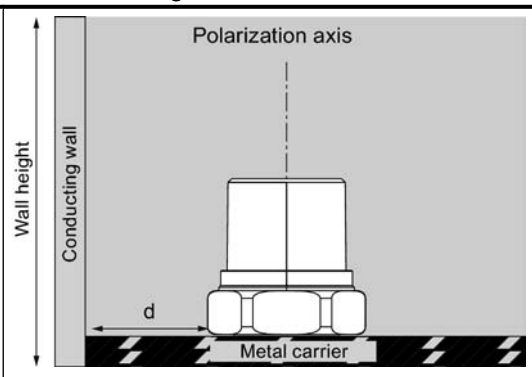

Top view

| Distance d | 20 mm | 50 mm | 100 mm | |
|---|---|---|---|---|
| Reading 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 |

## Reading range: Two conducting walls

**Influence on reading range when positioned against two conducting walls**




Side view

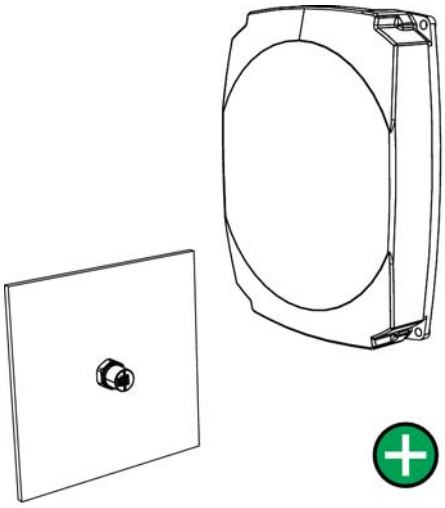
| Distance d | 20 mm | 50 mm | 100 mm | |
|---|---|---|---|---|
| Reading range | Approx. 90 % | Approx. 90 % | Approx. 90 % | Wall height 20 mm |
| | Approx. 25 % | Approx. 90 % | Approx. 90 % | Wall height 50 mm |
| | Approx. 25 % | Approx. 90 % | Approx. 90 % | Wall height 100 mm |

The values specified in the tables above must be complied with.

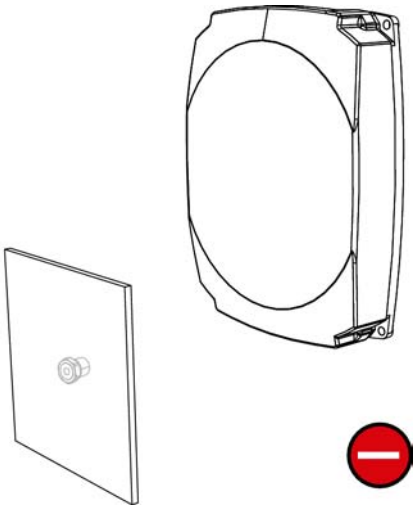
### 7.6.3.4 Directional radiation pattern of the transponder

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.

| NOTICE |
| --- |
| **Incorrect alignment of the transponder** |
| When you align the transponder in parallel with the transmitting antenna, it cannot be read! |

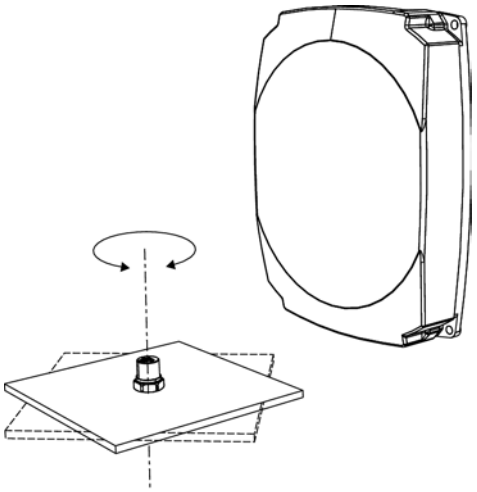


Optimum alignment of the transponder to the transmitting antenna



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.

### Rotation of the mounting plane

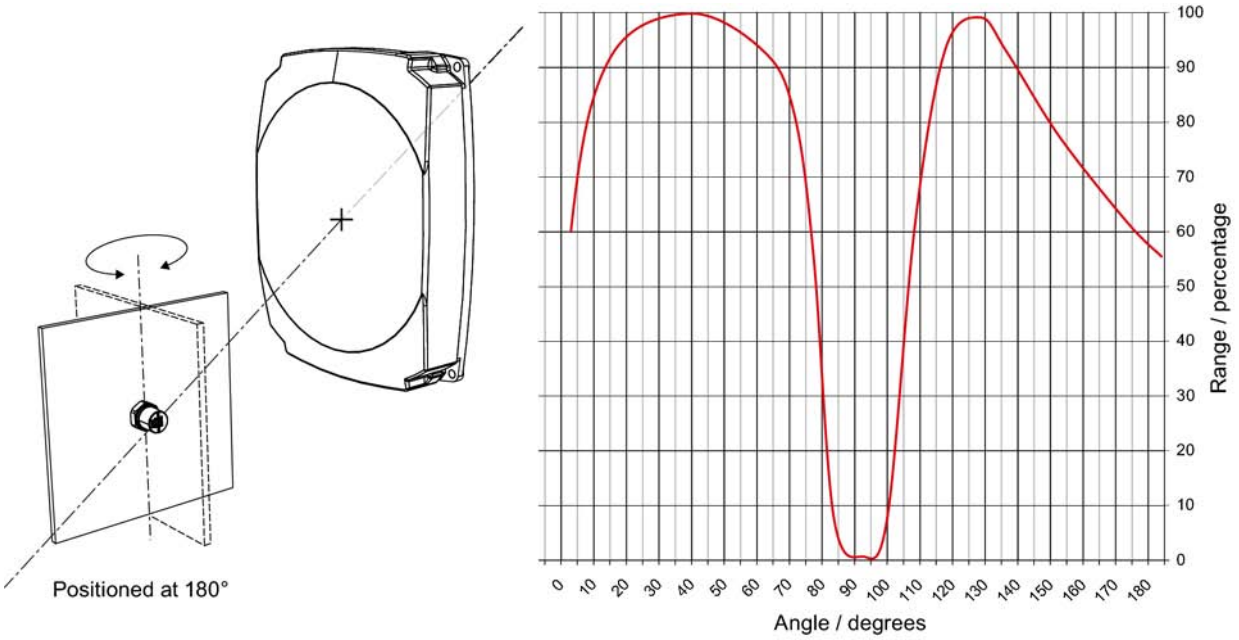



Figure 7-29 Characteristics of the transponder on rotation of the mounting plane

## 7.6.4 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.

## 7.6.5 Memory configuration

### 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.

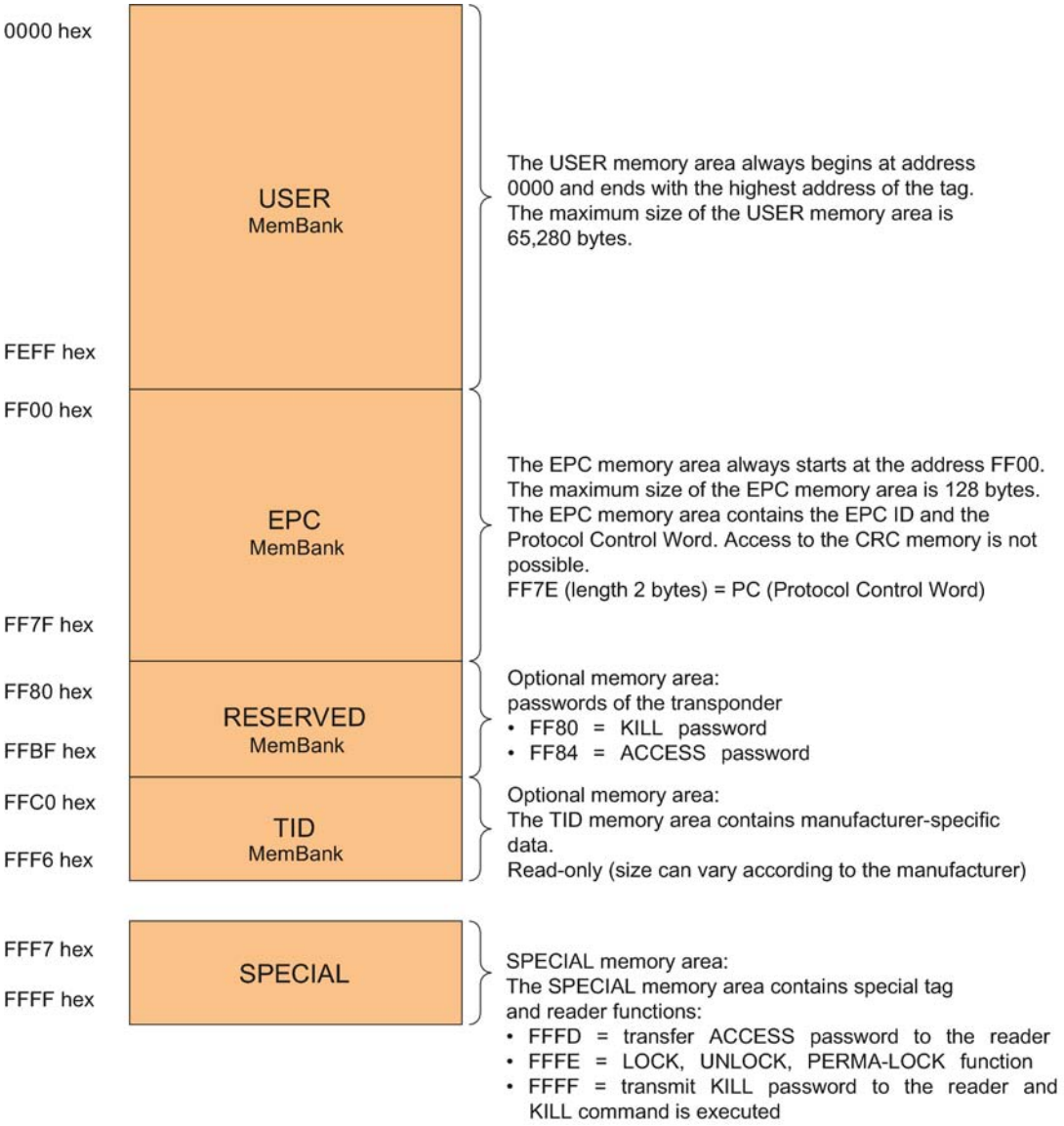



Figure 7-30 SIMATIC memory model

## Memory configuration for RF630T

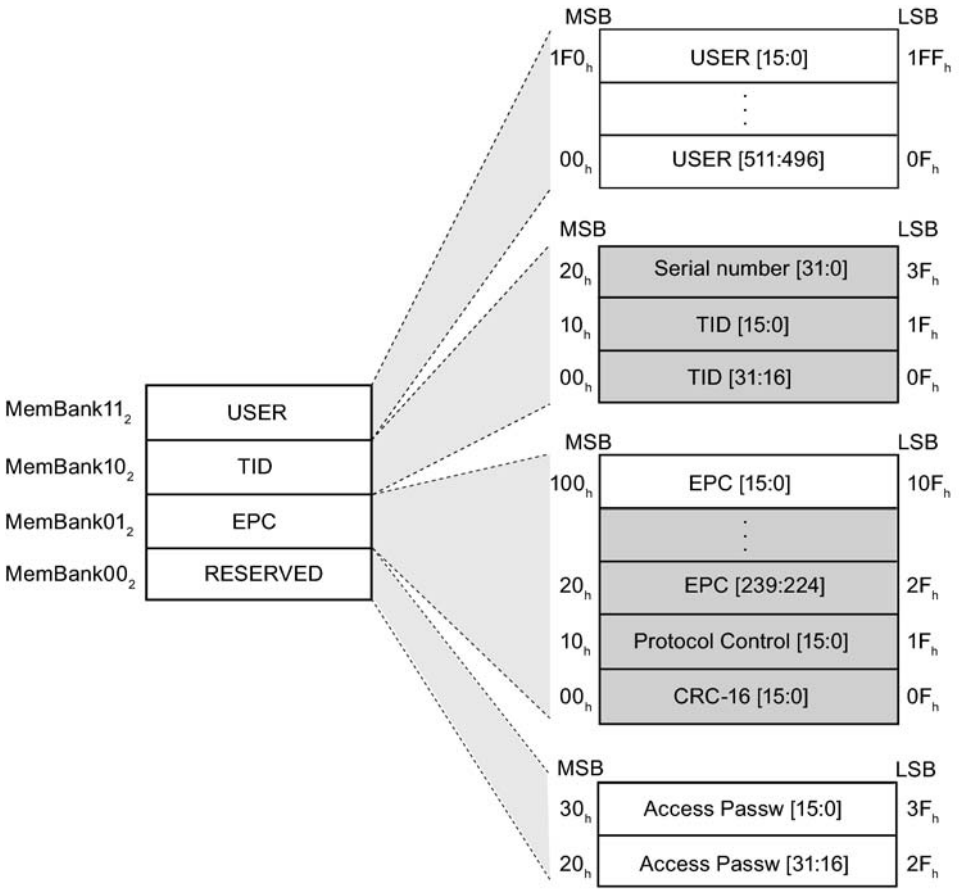
| Tag | User [hex] | EPC | | TID | RESERVED (passwords) | Special | |
|---|---|---|---|---|---|---|---|
| | | Range | Access | | | KILL-PW | Lock function |
| **RF630T *** | 00 - 3F | FF00-FF0B (240 bit = FF00-FF1D) | read/ write | FFC0-FFC7 | FF80-FF87 | Yes | Yes |

## Memory representation according to EPC

The memory of the ISO 18000-6C G2XM chip is logically divided 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 tag |
| MemBank $01_2$ | EPC | Contains the EPC data, the protocol information and the CRC data of a tag.<br>You can write to the EPC memory area. In the delivery condition, the memory contents can have the following states:<br>• containing the same data<br>• containing different data |
| MemBank $00_2$ | RESERVED | Contains the access password. |

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




| Color | Mode of access by SIMATIC RF600 reader |
|---|---|
| | Read |
| | Write / read |

Figure 7-31 Representation of the RF630T memory configuration according to EPC (logical memory map)

## Parameterization

The parameterization possibilities that are available to you for each reader of the RF600 family are outlined in section Overview of parameterization of RF600 reader (Page 325). Detailed information for parameterization as well as examples for describing and reading specific memory areas can be found in the referenced chapters of the documentation.

## 7.6.6 Technical specifications

### 7.6.6.1 Mechanical data

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

### 7.6.6.2 Electrical data

| Property | 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 MHz ... 928 MHz [1] |
| Necessary transmit power | 2 W (ERP) | 4 W (EIRP) |
| Reading range<br>Mounting on metal [2] | at least 1.2 m, typically 1.5 m | at least 1.2 m, typically 1.5 m |
| Writing range<br>Mounting on metal [2] | at least 0.8 m<br>typically 1.2 m | at least 0.8 m<br>typically 1.2 m |
| Polarization type | Linear | Linear |
| Minimum distance to transmit antenna | Approx. 0.15 m | Approx. 0.15 m |
| Energy source | Energy via electro-magnetic field via antenna, no battery required | Energy via electro-magnetic field via antenna, no battery required |
| Multi-tag 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 surface with a diameter of at least 150 mm and at room temperature.

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

### 7.6.6.3 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 | |
| Read cycles | Unlimited | |
| Write cycles | Minimum at +22 °C 100 000 | |

### 7.6.6.4 Environmental conditions

| Feature | Description |
|---|---|
| Temperature range during operation | -25 °C … +85 °C |
| Temperature range during storage | -40 °C to +125 °C |
| Shock<br>Vibration<br>compliant with EN 60721-3-7 Class 7 M3 | 100 g, [1]<br>20 g, [1] |
| Torsion and bending load | Not permissible |
| Degree of protection | IP 68 according to EN 60529:<br>(45 minutes. Immersion in water; water depth 1 m from<br>top edge of enclosure at +20 °C)<br>IPx9K according to DIN 40005-9<br>(steam jet-air ejector: 150 mm;<br>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.

### 7.6.6.5 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 |

| | Concentration | 20 °C | 60 °C |
|---|---|---|---|
| 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 |
| 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 |

## 7.6.7 Certificates and approvals

Table 7-18 6GT2810-2EC00 - RF630T UHF Tool Tag - Europe

| Certificate | Description |
|---|---|
| CE | Compatible with R&TTE directive |

Table 7-19 6GT2810-2EC10 - RF630T Gen 2 UHF Tool Tag - USA / Canada

| Standards | |
|---|---|
| FCC<br>Federal Communications Commission | Passive labels and transponders comply with the valid regulations; certification is not required. |
| C UL US | In preparation |

### 7.6.8 Dimension drawing

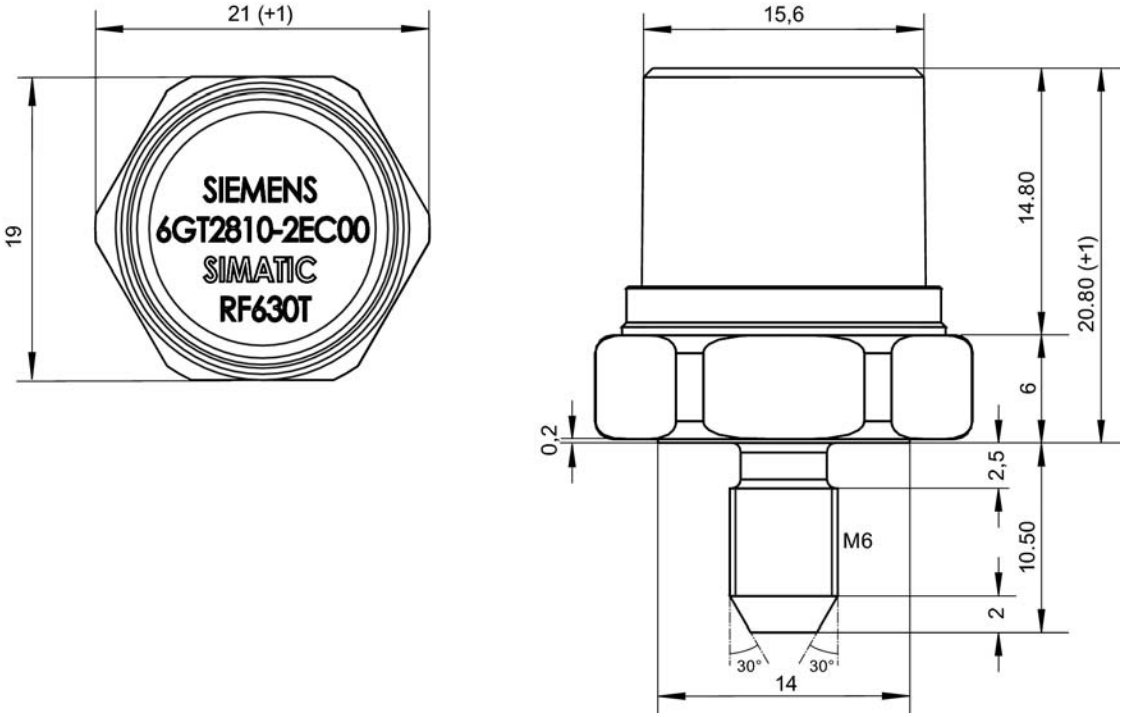



Figure 7-32 SIMATIC RF630T

Units of measurement: All dimensions in mm

General tolerances in accordance with DIN ISO 2768f.

## 7.7 SIMATIC RF640T

### 7.7.1 Characteristics

The SIMATIC RF640T Transponder is a passive, i.e. battery-free, round-shaped data carrier, operated in the UHF frequency spectrum on the basis of the UCODE HSL standards.

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

The tool tag is small, smart, and rugged, suitable for industrial applications with a high degree of protection (IP68) and is resistant to mineral oils, lubricants and cleaning agents.

The SIMATIC RF640T is preferably to be mounted on a flat metal surface of at least 150 mm diameter where it has a typical sensing distance of 2 m

| SIMATIC RF640T transponder | Characteristics | | |
|---|---|---|---|
|  | Application | Identification tasks in rugged industrial environments | |
| | Frequency versions | Europe | USA / Canada |
| | | 868 MHz | 915 MHz |
| | Polarization | Linear | |
| | Memory | 256-byte EEPROM, of which 216 bytes are user-definable | |
| | Read/write range | typically 2.0 m in connection with:<br>• RF660R readers and<br>• RF660A antennas | |
| | Installation | Suitable for direct mounting on conductive materials (preferably metal) | |

## 7.7.2 Ordering data

| Ordering data | Order no. |
|---|---|
| SIMATIC RF640T (Europe)<br>• For attaching to metal surfaces<br>• Frequency 865 MHz to 868 MHz,<br>• 216-byte user memory<br>• -25 °C to +85 °C operating temperature<br>• Dimensions 50 mm x 8 mm (DxH)<br>• IP 68 / IP x9K degree of protection<br>• ATEX | 6GT2810-0DC00 |
| SIMATIC RF640T (USA / Canada)<br>• For attaching to metal surfaces<br>• Frequency 915 MHz<br>• 216-byte user memory<br>• -25 °C to +85 °C operating temperature<br>• Dimensions 50 mm x 8 mm (DxH)<br>• IP 68 / IP x9K degree of protection | 6GT2810-0DC10 |

## 7.7.3 Planning the use

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

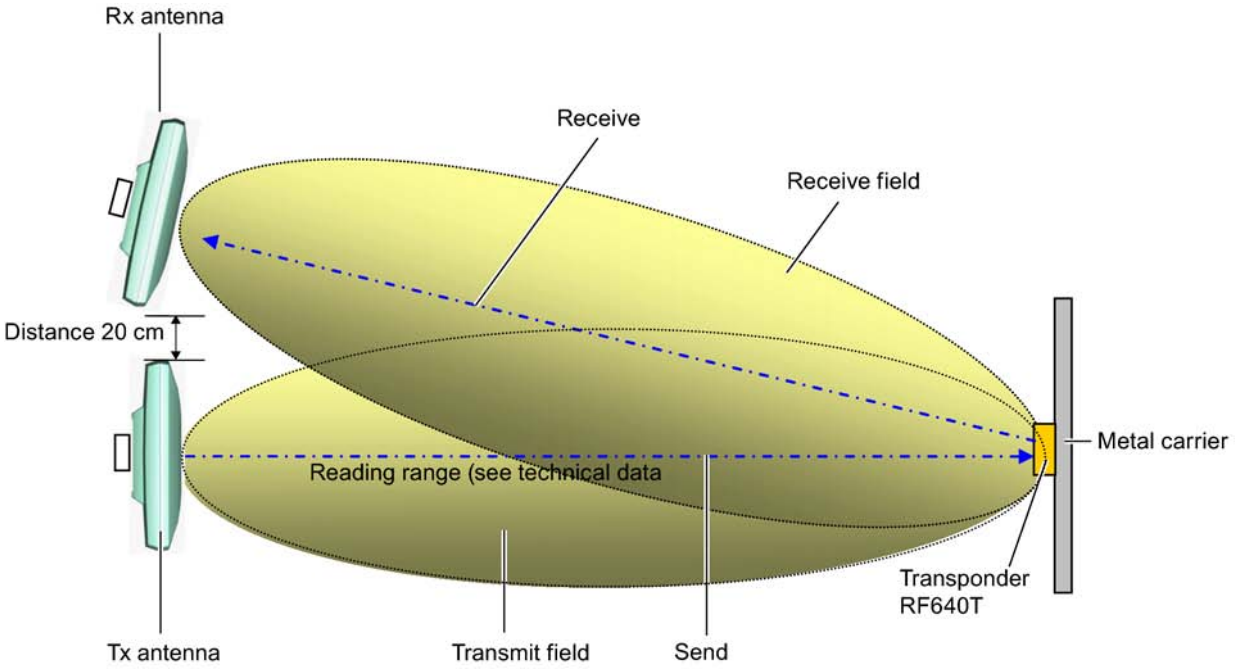



Figure 7-33 Example of optimum antenna/transponder positioning

### 7.7.3.2 Reading 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 centrically mounted on a flat metal plate, which may either be

almost square or circular, it can be aligned in any direction since the transmitting and receiving RF660A antennas operate with circular polarization.

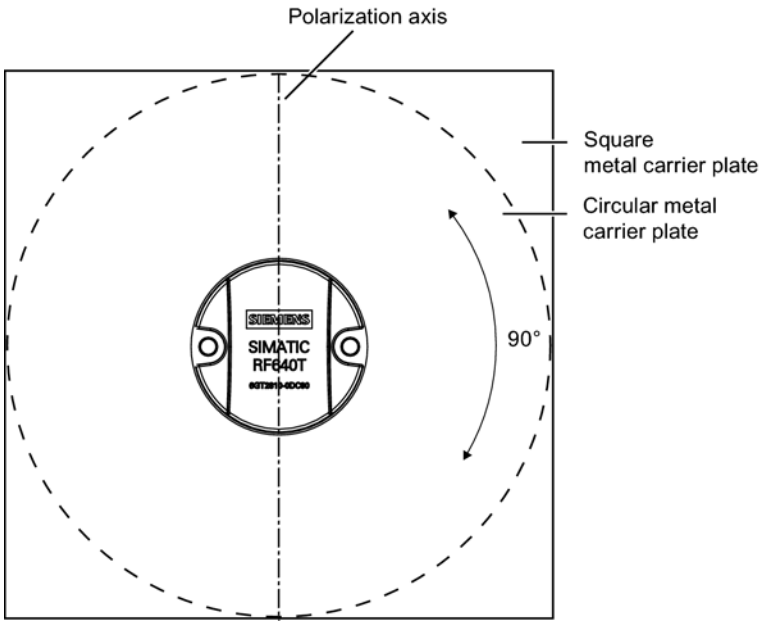



Figure 7-34 Optimum positioning of the transponder on a (square or circular) metal plate

Table 7-20 Reading range on flat metallic carrier plates

| Carrier plate material | Reading 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 % |

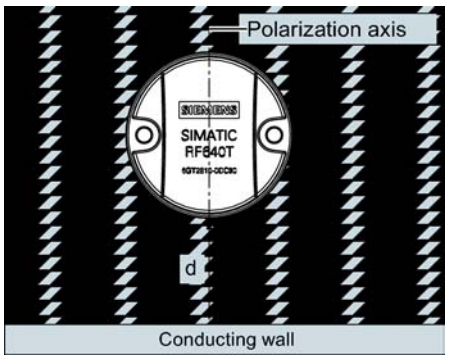
On rectangular carrier plates, the reading distance depends on the mounting orientation of the transponder A 90° rotation of the transponder about the axis of symmetry may result in greater reading distances

### 7.7.3.3 Influence of conducting walls on the reading range

If there are conducting walls or restrictions in the vicinity that could 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 conducting wall.

## Reading range: One conducting wall

**Influence on reading range when positioned against one conducting wall**

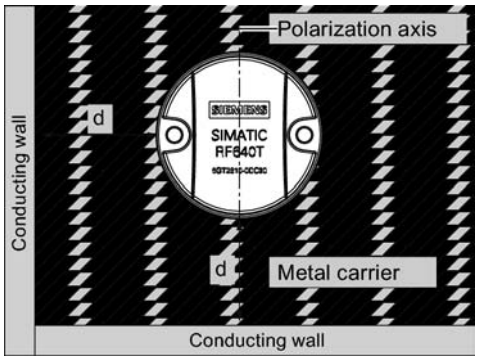



Top view

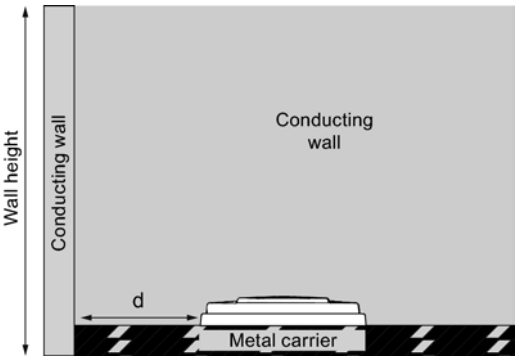
| Distance d | 20 mm | 50 mm | 100 mm | |
|---|---|---|---|---|
| Reading range | Approx. 90 % | Approx. 90 % | Approx. 95 % | Wall height 20 mm |
| | Approx. 80 % | Approx. 90 % | Approx. 90 % | Wall height 50 mm |
| | Approx. 70 % | Approx. 75 % | Approx. 90 % | Wall height 100 mm |

## Reading range: Two conducting walls

**Influence on reading range when positioned against two conducting walls**




Top view




Side view

| Distance d | 20 mm | 50 mm | 100 mm | |
|---|---|---|---|---|
| Reading 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 must be complied with.

### 7.7.3.4 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**

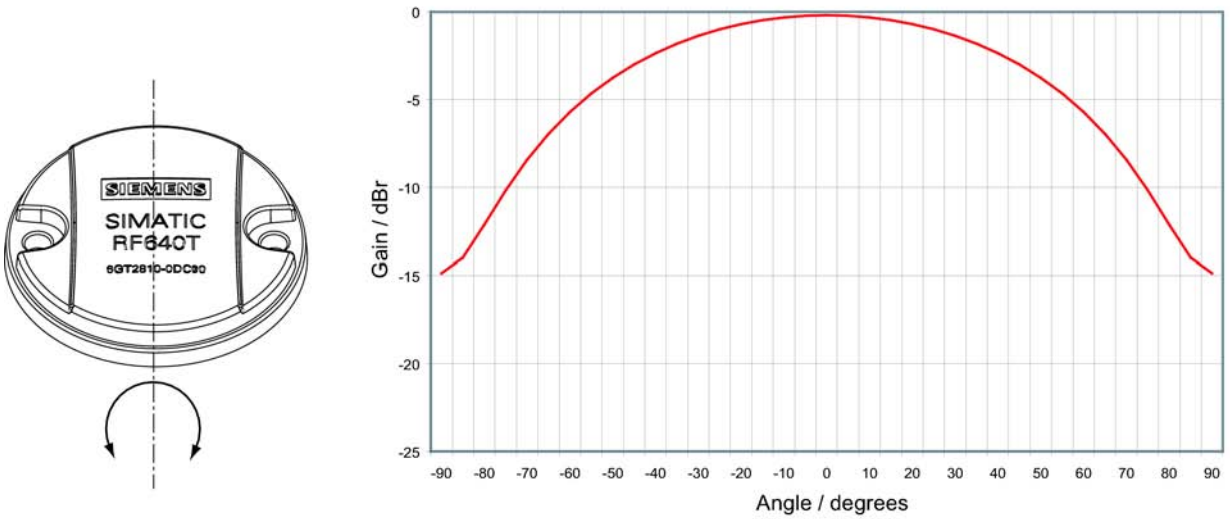



Figure 7-35 Transponder characteristics when rotated about the polarization axis

### Rotation orthogonal to the polarization axis

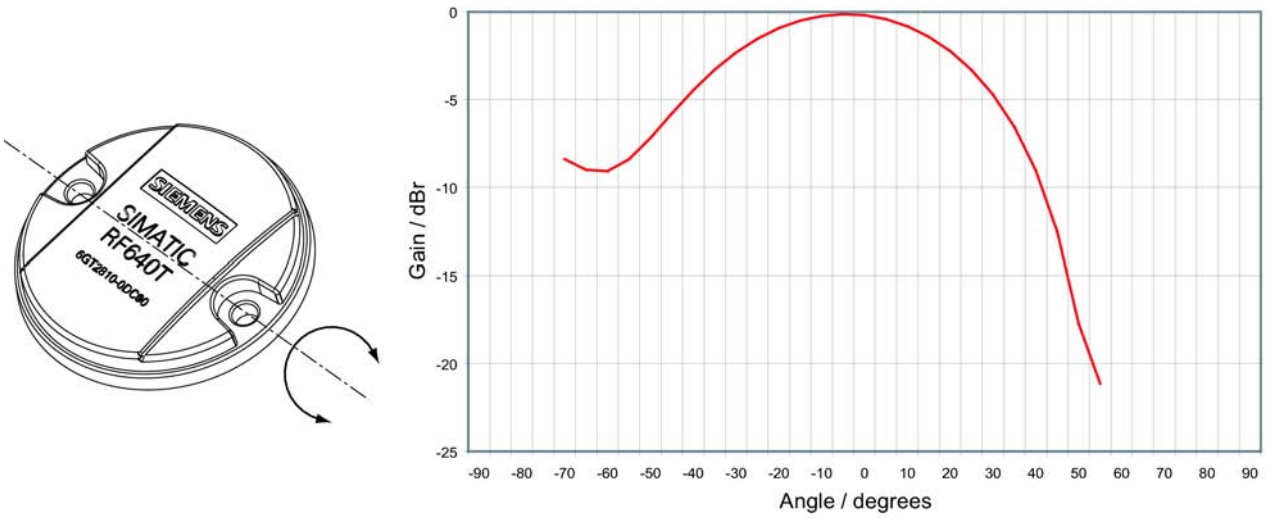



Figure 7-36 Transponder characteristics when rotated orthogonally to the polarization axis (within the tag plane)

## 7.7.3.5 Reading range when mounted on non-metallic carriers

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

Table 7-21 Reading range on non-metallic carriers

| Carrier plate material | Reading range |
|---|---|
| Transponder on wooden carrier | Approx. 40 % |
| Transponder on plastic carrier | Approx. 35 % |
| Transponder on plastic mineral water bottle | Approx. 55 % |

100% reading distance refers to a metal plate of at least 150 mm diameter.

## 7.7.3.6 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 EN 60079-0: 2004, EN 60079-11: 2007, IEC 61241-0: 2004 and IEC 61241-11: 2005.

### Identification

The identification is as follows:

 II 2 G Ex ib IIC T6 to T3 or  II 2 D Ex ibD 21 T140°C, -25 °C < Ta°< +85 °C

## 7.7.3.7 Use of the transponder in hazardous areas for gases


### 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 | T3 |
| -25 °C to +60 °C | T4 |
| -25 °C to +40 °C | T5 |
| -25 °C to +30 °C | T6 |

**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.

#### 7.7.3.8 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). With the ignition temperature specified according to IEC 61241-0 and IEC 61241-11 according to the type of ignition protection iD, the smoldering temperature of the dust layer is referenced in this case.

**Temperature class delineation for dusts**

| Ambient temperature range | Temperature value |
|---|---|
| -25 °C < Ta < +85 °C | T140 °C |

**⚠ 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.

### 7.7.4 Mounting instructions

| Properties | Description |
|---|---|
| Type of installation | Screw attachment, (M4 screws)<br>(two grommets DIN 433 and two hexagon M4 socket head cap screws DIN 6912) |
| Tightening torque | (at room temperature) < 1.2 Nm |

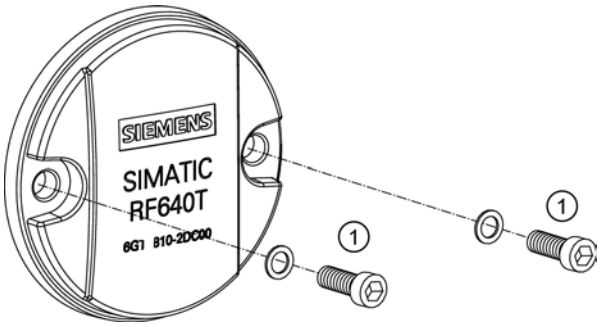
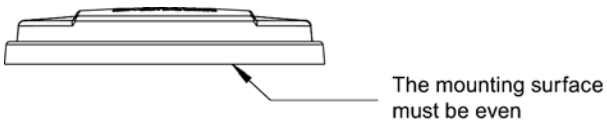



Figure 7-37 Screw mounting

**Note**

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



## 7.7.5 Memory configuration

### Memory banks

The memory of the ISO 18000-6B UCODE HSL chip is logically divided into two different areas:

| Memory area | Bit range | Default values | Description | Access |
|---|---|---|---|---|
| User memory | 1784 - 1791 | 4B | Test data from the manufacturer | Write / read |
| | 1776 - 1783 | 4F | | Write / read |
| | 1768 - 1775 | 6F | | Write / read |
| | 1760 - 1767 | 67 | | Write / read |
| | 144 - 1769 | 00 | | Write / read |
| | 96 - 143 | FF | | Write / read |
| | 88 - 95 | 02 | | Write / read |
| | 64 - 87 | 00 | | Write / read |
| Tag ID (UID) | 16 - 63 | xx | From the chip manufacturer Preassigned Serial number | Read |
| | 8 - 15 | 04 | Test data from the manufacturer | Read |
| | 0 - 7 | E0 | | Read |

| Color | Access by SIMATIC RF660R / SIMATIC RF610M |
|---|---|
| | Read |
| | Write / read |

### Parameterization

The parameterization possibilities that are available to you for each reader of the RF600 family are outlined in section Overview of parameterization of RF600 reader (Page 325). Detailed information for parameterization as well as examples for describing and reading specific memory areas can be found in the referenced chapters of the documentation.

## 7.7.6 Technical Specifications

### 7.7.6.1 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 |

### 7.7.6.2 Electrical data

| Property | Description | |
|---|---|---|
| | Europe | USA / Canada |
| Air interface | to ISO 18 000-6 B | to ISO 18 000-6 B |
| Frequency range | 865 … 868 MHz | 915 MHz [1] |
| Necessary transmit power | 2 W (ERP) | 4 W (EIRP) |
| Reading range<br>Mounting on metal [2] | at least 1.5 m<br>typically 2.0 m | at least 1.5 m<br>typically 2.0 m |
| Writing range<br>Mounting on metal [2] | at least 1.2 m<br>typically 1.5 m | at least 1.2 m<br>typically 1.5 m |
| Polarization type | Linear | Linear |
| Minimum distance to transmit antenna | Approx. 0.2 m | Approx. 0.2 m |
| Energy source | Magnetic energy via antenna, without battery | Magnetic energy via antenna, without battery |
| Multi-tag 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; recording is guaranteed at 915 MHz due to frequency hopping procedure.

[2] Mounting on a flat surface with a diameter of at least 150 mm

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

### See also

Directional radiation pattern of the transponder (Page 276)

### 7.7.6.3 Memory specifications

| Property | Description | |
|---|---|---|
| Type | 256 byte EEPROM | |
| Data retention time | 10 years | |
| Read cycles | Unlimited | |
| Write cycles | Minimum at +22 °C 100 000<br>Typically at +22 °C 1000 000 | |
| Memory organization | UID memory (fixed code) (Bytes 0 ... 7) | 8 bytes |
| | User memory (Bytes 8 ... 223) | 216 bytes |
| | Reserved memory | 32 bytes |

### 7.7.6.4 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 278) [2] |
| Temperature range when operating in areas at risk of dust explosions with T140 °C | See alsoUse of the transponder in hazardous areas for dusts (Page 279) [2] |
| Temperature range during storage | -40 °C … 125 °C[1] |
| Shock<br>Vibration<br>compliant with EN 60721-3-7 Class 7 M3 | 100 g, [3]<br>20 g, [3] |
| Torsion and bending load | Not permissible |
| Degree of protection | IP 68 according to EN 60529:<br>(45 minutes. immersion in water; water depth 1 m from<br>top edge of housing at +20 °C) |
| | IP x9K according to EN 60529:<br>• Steam blaster nozzle distance 150 mm<br>• 10 to 15 l of water per minute<br>• Pressure 100 bar<br>• Temperature 75 °C<br>• Test time 30 seconds |

[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.

**NOTICE**

**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.

### 7.7.6.5 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 | | ○○○○ | ○○○ |

| | Concentration | 20 °C | 60 °C |
|---|---|---|---|
| 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. | ○○○○ | ○○○○ |
| 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 |

## 7.7.7 Certificates and approvals

Table 7-22 6GT2810-0DC00 - RF640T UHF Tool Tag - Europe

| Certificate | Description |
|---|---|
| CE | CE Approval to R&TTE |
| | For Directive 94/9/EC:<br>EC type test certification no. TÜV 07 ATEX 346241<br>Acknowledgement of the quality assurance TÜV 96 ATEX 1125 Q |

Table 7-23 6GT2810-0DC10 - RF640T UHF Tool Tag - USA / Canada

| Standards | |
|---|---|
| FCC<br>Federal Communications Commission | FCC Title 47, Part 15.sections 15.247<br>Radio Frequency Interference Statement<br>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.<br>It meets the following safety standard(s):<br>UL 60950-1 - Information Technology Equipment Safety - Part 1: General Requirements<br>CSA C22.2 No. 60950 -1 - Safety of Information Technology Equipment<br>UL Report E 205089 |

### 7.7.7.1 Manufacturer's declaration RF640T UHF Tool Tag Version 1

The plant that manufactured the RF640T UHF Tool Tag Version 1 has an ATEX quality assurance system recognized by TÜV NORD with notification number TÜV 96 ATEX 1125 Q. The type test certification for the RF640T UHF Tool Tag Version 1 is stored by TÜV 07 ATEX 346241.

### Manufacturer's address

Siemens AG
Automation and Drives
System Engineering A&D SE
Würzburger Strasse 121
90766 Fürth, Germany.

### 7.7.8 Dimension drawing

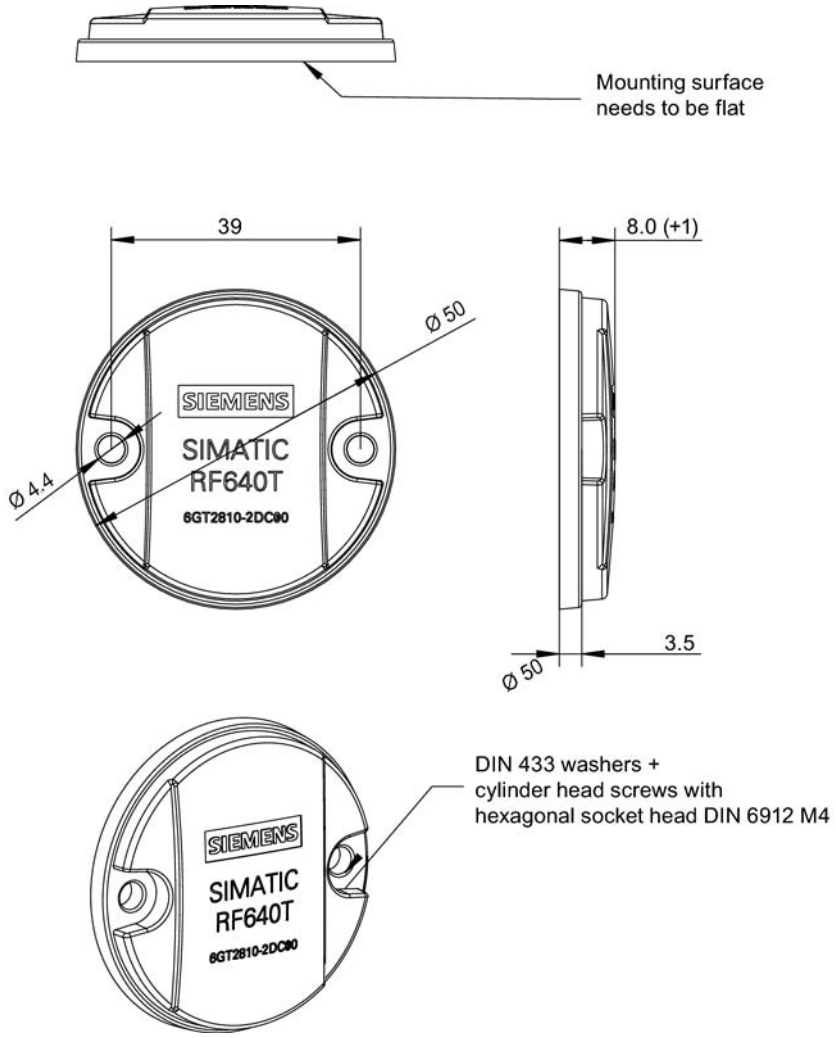



Figure 7-38 SIMATIC RF640T UHF Tool Tag Version 1

Units of measurement: All dimensions in mm

## 7.8 SIMATIC RF640T Gen 2

### 7.8.1 Characteristics

The SIMATIC RF640T Gen 2 transponder is a passive (i.e. battery-free) and maintenance-free, round-shaped data carrier. 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 transponder also has a 512-bit user memory.

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

The tool tag is small, smart, and rugged, suitable for industrial applications with degree of protection IP68. It is resistant to mineral oils, lubricants and detergents.

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 transponder** | **Features** | | |
|---|---|---|---|
|  | Application | Identification tasks in rugged industrial environments | |
| | Frequency versions | Europe | USA / Canada |
| | | 868 MHz | 915 MHz |
| | Air interface | according to ISO°18000-6C | |
| | Polarization | Linear | |
| | Memory | EPC 96 bit/240 bit<br>Add-on-memory 64 bytes | |
| | Read/write range | Typically X°m in connection with: @@@<br>• RF670R reader and<br>• RF660A antennas | |
| | | Typically 4.0 m in connection with:<br>• RF660R readers and<br>• RF660A antennas | |
| | | Typically 2 m in connection with:<br>• RF630R readers and<br>• RF660A antennas | |
| | | Typically 2 m in connection with:<br>• RF620R with integrated antenna | |
| | Installation | Suitable for direct mounting on conductive materials (preferably metal) | |

## 7.8.2 Ordering data

| Ordering data | Order no. |
|---|---|
| SIMATIC RF640T Gen 2 (Europe)<br>• Frequency 865 MHz to 868 MHz<br>• EPC 96 bits/240 bits<br>• 64-byte user memory<br>• -25 °C to +85 °C operating temperature<br>• Dimensions (D x H) 50 mm x 8 mm | 6GT2810-2DC00 |
| SIMATIC RF640T Gen 2 (USA/Canada)<br>• Frequency 902 MHz to 928 MHz<br>• EPC 96 bits/240 bits<br>• 64-byte user memory<br>• -25 °C to +85 °C operating temperature<br>• Dimensions (D x H) 50 mm x 8 mm | 6GT2810-2DC10 |

## 7.8.3 Planning the use

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

**Example to show optimum antenna/transponder positioning with RF670R, RF630R or RF620R and an RF600 antenna**

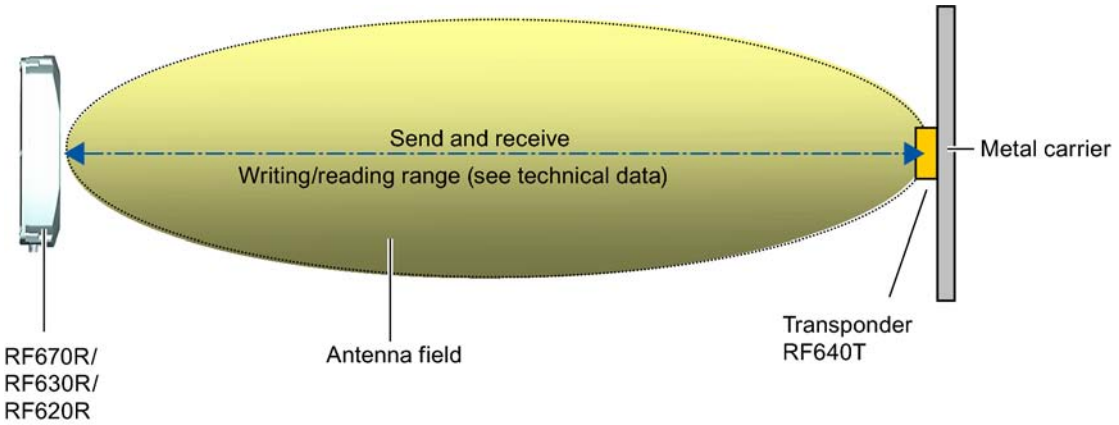



Figure 7-39 Example to show optimum antenna/transponder positioning with RF670R, RF630R or RF620R and an RF600 antenna

### Example of optimum antenna/transponder positioning with RF660R and RF660A antennas

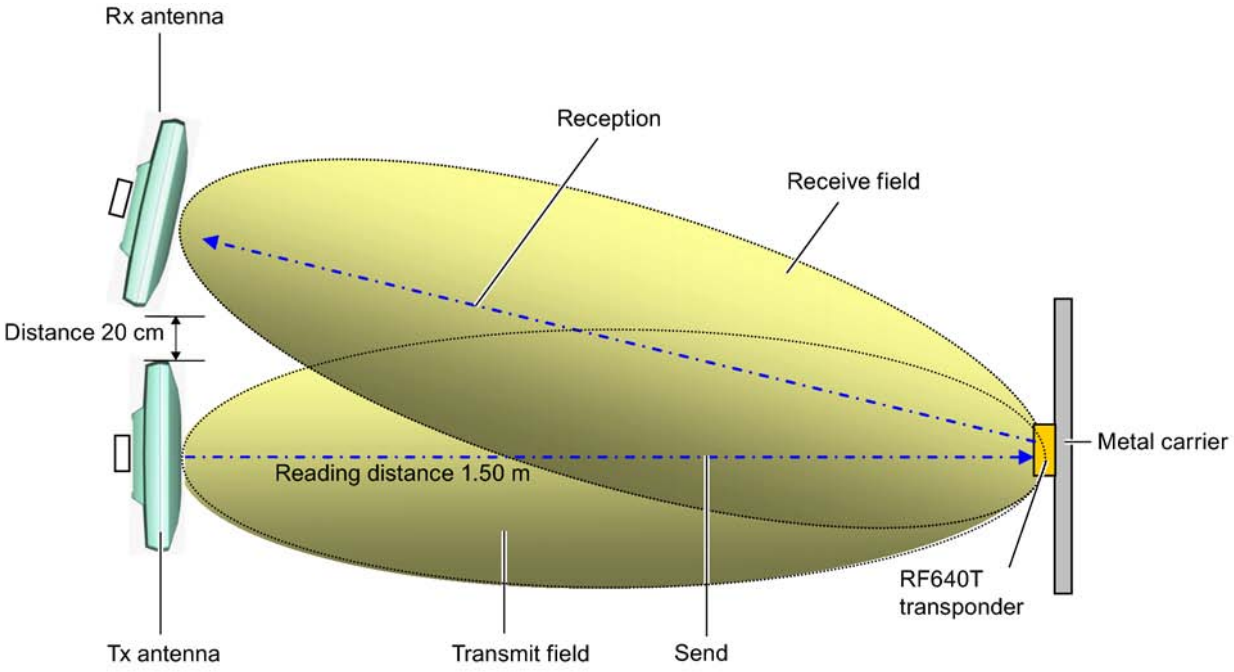



Figure 7-40 Example of optimum antenna/transponder positioning with RF660R and RF660A antennas

### 7.8.3.2 Reading 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 centrically mounted on a flat metal plate, which may either be

almost square or circular, it can be aligned in any direction since the transmitting and receiving RF660A antennas operate with circular polarization.

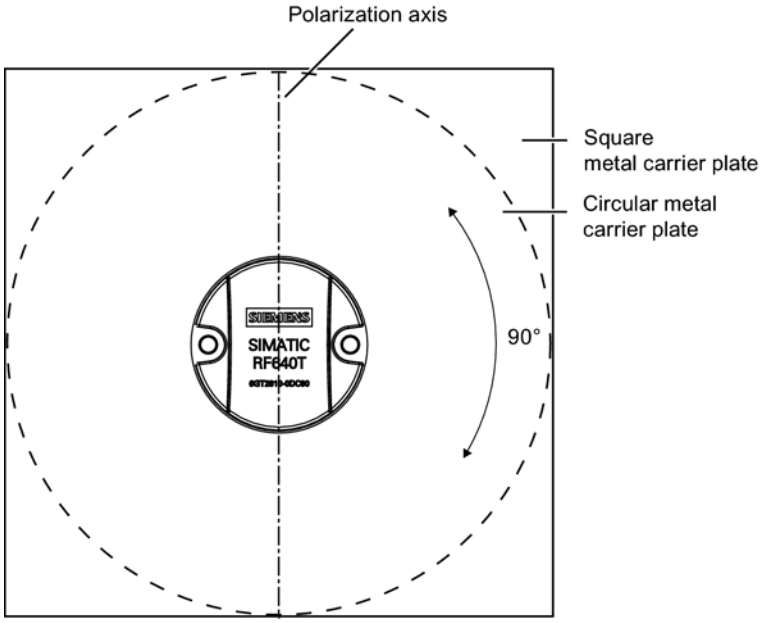



Figure 7-41 Optimum positioning of the transponder on a (square or circular) metal plate

Table 7-24 Reading range on flat metallic carrier plates

| Carrier plate material | Reading 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 reading distance depends on the mounting orientation of the transponder

### 7.8.3.3 Reading range when mounted on non-metallic carriers

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

Table 7-25 Reading range on non-metallic carriers

| Carrier plate material | Reading 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% |

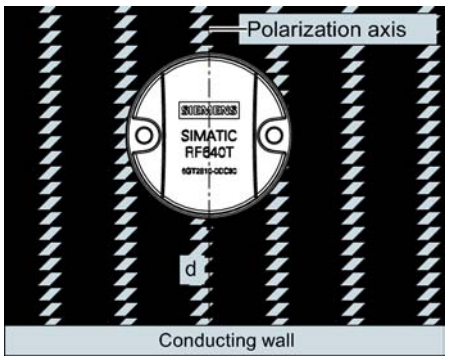
100% reading distance refers to a metal plate of at least 150 mm diameter.

### 7.8.3.4 Influence of conducting walls on the reading range

If there are conducting walls or restrictions in the vicinity that could 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 conducting wall.

#### Reading range: One conducting wall

**Influence on reading range when positioned against one conducting wall**

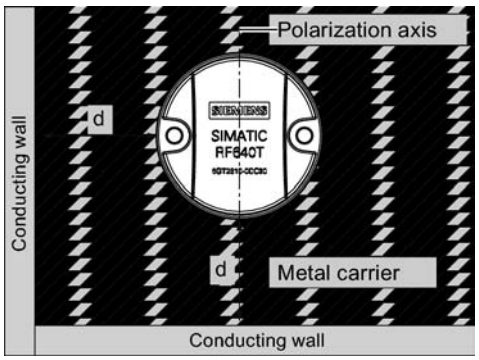



Top view

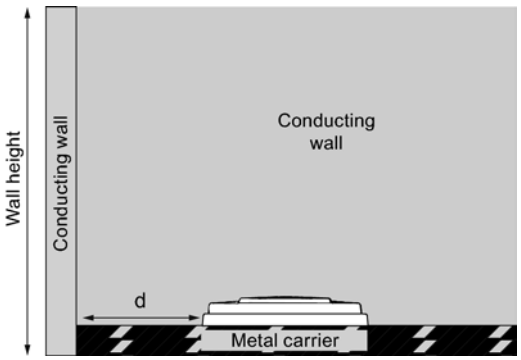
| Distance d | 20 mm | 50 mm | 100 mm | |
|---|---|---|---|---|
| Reading range | Approx. 90 % | Approx. 90 % | Approx. 95 % | Wall height 20 mm |
| | Approx. 80 % | Approx. 90 % | Approx. 90 % | Wall height 50 mm |
| | Approx. 70 % | Approx. 75 % | Approx. 90 % | Wall height 100 mm |

## Reading range: Two conducting walls

**Influence on reading range when positioned against two conducting walls**




Top view




Side view

| Distance d | 20 mm | 50 mm | 100 mm | |
|---|---|---|---|---|
| Reading 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 must be complied with.

### 7.8.3.5 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

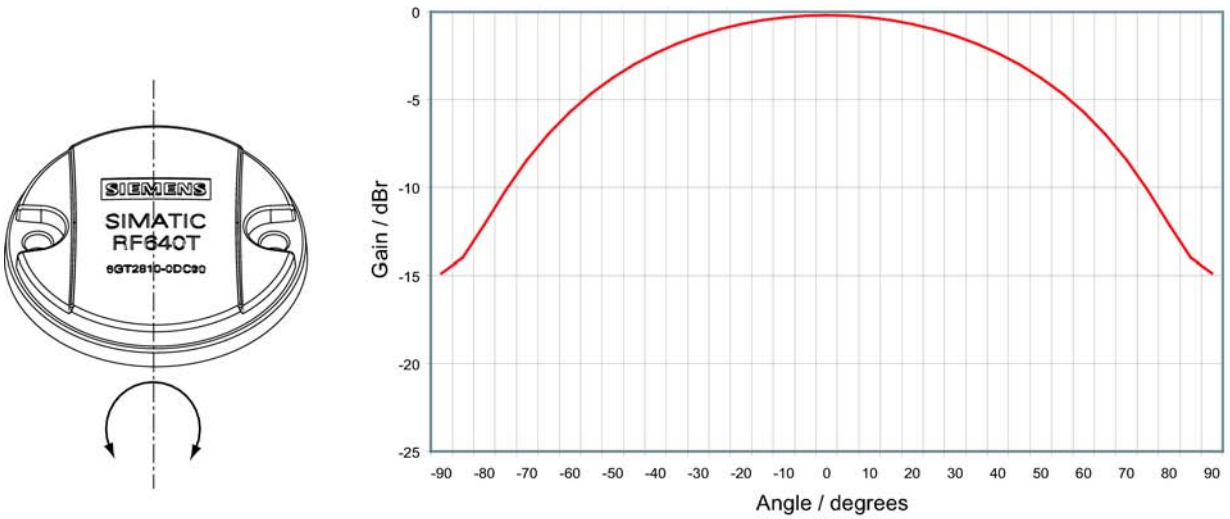



Figure 7-42 Transponder characteristics when rotated about the polarization axis

### Rotation orthogonal to the polarization axis

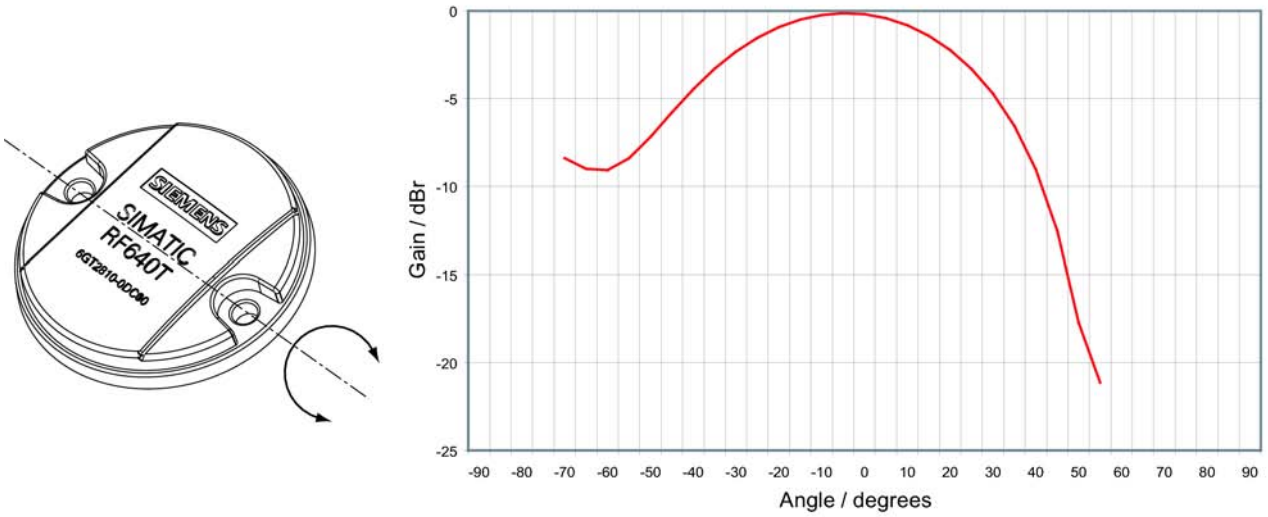



Figure 7-43 Transponder characteristics when rotated orthogonally to the polarization axis (within the tag plane)

### 7.8.3.6 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 EN 60079-0: 2004, EN 60079-11: 2007, IEC 61241-0: 2004 and IEC 61241-11: 2005.

#### Identification

The identification is as follows:

 II 2 G Ex ib IIC T6 to T3 or  II 2 D Ex ibD 21 T140°C, -25 °C < Ta°< +85 °C

### 7.8.3.7 Use of the transponder in hazardous areas for gases


#### 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 | T3 |
| -25 °C to +60 °C | T4 |
| -25 °C to +40 °C | T5 |
| -25 °C to +30 °C | T6 |

**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.

### 7.8.3.8 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). With the ignition temperature specified according to IEC 61241-0 and IEC 61241-11 according to the type of ignition protection iD, the smoldering temperature of the dust layer is referenced in this case.

#### Temperature class delineation for dusts

| Ambient temperature range | Temperature value |
|---|---|
| -25 °C < Ta < +85 °C | T140 °C |

**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.

## 7.8.4 Mounting instructions

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

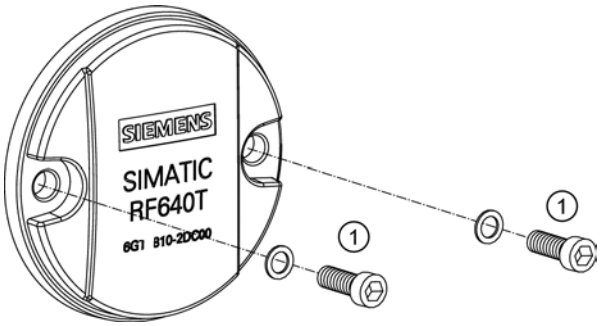
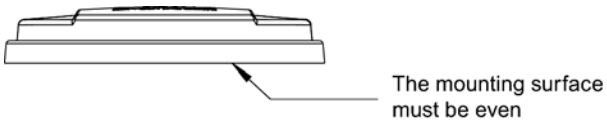



Figure 7-44 Screw mounting

**Note**

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



## 7.8.5 Memory configuration

### 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.

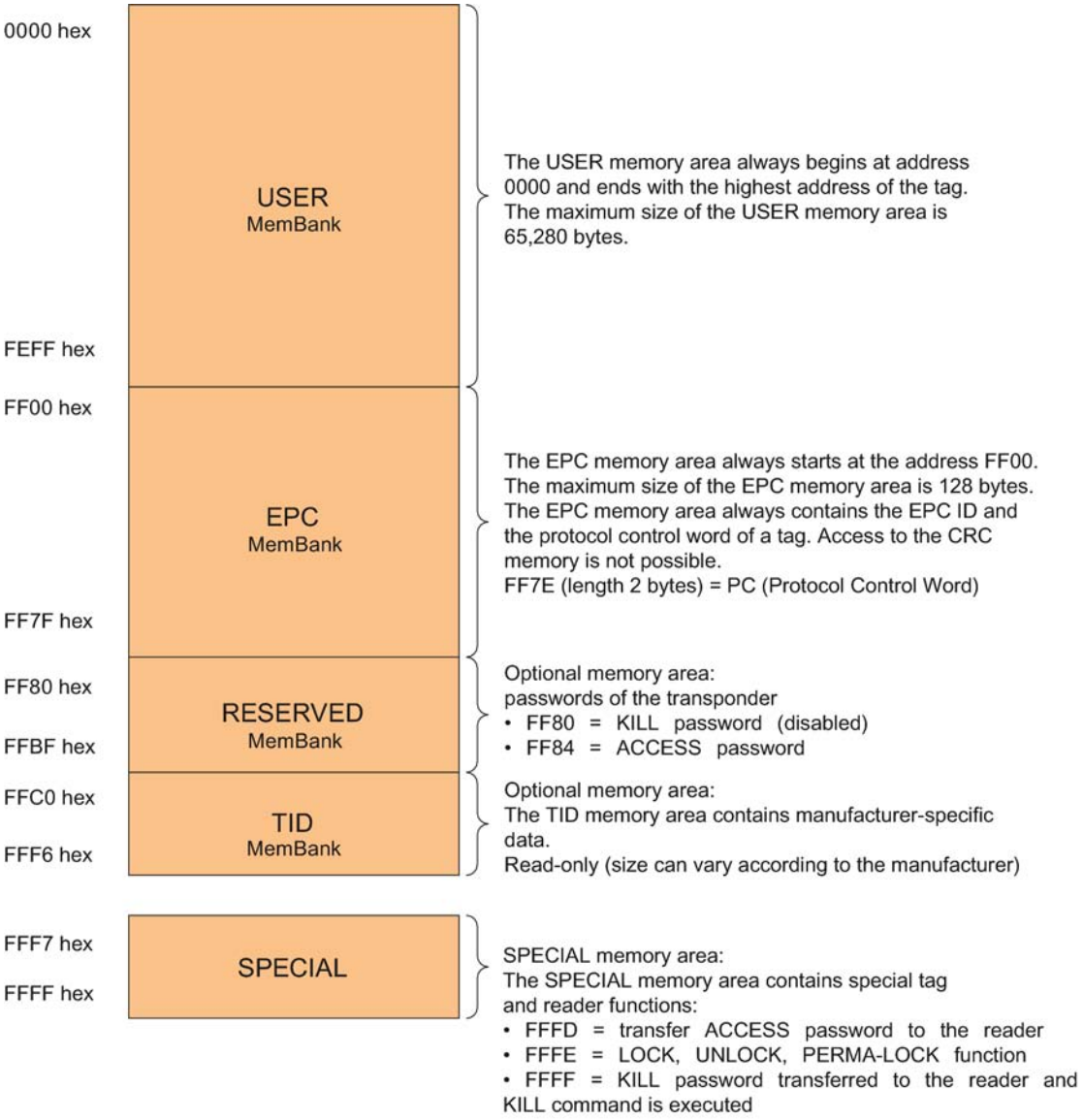



Figure 7-45 SIMATIC memory configuration

## RF640T Gen 2 memory configuration

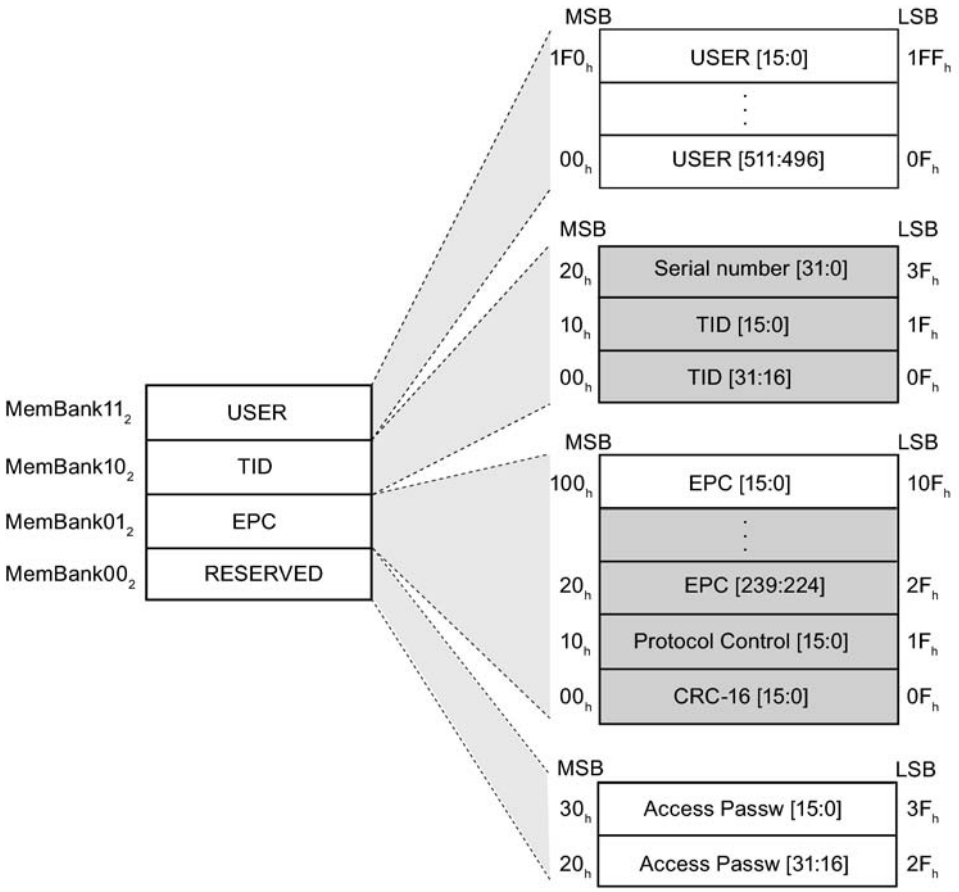
| Tags | User [hex] | EPC | | TID | RESERVED (passwords) | Special | |
|---|---|---|---|---|---|---|---|
| | | Range | Access | | | KILL-PW | Lock function |
| **RF640T Gen 2** | 00 - 3F | FF00-FF0B (240 bit = FF00-FF1D) | read/ write | FFC0-FFC7 | FF80-FF87 | LOCKED | Yes |

## Memory representation according to EPC

The memory of the ISO 18000-6C EPC Class 1 Gen 2 chip is logically divided 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 tag |
| MemBank $01_2$ | EPC | Contains the EPC UID, the protocol and the CRC of a tag<br>You can write to the EPC memory area. In the delivery condition, the memory contents can have the following states:<br>• empty<br>• containing the same data<br>• 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 bit) in the memory.




| Color | Mode of access by RF600 reader |
|---|---|
| | Read |
| | Write / read |

Figure 7-46 Representation of the memory configuration RF640T Gen 2 according to EPC (logical memory map)

## Parameterization

The parameterization possibilities that are available to you for each reader of the RF600 family are outlined in section Overview of parameterization of RF600 reader (Page 325). Detailed information for parameterization as well as examples for describing and reading specific memory areas can be found in the referenced chapters of the documentation.

## 7.8.6 Technical Specifications

### 7.8.6.1 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 |

### 7.8.6.2 Electrical data

| Property | 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 MHz ... 928 MHz [1] |
| Necessary transmit power | 2 W (ERP) | 4 W (EIRP) |
| Reading range<br>Mounting on metal [2] | at least 3 m<br>typically 4.0 m | at least 3 m<br>typically 4.0 m |
| Writing range<br>Mounting on metal [2] | at least 2 m<br>typically 3 m | at least 2 m<br>typically 3 m |
| Polarization type | Linear | Linear |
| Minimum distance to transmit antenna | Approx. 0.2 m | Approx. 0.2 m |
| Energy source | Magnetic energy via antenna, without battery | Magnetic energy via antenna, without battery |
| Multi-tag 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; recording is guaranteed at 915 MHz due to frequency hopping procedure.

[2] Mounting on a flat surface with a diameter of at least 150 mm

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

### See also

Reading range when mounted on flat metallic carrier plates (Page 290)

Directional radiation pattern of the transponder (Page 293)

### 7.8.6.3 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 | |
| Read cycles | Unlimited | |
| Write cycles | Minimum at +22 °C 100 000 | |

### 7.8.6.4 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 295) [2)] |
| Temperature range when operating in areas at risk of dust explosions with T140 °C | See alsoUse of the transponder in hazardous areas for dusts (Page 296) [2)] |
| Temperature range during storage | -40 °C … 125 °C[1)] |
| Shock<br>Vibration<br>compliant with EN 60721-3-7 Class 7 M3 | 100 g, [3)]<br>20 g, [3)] |
| Torsion and bending load | Not permissible |
| Degree of protection | IP 68 according to EN 60529:<br>(45 minutes. immersion in water; water depth 1 m from<br>top edge of housing at +20 °C) |
| | IP x9K according to EN 60529:<br>• Steam blaster nozzle distance 150 mm<br>• 10 to 15 l of water per minute<br>• Pressure 100 bar<br>• Temperature 75 °C<br>• Test time 30 seconds |

[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.

**NOTICE**

**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.

### 7.8.6.5 Chemical resistance of the RF640T Gen 2 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 | | ○○○ | □ |

| | Concentration | 20 °C | 60 °C |
|---|---|---|---|
| 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. | ○○○○ | ○○○○ |
| 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 |

## 7.8.7 Certificates and approvals

Table 7-26 6GT2810-2DC00 - RF640T Gen 2 UHF Tool Tag - Europe

| Certificate | Description |
|---|---|
| CE | CE approval according to R&TTE guideline |
| | For Directive 94/9/EC:<br>EC type test certification no. TÜV 07 ATEX 346241<br>Acknowledgement of the quality assurance TÜV 96 ATEX 1125 Q |

Table 7-27 6GT2810-2DC10 - RF640T Gen 2 UHF Tool Tag - USA/Canada

| Standard | |
|---|---|
| FCC<br>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.<br>It meets the following safety standard(s):<br>UL 60950-1 - Information Technology Equipment Safety - Part 1: General Requirements<br>CSA C22.2 No. 60950 -1 - Safety of Information Technology Equipment<br>UL Report E 205089 |

### 7.8.7.1 Manufacturer's declaration RF640T Gen 2 UHF Tool Tag Version 1

The plant that manufactured the RF640T Gen 2 UHF Tool Tag Version 1 has an ATEX quality assurance system recognized by TÜV NORD with notification number TÜV 96 ATEX 1125 Q. The type test certification for the RF640T Gen 2 UHF Tool Tag Version 1 is stored by TÜV 07 ATEX 346241.

#### Manufacturer's address

Siemens AG
Automation and Drives
System Engineering A&D SE
Würzburger Strasse 121
90766 Fürth, Germany.

### 7.8.8 Dimension drawing

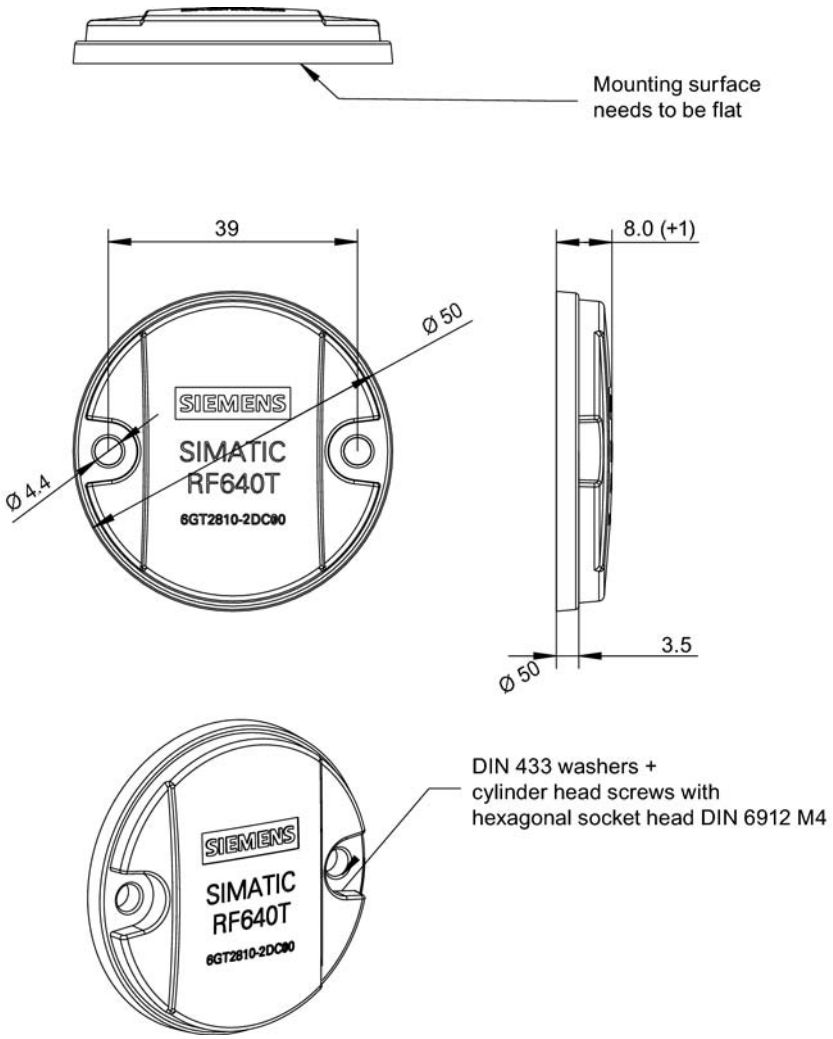



Figure 7-47 SIMATIC RF640T Gen 2 UHF Tool Tag Version 1

Units of measurement: All dimensions in mm

## 7.9 SIMATIC RF680T

### 7.9.1 Characteristics

The heat-resistant SIMATIC RF680T transponder is a passive, maintenance-free data carrier. 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 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 optimal operation and has a typical detection range of 4 m.

| SIMATIC RF680T transponder | Features | |
|---|---|---|
|  | Application | Applications in production logistics and in assembly lines subject to high temperatures (up to +220 °C, e.g. paintshop). |
| | Frequency band | 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<br>Add-on-memory 64 bytes |
| | Read/write range | Typically X°m/X°m in connection with: @@@<br>• RF670R reader and<br>• RF660A antenna |
| | | Typically 3 m/4 m in connection with:<br>• RF660R readers and<br>• RF660A antennas |
| | | Typically 1.4 m/2 m in connection with:<br>• RF630R reader and<br>• RF660A antenna |
| | | Typically 1.4 m/2 m in connection with:<br>• RF620R with integrated antenna |
| | Installation | Suitable for direct mounting on conductive and non-conductive materials. |
| | Material | Plastic PPS; silicone-free |
| | Dimensions | 130 x 32 x 15 mm |

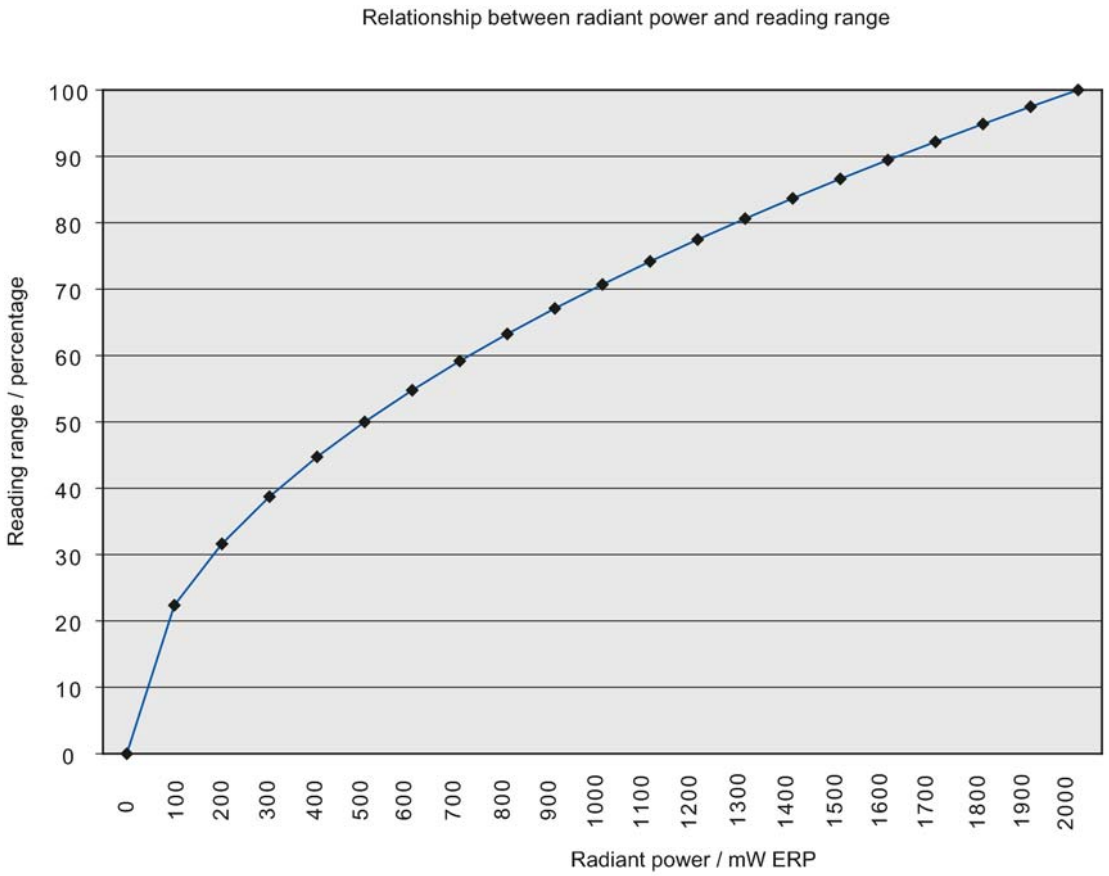
## 7.9.2 Ordering data

| Ordering data | Order no. |
|---|---|
| SIMATIC RF680T<br>• Frequency 865 MHz to 928 MHz<br>• EPC 96 bit/240 bit (64 bytes user memory)<br>• -25 ... +220 °C<br>• 130 x 32 x 15 mm | 6GT2810-2HG80 |

## 7.9.3 Planning the use

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:




### 7.9.3.1 Reading range when mounted on non-metallic carriers

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

Table 7-28 Reading ranges for non-metal carriers (RF660R = 2 W ERP; RF670R = @@@ W)

| Carrier plate material | Reading range for RF670R | Reading range for RF660R |
|---|---|---|
| Transponder on wooden carrier (dry, degree of moisture < 15%) | @@@ | Typ. 4 m |
| Transponder on plastic carrier | @@@ | Typ. 4 m |
| Transponder on glass | @@@ | Typ. 4 m |

100% reading range is achieved when mounted in empty, anechoic rooms.

### 7.9.3.2 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.

#### Rotation about the polarization axis

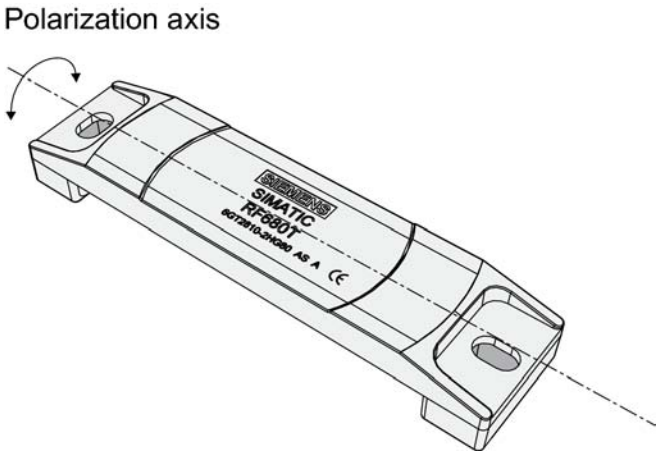



Figure 7-48 Rotation of the transponder about the polarization axis

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

### Rotation orthogonal to the polarization axis

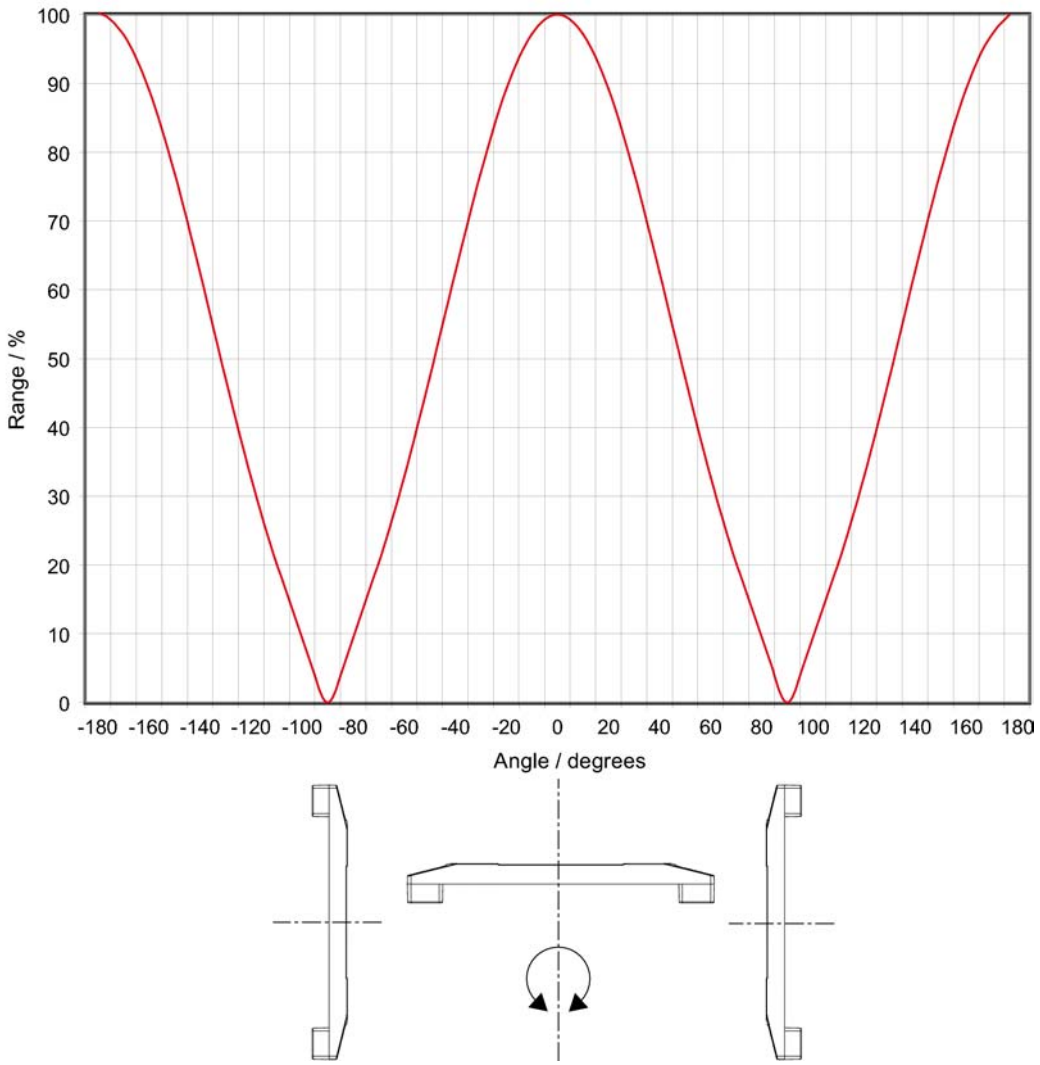



Figure 7-49 Transponder characteristics when rotated orthogonally to the polarization axis (within the tag plane)

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.

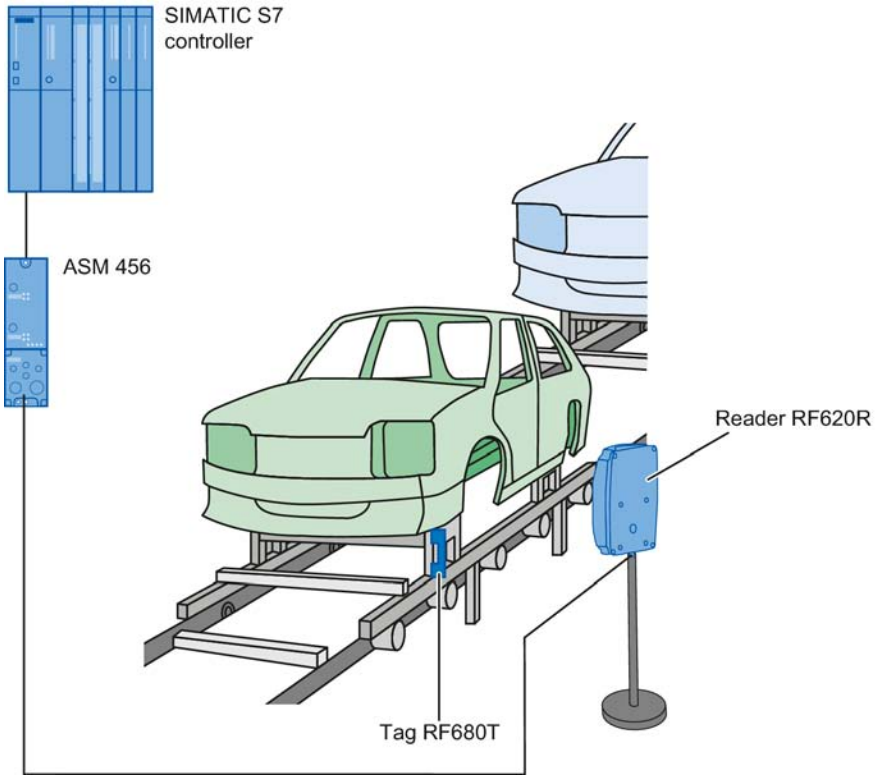



Figure 7-50 Application example

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

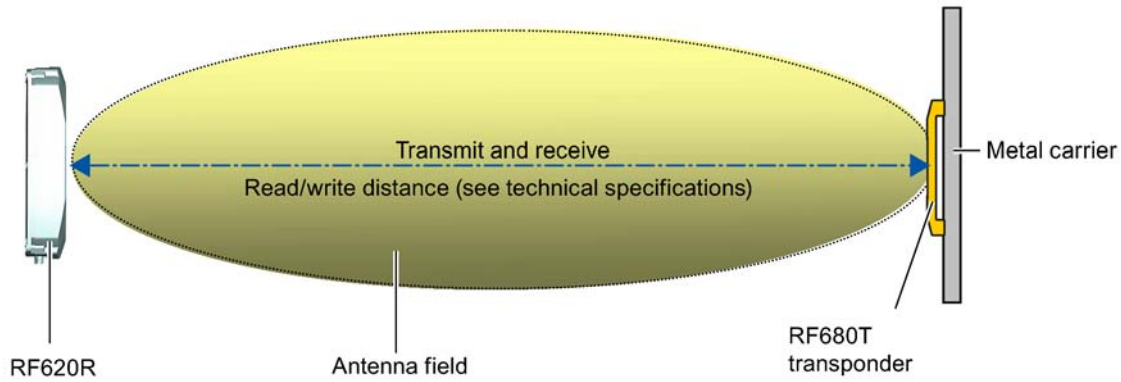



Figure 7-51 Example of optimum antenna/transponder positioning

### 7.9.3.4 Reading range when mounted on plane 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).

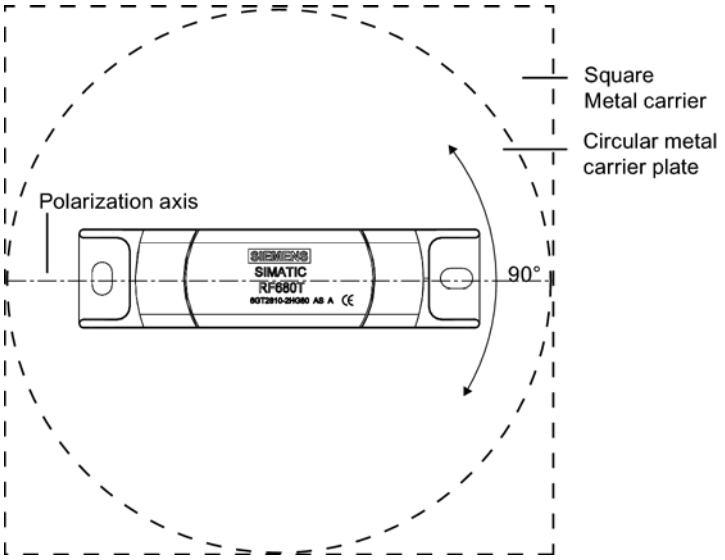



Figure 7-52 Optimum positioning of the transponder on a (square or circular) metallic carrier plate

Table 7-29 Reading range with metallic, plane carriers with spacer

| Carrier plate material | Reading range Europe | Reading range USA |
|---|---|---|
| Metal plate 150 x 150 mm | Typ. 4 m | Typ. 4 m |

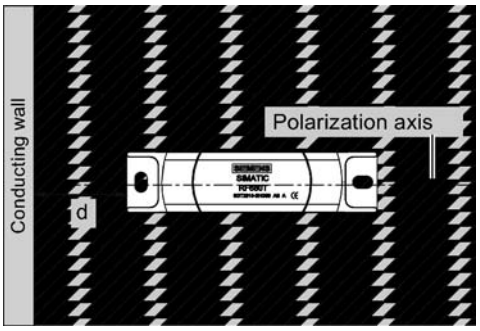
On rectangular carrier plates, the reading distance depends on the mounting orientation of the transponder A 90° rotation of the transponder about the axis of symmetry may result in greater reading distances

### 7.9.3.5 Influence of conducting walls on the reading 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 conducting wall.

## Reading range: One conducting wall

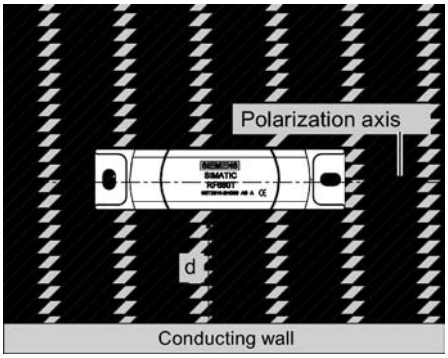
**Influence on reading range when positioned orthogonally to the conducting wall**




Top view

| Distance d | 20 mm | 50 mm | 100 mm | |
|---|---|---|---|---|
| Reading 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 |

**Influence on reading range when positioned parallel to the conducting wall**

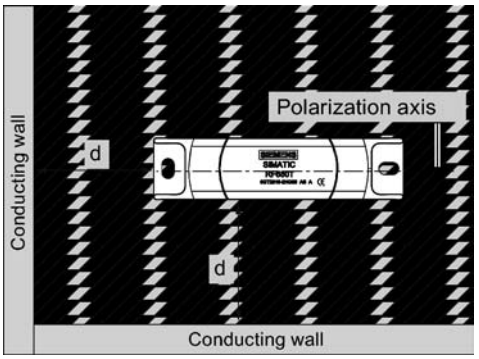


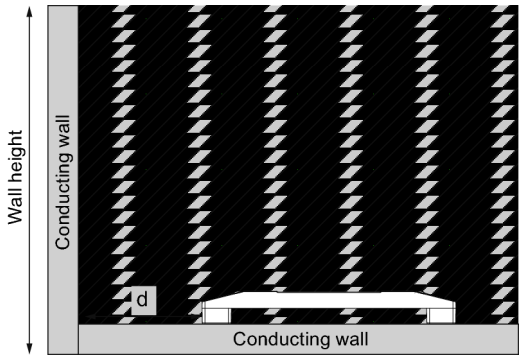

Top view

| Distance d | 20 mm | 50 mm | 100 mm | |
|---|---|---|---|---|
| Reading 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 |

### Reading range: Two conducting walls

**Influence on reading range when positioned against two conducting walls**




Side view

| Distance d | 20 mm | 50 mm | 100 mm | |
|---|---|---|---|---|
| Reading 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 reference values.

### 7.9.3.6 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

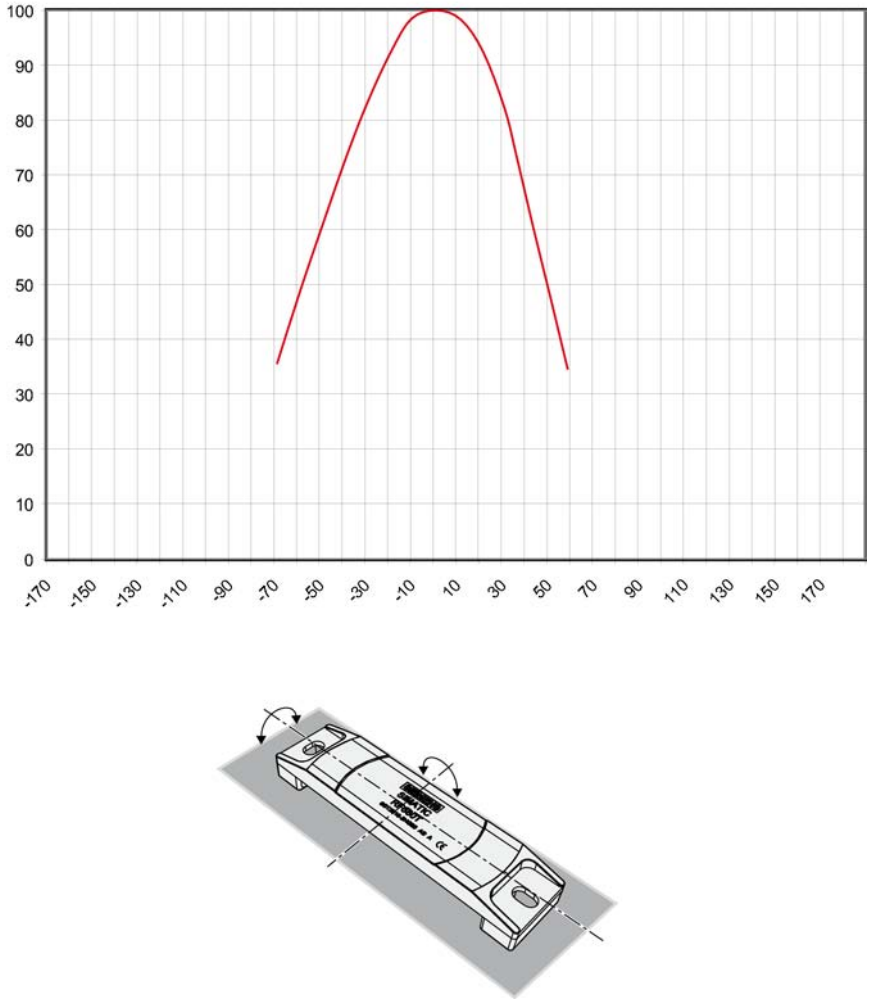



Figure 7-53 Characteristic of the transponder when rotated about the polarization axis or orthogonally to the polarization axis

**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.

## 7.9.4 Mounting instructions

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

Figure 7-54 Mounting SIMATIC RF680T

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

| NOTICE |
|---|
| **Reduction of the read/write distance**<br>When mounting on metal or conductive material, ensure that the space below the transponder remains empty. |

## 7.9.5 Memory configuration

### 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.

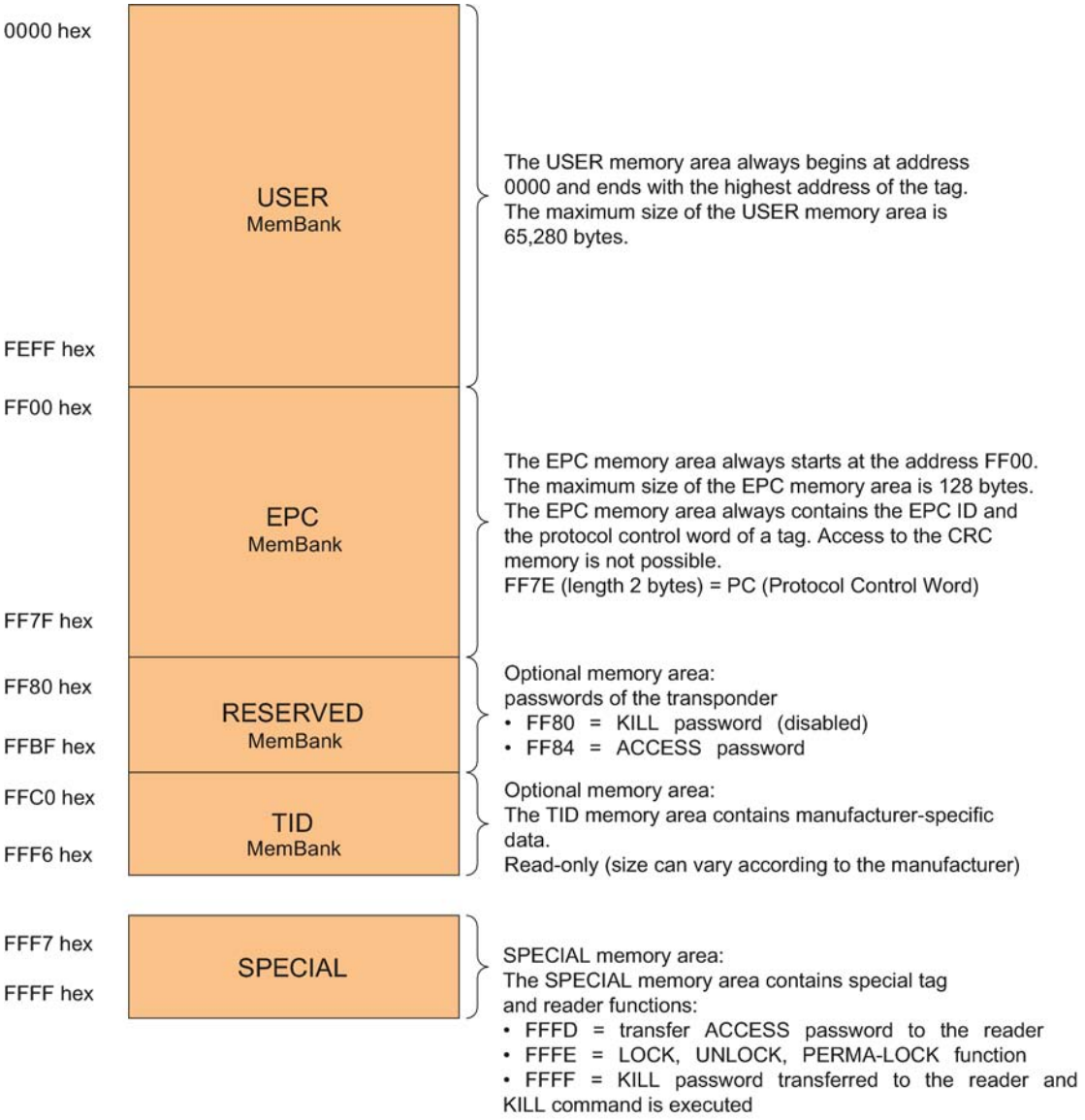



Figure 7-55 SIMATIC memory model

## RF680T memory configuration

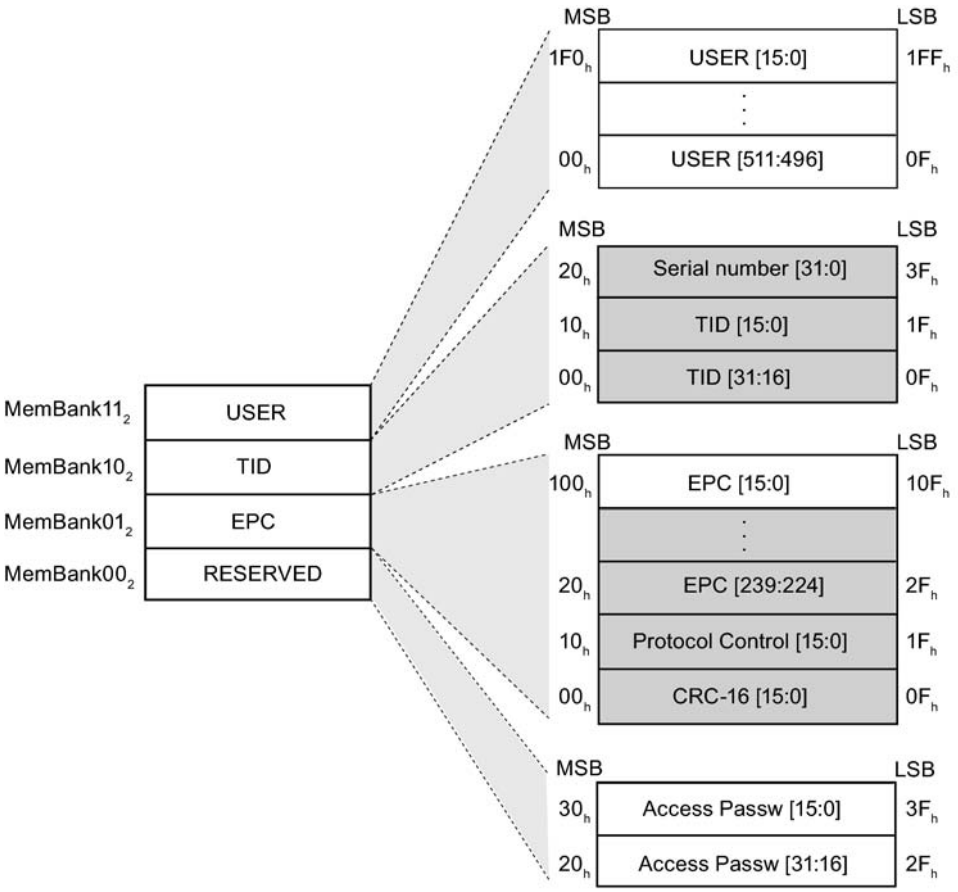
| Tag | User [hex] | EPC | | TID | RESERVED (passwords) | Special | |
|---|---|---|---|---|---|---|---|
| | | Range | Access | | | KILL-PW | Lock function |
| **RF680T** | 00 - 3F | FF00-FF0B (240 bit = FF00-FF1D) | read/ write | FFC0-FFC7 | FF80-FF87 | Locked | Yes |

## Memory banks

The memory of the ISO 18000-6C G2XM chip is logically divided 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 tag |
| MemBank $01_2$ | EPC | Contains the EPC data, the protocol information and the CRC data of a tag.<br>You can write to the EPC memory area. In the delivery condition, the memory contents can have the following states:<br>• containing the same data<br>• containing different data |
| MemBank $00_2$ | RESERVED | Contains the access password. |

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




| Color | Mode of access by RF600 reader |
|---|---|
| | Read |
| | Write / read |

Figure 7-56 Memory utilization

## Parameterization

The parameterization possibilities that are available to you for each reader of the RF600 family are outlined in section Overview of parameterization of RF600 reader (Page 325). Detailed information for parameterization as well as examples for describing and reading specific memory areas can be found in the referenced chapters of the documentation.

## 7.9.6 Technical specifications

### 7.9.6.1 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 |

### 7.9.6.2 Electrical data

| Property | Description | |
|---|---|---|
| **Europe** | **USA / Canada** | |
| Air interface | According to ISO 18 000-6 C | |
| Frequency range | 865 … 868 MHz | 915 ... 928 MHz |
| Necessary[2] transmit power | 2 W (ERP) | 4 W (EIRP) |
| Read distance<br>• on non-metallic carriers<br>• On metal[1] | <br>• Typ. 4 m<br>• Typ. 4 m | |
| Write distance<br>• on non-metallic carriers<br>• On metal[1] | <br>• Typ. 3 m<br>• Typ. 3 m | |
| Polarization type | Linear | |
| Minimum distance to transmitting antenna | Approx. 0.2 m | |
| Energy source | Magnetic energy via antenna, without battery | |
| Multi-tag capability | Yes, minimum distance between transponders ≥ 50 mm [3] | |

[1] Plane metal surface 15 x 15 cm, reduction of range to about 70% at the band limit 928 MHz on metal surfaces; detection is guaranteed at 915 MHz due to frequency hopping procedure.

[2] For maximum read/write distances at room temperature

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

### 7.9.6.3 Memory specifications

| Property | Description |
|---|---|
| Type | EPC Class 1 Gen2 |
| Memory organization | 96 bits/240 bits EPC code |

| Property | Description |
|---|---|
| Protocol | ISO 18000-6C |
| Data retention time | 10 years |
| Read cycles | Unlimited |
| Write cycles | Typ. 1,000,000 (at +40 °C) |

### 7.9.6.4 Environmental conditions

| Property | | Description | |
|---|---|---|---|
| Ambient temperature | • Operation | -25 °C to +100 °C | Permanent |
| | | From 100 °C to +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 |
| | • Transport and storage | -40 °C to +100 °C | |
| Shock<br>Vibration<br>compliant with EN 60721-3-7 Class 7 M3 | | 50 g, [1]<br>20 g [1] | |
| Torsion and bending load | | Not permissible | |
| Degree of protection | | • IP 68 according to EN 60529:<br>(45 minutes immersion in water;<br>water depth 1 m from top edge of housing at +20 °C)<br>• IPx9K<br>(steam jet: 150 mm; 10 to 15 l/min; 100 bar; 75 °C) | |
| Silicone-free | | Yes | |

[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.

### 7.9.6.5 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. | - | - |

| | 20 °C | 65 °C |
|---|---|---|
| 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 | ○ | - |

| Abbreviations | |
|---|---|
| + | Resistant |
| ○ | Limited resistance |
| ☐ | Not resistant |

## 7.9.7 Certificates and approvals

Table 7-30 6GT2810-2HG80 - RF680T Gen 2 UHF- Europe

| Certificate | Description |
|---|---|
| CE | Conformity with R&TTE directive |

Table 7-31 6GT2810-2HG80- RF680T Gen 2 UHF- USA / Canada

| Standard | |
|---|---|
| FCC<br>Federal Communications Commission | Passive labels or transponders comply with the valid regulations; certification is not required |

## 7.9.8 Dimension drawing

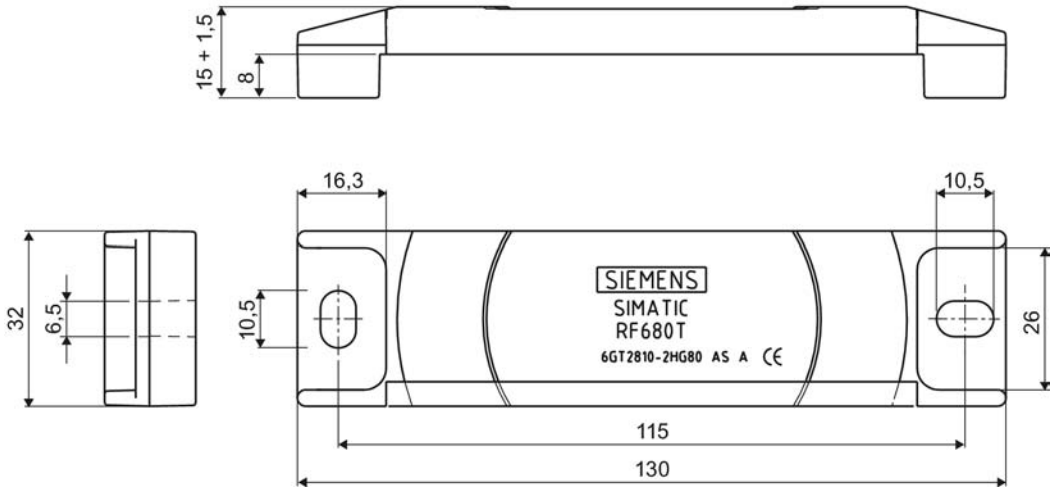



Figure 7-57 Dimension drawing of SIMATIC RF680T

Units of measurement: All dimensions in mm

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

# Integration into networks

# 8

## 8.1 Overview of parameterization of RF600 reader

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

| Readers | RF-MANAGER 2008 SP 3 | SIMATIC command messages | RF-MANAGER Basic 2010 | Configuration software | XML commands | RFID reader interface |
|---|---|---|---|---|---|---|
| RF670R | Online-Help > chapter "Introduction to RF-MANAGER > Overview of the RFID functions" | | Online help > chapter "Working with RFID objects" | | Function Manual RF670R, Chapter "Standard Configuration Messages" | |
| RF660R | | | | "Configuration Manual SIMATIC RF660R Configuration software", chapter "Parameterizing the RF660R" | Function Manual RF660R, Chapter "Standard Configuration Messages" | |
| RF630R | | "Configuration Manual RF620R/ RF630R", chapter "Overview of commands" | | | | |
| RF620R | | "Configuration Manual RF620R/ RF630R", chapter "Overview of commands" | | | | |
| RF610M | | | | | | Function Manual Mobile Reader, chapter"RFID Reader Interface Reference" |

# 8.2 Integration in IT networks via RF-MANAGER

## 8.2.1 RF-MANAGER and PC integration of the RF600 reader

### Fields of application

The RF-MANAGER is used for configuring, commissioning and operating RFID systems. It allows you to collect RFID data, to process it and to filter it. This data can be exchanged with an S7 PLC by means of variables or transferred to a higher-level management system.

The RF-MANAGER supports you with quick and easy creation of RFID solutions as well as the administration of RFID systems and their hardware components. The application also offers extensive help with the preprocessing of RFID data.

#### 8.2.1.1 Tasks of RF-MANAGER

### Tasks of RF-MANAGER

At both the planning level (ERP) and production level (MES), systems are used that generate a large volume of information that is relevant to production or that has commercial relevance. To increase productivity and efficiency, the individual levels must communicate with each other to use all the information that is available optimally. The RF-MANAGER makes an important contribution to this and is located at the PLC/PC level. It manages the connected RFID readers, collects the supplied data and reduces them to the accuracy and quantity required by the MES/ERP level. The most important areas are device management, data management and business integration. RF-MANAGER also acts as the interface between RFID data and the MES/ERP level.

The current RF-MANAGER version supports the following readers of the SIMATIC RF600 system: RF670R, RF660R, RF620R, RF630R, RF610M.

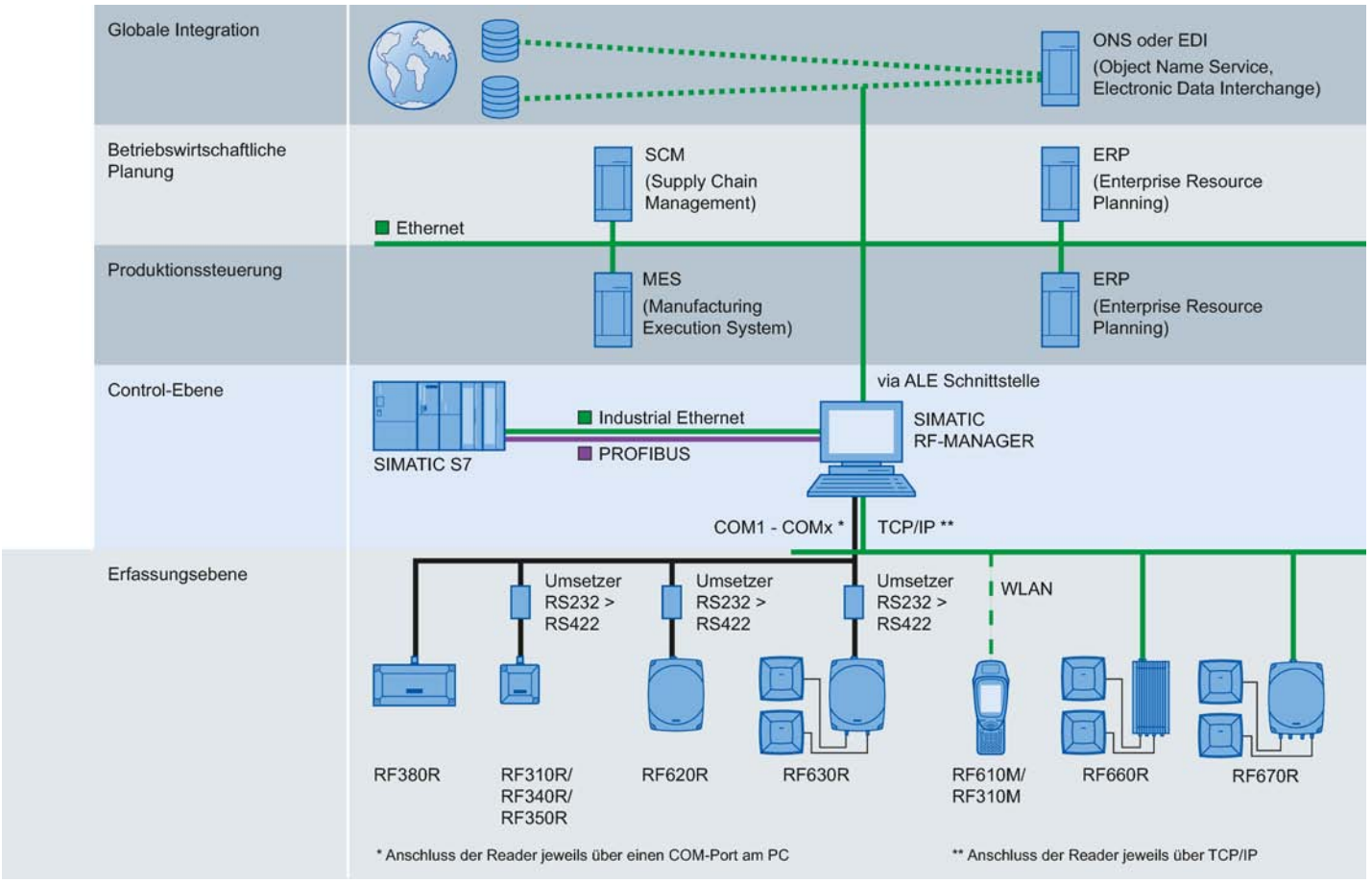



Figure 8-1 System overview

## Properties of RF-MANAGER

RF-MANAGER is characterized by the following features:

- Smooth operation and simple diagnostics
- Preparation of data for higher-level systems
- Logical operations on RFID data with automation data (SIMATIC S7):
- Flexibility with the higher-level system
- Comprehensive investment security

### 8.2.1.2 RF-MANAGER components

The RF-MANAGER comprises the following components:

- RF-MANAGER Engineering System (ES)
- RF-MANAGER Runtime (RT)

### RF-MANAGER Engineering System (ES)

The RF-MANAGER Engineering System is the software for handling all your essential configuring tasks. You can use ES to create RFID projects on your PC and to parameterize their components.

### RF-MANAGER Runtime (RT)

RF-MANAGER Runtime is the software that is used to operate RFID systems. In Runtime, you can execute the RFID projects during process operation that you created and parameterized in the Engineering System. The RT software can run either on the same PC as the ES, or on another Windows XP-PC of your choice. The SIMATIC Microbox PC 427B is also an option for runtime. The runtime system can exchange data with an S7 PLC by means of variables. In accordance with the product version or licensing of RF-MANAGER that you have selected, you can use the runtime system to address up to 50 RFID readers. Later license extensions for the Runtime software can also be obtained.

## 8.2.1.3 Connecting principle

- The RF670R/RF660R UHF reader is connected to the PC via TCP/IP.
- The RF620R and RF630R UHF readers are connected to the PC serially via a COM interface. For this an RS232 to RS422 interface converter is needed.
- The RF610M mobile handheld terminal is connected to the RF-MANAGER via WLAN.

### Tested interface converters for the operation of RF620R/RF630R

The following interface converters were used by Siemens in the test:

- Trycom IP interface converter: "TRP-C06".
- EXSYS GmbH interface converter card: "EX-42054-9-8S" with 8 interfaces.
- EXSYS GmbH interface converter card: "EX-42052-9-2S" with 2 interfaces.

Interface converters that do not work with RS232 but are connected to the PC via, for example, Ethernet or USB are not recommended. In general, these do not meet the timing requirements demanded by the protocol.

When using an interface converter, the following pin assignment should be observed.

## 8.2.1.4 Pin assignment for TRP-C06 interface converter

### Pin assignment and wiring diagram for interface converter

Trycom IP interface converter: "TRP-C06" is an external unit to convert RS232 to RS422 and vice versa. To commission the interface converter, connect the wires of the reader cable (Order No. 6GT2891-0EH50) to the correct terminals on the interface converter and the power supply/ ground (GND).

The following graphic shows an example of a wiring diagram:

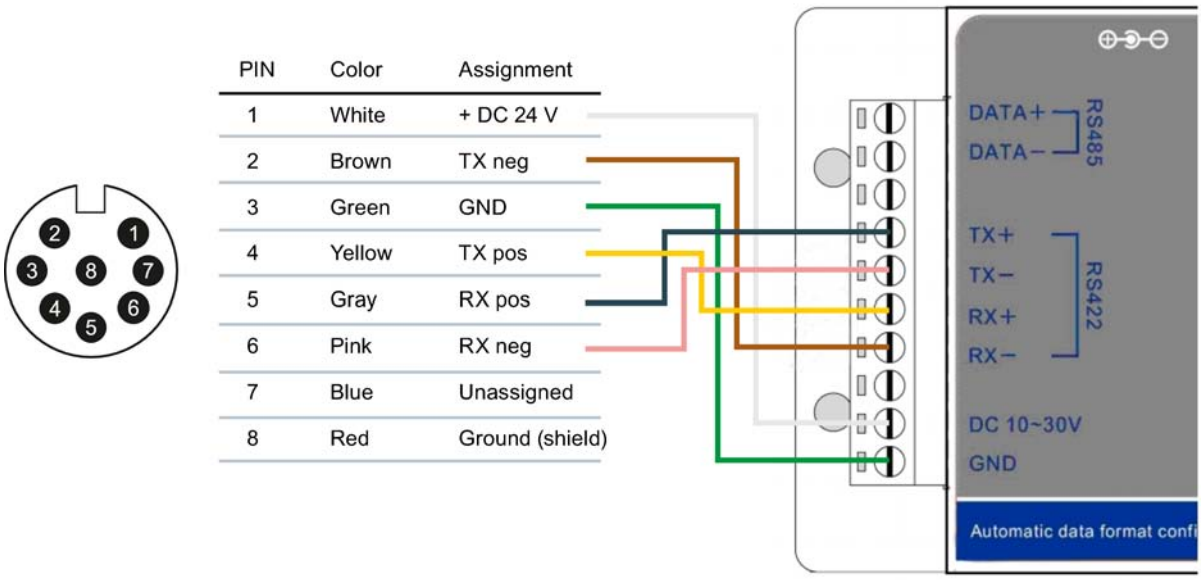



Figure 8-2 TRP-C06 wiring diagram

### 8.2.1.5 Pin assignment connector EX-42054-9-8S interface converter card

The interface converter card EX-42054-9-8S is installed in the PC. A driver is installed for each interface so that 8 additional COM ports become available. A connector matching the 8 interfaces must be mounted on the reader cable.

The following figure gives an example of a pin assignment for a connector on an RS422 reader cable (Order No. 6GT2891-0EH50) as well as the power supply for the reader:

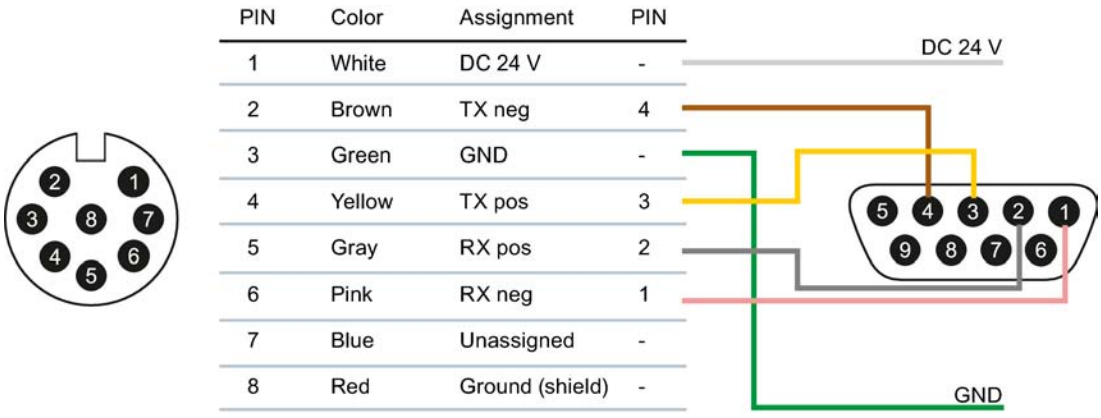



Figure 8-3 Connector pin assignment EX-42054-9-8S and reader power supply

**Note**

**Same pin assignment for the interface converter card EX-42052-9-2S**

For the interface converter card EX-42052-9-2S a connector with the same assignment as shown above must be installed.

#### 8.2.1.6 Number of readers

The maximum number of readers connected simultaneously to a single computer with serial communications depends largely on the computer's performance.

In the system test a standard PC (see system requirements) with 8 readers was tested. Insufficient computer performance can lead to connection interruptions or communication errors.

On the Microbox with a serial interface, a reader with serial communications was tested.

## 8.3 Integration in IT networks via the user application

### 8.3.1 Interfacing with RF670R via XML

If you want to create your own applications for the RF670R reader, you can do this using the XML-based interface of the reader. For detailed information on configuring the reader using RF-MANAGER Basic 2010, please refer to the online help for the reader. For information about XML commands, please refer to the Function Manual "SIMATIC RF670R XML Interface".

### 8.3.2 Interfacing with RF660R via XML

If you want to create your own applications for the RF660R reader, you can do this using the XML-based interface of the reader. For detailed information on configuring and operating the reader using XML commands, please refer to the Function Manual "SIMATIC RF660R XML Interface".

# 8.4 Integration in SIMATIC networks

## 8.4.1 RF620R/RF630R

### RF620R/RF630R

RF620R and RF630R readers are connected to the controller via the following adapter/ communication modules:

- SIMATIC RF170C
- SIMATIC RF180C
- ASM 456

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

### Function blocks, interface modules/communication modules and readers

Table 8-1 Table of reader/interface modules

| Function blocks | Interface modules/communication modules | | | | |
|---|---|---|---|---|---|
| ASM 456 [1] | RF170C [1] | RF180C | RF182C | ASM 475 | |
| FB 45 | 1 - 2 readers | 1 - 2 readers | 1 - 2 readers | N/A | Not released |
| FC 55 | 1 - 2 readers | 1 - 2 readers [2] | N/A | N/A | Not released |
| XML | N/A | N/A | N/A | 1 - 2 readers | N/A |
| For all possible combinations, the following restriction applies:<br>• The input voltage at the communication module is 21.6 V - 30 V<br>[1]) If 2 readers are used on one ASM, the following additional restrictions apply:<br>• The maximum operating temperature is 35 °C (ASM 456)<br>• The maximum operating temperature is 55 °C (RF170C)<br>[2] No operation is possible with a PROFINET head. | | | | | |

## Interface modules/communication modules and function blocks

Table 8-2 Overview of interface modules/communication 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 protection |
|---|---|---|---|---|---|---|---|
| ASM 456 | PROFIBUS DP-V1 | 2 x 8-pin connection socket, M12 | FB 45<br>FC 55 | 2 (parallel) | 60 x 210 x 54<br>or 79 | 0 to +55 °C | IP 67 |
| SIMATIC RF170C | PROFIBUS DP-V1<br>PROFINET IO | 2 x 8-pin connection socket, M12 | FB 45<br>FC 55 | 2 (parallel) | 90 x 130 x 60 | -25 to +55° C | IP 67 |
| SIMATIC RF180C | PROFINET IO | 2 x 8-pin connection socket, M12 | FB 45 | 2 (parallel) | 60 x 210 54 | 0 to +60° C | IP 67 |
| SIMATIC RF182C | TCP/IP | 2 x 8-pin connection socket, M12 | - | 2 (parallel) | 60 x 210 x 54 | 0 to +60 °C | IP 67 |

The following table shows which readers can be connected to which interface modules/ communication modules.

## Configuration with SIMATIC RF170C

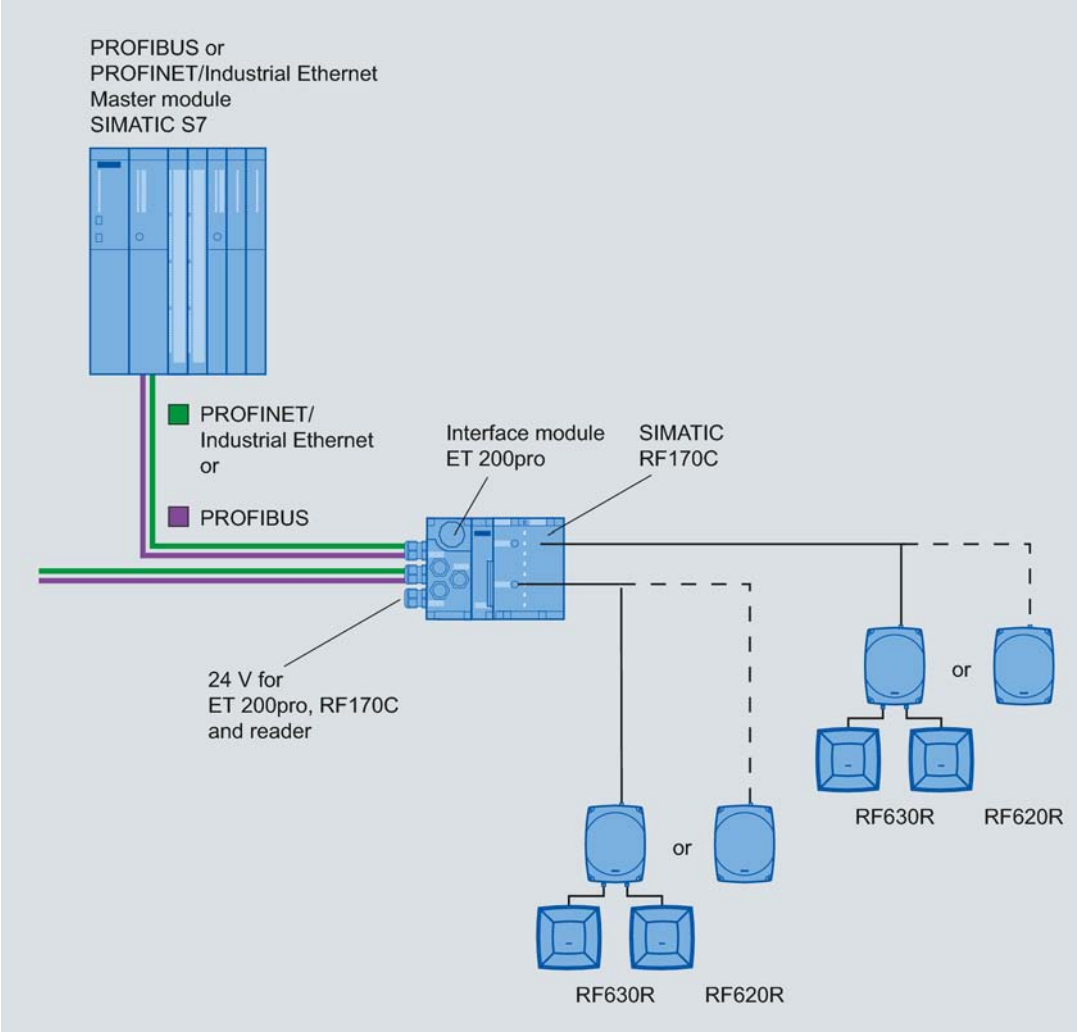



Figure 8-4 Configuration with SIMATIC RF170C

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

## Configuration with SIMATIC RF180C

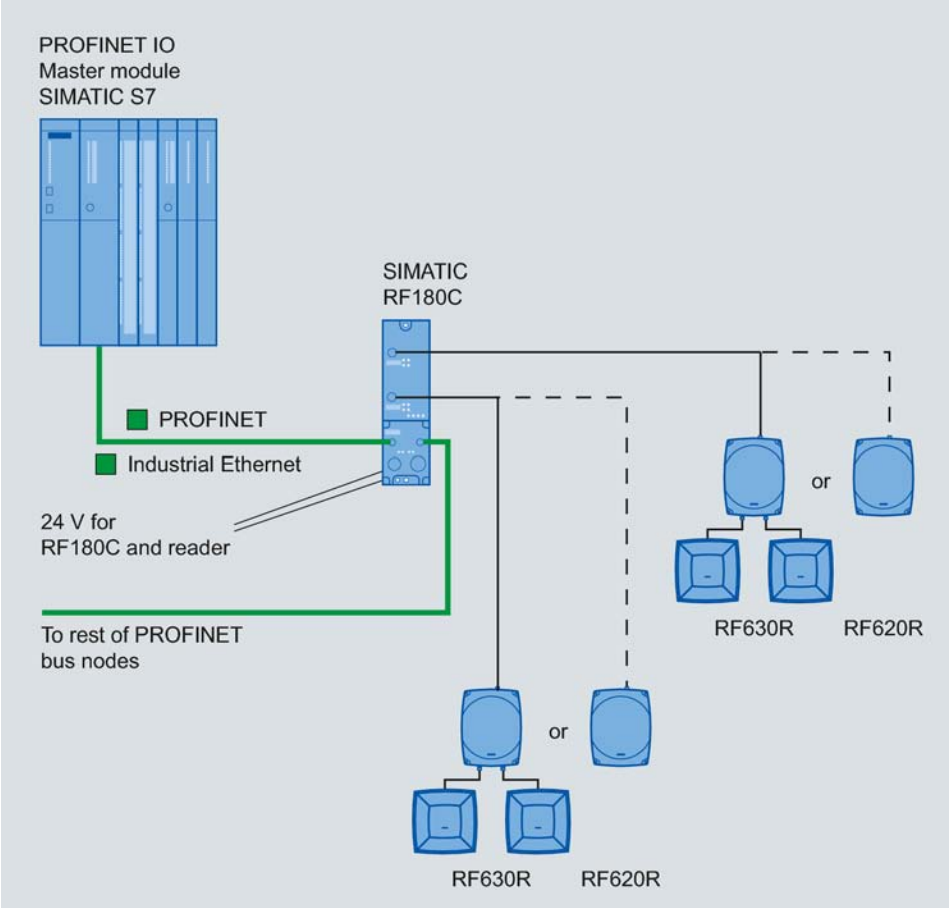



Figure 8-5 Configuration with SIMATIC RF180C

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

## Configured with ASM 456

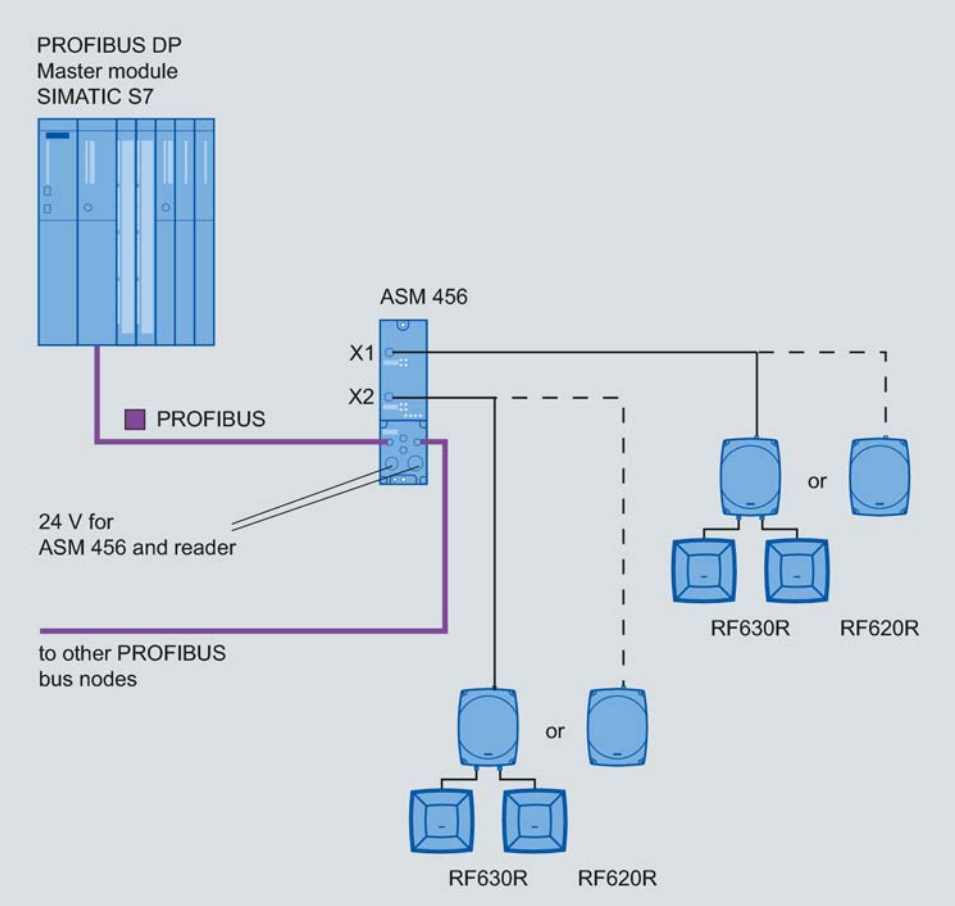



Figure 8-6 Configured with ASM 456

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

## Configuration with RF182C

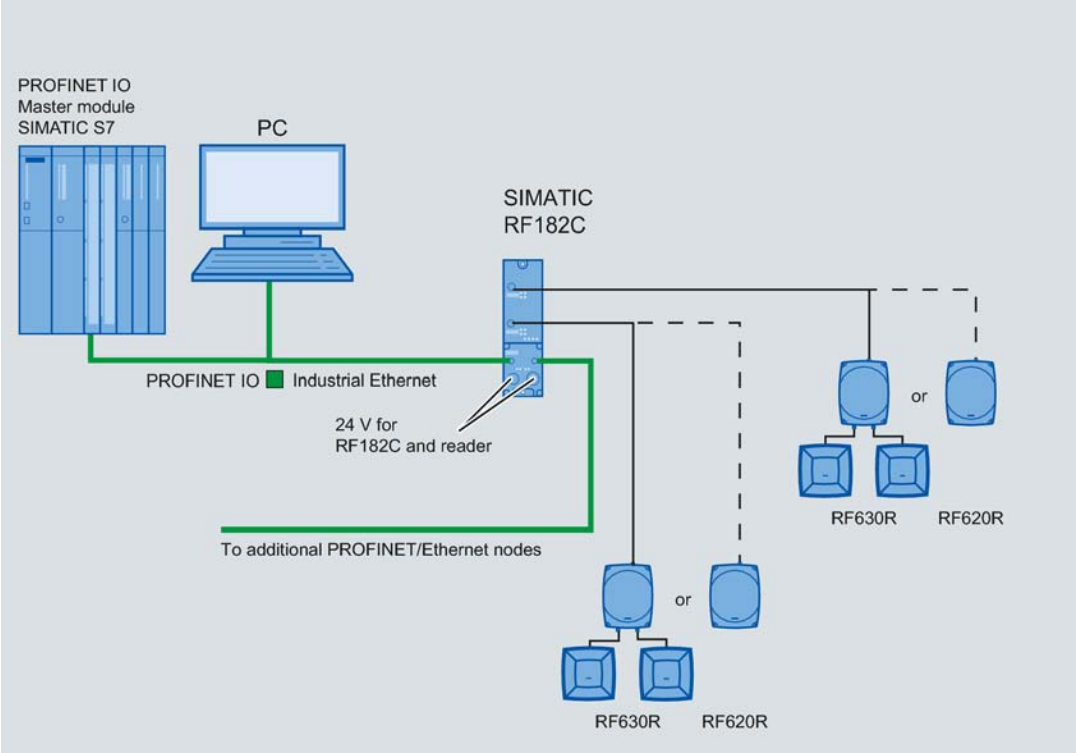



Figure 8-7 Configuration with SIMATIC RF182C

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

# System diagnostics

# 9

## 9.1 Error messages and flash codes for RF670R

| Error description | Flashing of ERR LED | |
|---|---|---|
| | Number | Repetitions |
| Reader inactive, no configuration data | 1 | Permanent |
| Antenna 1 not connected or defective | 3 | Permanent |
| Antenna 2 not connected or defective | 4 | Permanent |
| Antenna 3 not connected or defective | 5 | Permanent |
| Antenna 4 not connected or defective | 6 | Permanent |
| Writing of the tag ID has failed | 10 | 3 times |
| Reading of user-defined memory has failed | 11 | 3 times |
| Writing of user-defined memory has failed | 12 | 3 times |
| Wrong or missing password | 14 | 3 times |
| LOCK has failed | 16 | 3 times |
| KILL has failed | 17 | 3 times |
| Access to impermissible memory areas | 18 | 3 times |
| Too many tags in the field | 19 | 3 times |
| General software errors | 20 | Permanent |
| Impermissible message frame;<br>Impermissible message frame parameter | 29 | 3 times |
| Incorrect message frame format | 30 | 3 times |

1 x flashing of the ERR LED means no error. This means that the reader is not currently active.

## 9.2 Error messages and flash codes for RF660R

| Error code | Error description | Flashing of ERR LED | Remark |
|---|---|---|---|
| - | Reader is not active | 1 | Indicates that the reader is not active |
| 1000 | Serious error: Programming of the synthesizer failed | 20 | Hardware error |
| 1001 | Serious error: Antennas connected incorrectly | 20 | Hardware error |
| 1002 | Serious error: Power amplifier could not be connected | 20 | Hardware error |
| 1003 | Serious error: Tx gain could not be set | 20 | Hardware error |
| 1004 | Serious error: Rx gain could not be set | 20 | Hardware error |
| 1005 | Serious error: Delete FLASH failed | 20 | Hardware error |
| 1006 | Serious error: FLASH write failed | 20 | Hardware error |

| Error code | Error description | Flashing of ERR LED | Remark |
|---|---|---|---|
| 2000 | Serious error: Software errors | 20 | Software errors |
| 2001 | Error: Config rollback error | 20 | Software errors |
| 2002 | Serious error: Saving the default config to FLASH failed | 20 | Hardware error |
| 5101 | Error: No firmware selected for ramp-up | 18 | Faulty firmware |
| 5102 | Error: Antenna not connected | 3 | Antenna not connected |

1 x flashing of the ERR LED means no error. This means that the reader is not currently active.

## 9.3 Error messages and flash codes for RF620R/RF630R

### error_MOBY

The ERR LED of the reader flashes when the ASM reports error messages.

Table 9-1 Error messages of the MOBY-ASM via the "error_MOBY" variable

| Error code (B#16#..) | Flashing of ERR LED | Description |
|---|---|---|
| 00 | – | No error<br>Default value if everything is ok. |
| | 1x | Boot message |
| 01 | 2x | Presence error, possible causes:<br>• The active command was not carried out completely<br>• The tag has left the field while the command is being processed<br>• Communication fault between reader and tag<br>The next command is automatically executed on the next tag. A read or write command is possible. |
| 02 | 2x | Presence error: A tag has passed by a reader without being processed by a MOBY command.<br>• This error message is not reported immediately. Instead, the ASM waits for the next command (read, write). This command is immediately replied to with this error. This means that a read or write command is not processed. The next command is executed normally by the ASM again. An init_run from FB 45 also resets this error state.<br>• Bit 2 is set in parameter "option_1" and no tag is in the transmission window. |

| Error code (B#16#..) | Flashing of ERR LED | Description |
|---|---|---|
| 03 | 3x | Error in the connection to the reader. The reader does not answer.<br>• Cable between MOBY ASM and reader is wired incorrectly or cable break.<br>• Antenna error: (Cable is defective), cable is no longer connected<br>• The 24 V supply voltage is not connected or is not on or has failed briefly.<br>• Automatic fuse on the ASM has blown.<br>• Hardware defect<br>• Another reader is in the vicinity and is active.<br>• Interference on reader - or PROFIBUS line<br>• Execute init_run after error correction |
| 04 | 4x | Error in tag memory<br>The tag has never been write-accessed or has lost the contents of its memory due to battery failure.<br>• Replace tag (if battery bit is set).<br>• Initialize tag with the STG<br>• Re-initialize tag |
| 05 | 5x | • Unknown command<br>• Incorrect parameter<br>• Function not allowed<br>• Mode in SET-ANT command unknown<br>FB 45/FC 55 is sending an uninterpretable command to the MOBY-ASM.<br>• Command_DB contains invalid command parameters.<br>• The command_DB was overwritten by the user<br>• The MDS reported an address error. |
| 06 | 6x | Field disturbance on reader<br>The reader is receiving interference pulses from the environment.<br>• The distance between two readers is too small and does not correspond to the configuration guidelines<br>• 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 | | Wrong communications standard selected in the init_run command (e.g. FCC in ETSI reader) |
| 0B | 11x | Tag memory cannot be read correctly or cannot be written.<br>Tag reports an error:<br>• Other error (00000000B) *<br>• Insufficient power (00001011B): Tag is in the limit range *<br>• Non-specific error (00001111B) * |
| 0C | 12x | The tag memory cannot be write-accessed.<br>• Tag memory is defective<br>• Memory is write-protected (Memory Locked: 000000100B)<br>(The tag memory is PERMA-locked and cannot be overwritten or the reader password has to be reset) |

| Error code (B#16#..) | Flashing of ERR LED | Description |
|---|---|---|
| 0D | 13x | Error in specified address (address error)<br>• The specified address does not exist on the tag<br>• The command must be checked and corrected.<br>• This is not the correct tag type.<br>• Access attempted to non-existent or non-accessible memory areas ( Memoryoverrun: 00000011B) |
| 0E | 14x | Password error<br>• Incorrect tag password (the reader password must be set again so that is agrees with the password). |
| 0F | 1x | Start-up message from ASM. The ASM was off and has not yet received an init_run command<br>• Execute an init_run<br>• The same physical ASM channel is used in two (or more) UDT 10 structures. Check the ASM_address and ASM_channel in *all* UDT 10 structures. |
| 10 | 16x | NEXT command not possible or not permitted<br>• ASM is operating without MDS control (MDS_control = 0.1)<br>• ASM has already received a Next command.<br>• ASM / write/read device doesn't recognize NEXT command.<br>REPEAT after forbidden commands:<br>• REPEAT for SET-ANT<br>• REPEAT for SLG status |
| 11 | – | Short circuit or overload of the 24 V outputs (DQ, error code, presence)<br>• The affected output is turned off.<br>• All outputs are turned off when total overload occurs.<br>• A reset can only be performed by turning the 24 V voltage off and on again.<br>• Then start init_run. |
| 12 | 18x | Internal ASM communication error<br>• Connector contact problem on the ASM<br>• Defective ASM hardware<br>– Return ASM for repair<br>• Start init_run command after error correction. |
| 13 | 19x | • ASM/reader does not have enough buffer to store the command intermediately.<br>• Maximum allowable number of 150 commands in a command chain was ignored. If REPEAT is used in connection with a command chain, the maximum number of commands is also 150 (including the REPEAT command).<br>If a command chain contains more than 150 commands, after the 150th command is called, it will be canceled 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. |

| Error code (B#16#..) | Flashing of ERR LED | Description |
|---|---|---|
| 14 | 20x | Internal ASM / write/read device error<br>• Program sequence error on the ASM<br>• Turn power of ASM off and on again.<br>• Start init_run command after error correction.<br>• Watchdog error on reader |
| 15 | 21x | Wrong parameterization of the ASM/reader<br>• Check INPUT parameters in UDT 10<br>• Check parameters in HW Config<br>• Transmit power set too high<br>• Unused parameter bits are not 0.<br>• init_run command is parameterized incorrectly<br>• After a start-up, the ASM has still not received an init_run.<br>• Parameter scanning_time = 0x00 was set (no standard selected). |
| 16 | 22x | The FB command cannot be executed with the ASM parameters on PROFIBUS.<br>• Length of the input/output areas too small for the cyclic I/O word. Did you use the right GSD file?<br>• FB command (e.g. read) has too much user data (data length > 233 bytes) |
| 17 | 23x | Communication error between FB 45/FC 55 and MOBY-ASM. Handshake error<br>• Params_DB (UDT 10) of this ASM station is being overwritten by other parts of the program<br>• Check parameters of MOBY-ASM in UDT 10<br>• Check FB 45/FC 55 command which caused this error.<br>• Start init_run command after error correction. |
| 18 | – | An error has occurred which must be acknowledged with an init_run.<br>• A temporary short circuit has occurred on PROFIBUS.<br>• The init_run command is faulty<br>• Start init_run command after error correction.<br>• Check parameters ASM_address, ASM_channel, and MOBY_mode. |
| 19 | 25x | Previous command is active or buffer overflow.<br>The user sent a new command to the ASM although the last command was still active.<br>• Active command can only be terminated with an init_run.<br>• Before a new command can be started the READY bit must be 1 (exception: init_run).<br>• Two FB 45/FC 55 calls were parameterized with the same parameters "ASM_address" and "ASM_channel"<br>• Two FB 45/FC 55 calls are using the same Params_DB pointer<br>• Start init_run command after error correction.<br>• When command repetition (e.g. read-only MDS) is used, no data are fetched from the tag. The data buffer on the ASM has overflowed. Tag data have been lost. |

| Error code (B#16#..) | Flashing of ERR LED | Description |
|---|---|---|
| 1A | – | PROFIBUS DP error occurred.<br>• The PROFIBUS DP bus connection was interrupted<br>– Wire break on the bus<br>– Bus connector on ASM was removed briefly<br>• PROFIBUS DP master no longer addresses the ASM<br>• Execute an init_run<br>• The ASM has detected a message frame interruption on the bus. The PROFIBUS may have been reconfigured (e.g. with HW Config).<br>This error is only indicated when access monitoring has been enabled in the PROFIBUS configuration. |
| 1B | 27x | There is an inconsistency in the parameterization of the reader. In expert mode, parameters were probably set which the reader cannot use.<br>• ETSI performance testing faulty |
| 1C | 28x | • Antenna is already switched off<br>• Antenna is already switched on<br>• Mode in SET-ANT command not recognized. |
| 1D | – | More MDSes are in the transmission window than the SLG is capable of processing simultaneously.<br>• Only 1 MDS can be processed at a time with FB 45.<br>• With FB 45 and FC 55: there is more than one tag with the same EPC ID in the antenna field of the reader.<br>• With FC 55: Increase the value in multitag or decrease the number of MDSes in the field.<br>• With FC 55: A read or write command has been sent on a transponder (UID) and there are one or more transponders in the antenna field, for which the contents of the addresses FF00 – FF03 of the EPC ID do not agree (unambiguity when transponder is accessed via 8-byte long UID).<br>• Power supply of the MDS in the limit range:<br>Due to short-term power shortage, an MDS loses its communications status (session), upon which the identical EPC-ID is sent a second time as soon as the power threshold is exceeded again.<br>Increase the reader's radiated power and/or reduce the distance between antenna and MDS until this effect no longer occurs. |
| 1E | 30x | Wrong number of characters in the command message frame. |
| 1F | 31 | Running command canceled by RESET (init_run or cancel) or bus connector removed<br>• Communication with the tag was terminated by init_run.<br>• This error can only be reported on init_run or cancel |

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

# 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<br>(2) DC output 2<br>(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

**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

### 10.1.3 Ordering data

| | |
|---|---|
| Wide-range power supply unit for SIMATIC RF-systems<br>(100 - 240 V AC / 24 V DC / 3 A)<br>with 2 m connecting cable with country-specific plug | EU: 6GT2898-0AA00<br>UK: 6GT2898-0AA10<br>US: 6GT2898-0AA20 |
| 24 V connecting cable for SIMATIC°RF660R, length 5 m | 6GT2491-1HH50 |
| 24 V connecting cable for SIMATIC°RF670R, length 5 m | 6GT2891-0NH50 |

**Note**

**Risk of confusion**

Please not that you require different 24°V connecting cables for the RF660R 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.

**NOTICE**

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 V DC, 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

The SIMATIC RF670R/RF660R reader is only permitted to be operated with the wide input range power supply for SIMATIC RF systems - as an optional component – or with power supplies which 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.

## 10.1.5 Connecting

- 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.

**NOTICE**

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<br>ESD<br>HF fields<br>Burst<br>Surge<br>HF injection<br>Mains quality test | EN 61000-4-2,<br>4-3 up to 4-6, 4-11 | <br>Air discharge: 15 kV<br>10 V/m<br>symmetrical: 2<br>Symmetrical: 1<br>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 | IP 65 | |

Table 10-2 Technical specifications for the input

| | | |
|---|---|---|
| Rated input voltage $U_{in}$ | EN 60950 / UL 60950 | 100 to 240 V AC<br>120 to 353 V DC |
| Input voltage range $U_{in}$ | | 94 to 264 V AC<br>120 to 375 V DC<br>(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 $\Delta U_{out}$ | $U_{in}$ = 230 $V_{AC}$ | $U_{out\ nom}$ ≤ +2 %/-1 % |
| Overvoltage protection | | $U_{out\ nom}$ +20 % typ. |
| Noise $\Delta U_{LF}$ | $U_{in}$ = min., BW: 1 MHz | ≤ 1 % $U_{out}$ |
| Noise $\Delta U_{HF}$ | $U_{in}$ = min., BW: 20 MHz | ≤ 2 % $U_{out}$ |

| | | |
|---|---|---|
| Line Regulation<br>Load Regulation | $U_{in}$ = min./max.<br>$I_{out}$ = 10...90...10 % | ≤ 1,0 %<br>≤ 1,0 % |
| Short-circuit current $I_{max}$ | $I_{nom}$ = 4 A (+50°C) | 105 up to 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/<br>No-load response | | Continuous/no-load stability |
| Derating | $T_A$ > +50 °C to +70 °C | max. 2 %/K |
| Connector type | Flanged connector<br>Binder,<br>Order No.: 09-3431-90-04 | 4 pins |

Table 10-4 Output configurations

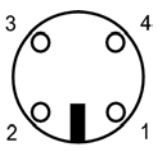
| Input | Outputs<br>U1 = U2 | ILoad =<br>I1 + I2 | Efficiency<br>(%) | Remarks |
|---|---|---|---|---|
| 110 V AC | 24 V DC | 0 A | | No-load stability |
| 110 V AC | 24 V DC | 3 A | ≥ 88 | |
| 220 V AC | 24 V DC | 0 A | | No-load stability |
| 220 V AC | 24 V DC | 3 A | ≥ 90 | |

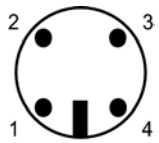
Table 10-5 Compliance with standards

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

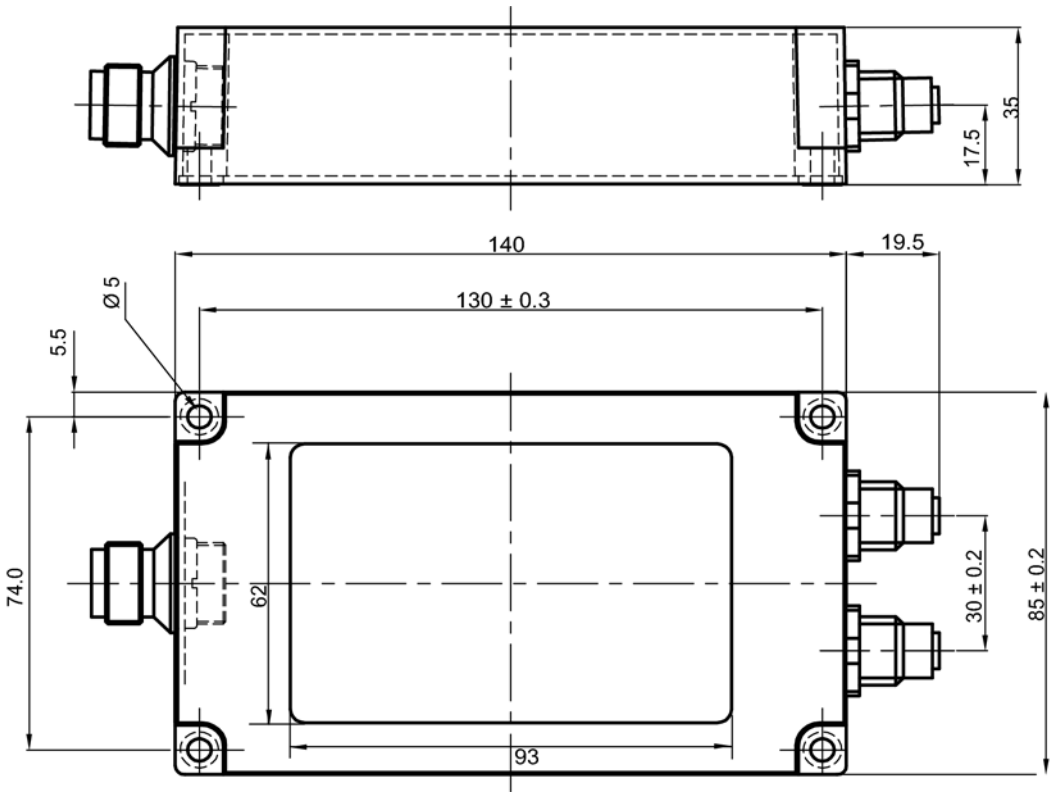
All values are measured at full-load and at an ambient temperature of 25 °C (unless specified otherwise).

## 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. |

## 10.1.8 Dimension drawing




Units of measurement:

All dimensions in mm

## 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<br>2004/108/EC EMC<br>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.<br>It meets the following safety standards:<br>UL 60950-1 - Information Technology Equipment Safety - Part 1: General Requirements<br>CSA C22.2 No. 60950 -1 - Safety of Information Technology Equipment<br>UL Report E 205089 |

# 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<br>Federal Communications Commission | FCC Title 47, Part 15.sections 15.247<br>Radio Frequency Interference Statement<br>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.<br>It meets the following safety standard(s):<br>UL 60950-1 - Information Technology Equipment Safety - Part 1: General Requirements<br>CSA C22.2 No. 60950 -1 - Safety of Information Technology Equipment<br>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<br>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 National regulations

## A.2.1 Exceptions for certain regions in France

The following table defines the permitted frequency bands for the ETSI profile which must be utilized for special regions in France. The *italic* entries show the permitted frequency bands for transmitting in the EPC Class 1 Gen 2 multi-channel dense interrogator environment. The EPC Class 1 Gen 2 single-channel regulatory environment can use all frequency bands.

| Channel ID | Frequency (MHz) | Maximum transmit power (W) |
|---|---|---|
| 100 | 865.1 | 0.1 |
| 101 | 865.3 | 0.1 |
| 102 | 865.5 | 0.1 |
| 103 | 865.7 | 0.5 |
| *104* | *865.9* | 0.5 |
| 105 | 866.1 | 0.5 |
| *106* | *866.3* | 0.5 |
| 107 | 866.5 | 0.5 |
| *108* | *866.7* | 0.5 |
| 109 | 866.9 | 0.5 |
| *110* | *867.1* | 0.5 |
| 111 | 867.3 | 0.5 |
| *112* | *867.5* | 0.5 |
| 113 | 867.7 | 0.5 |
| 114 | 867.9 | 0.5 |

Due to a European Commission decision as of 16th May 2007 granting France the derogation to further limit the emission powers for the use of the frequency band 865.6-867.6 MHz for the radio frequency identification devices (RFID) operating within certain zones on the territory of France, the operation of the RF600 system is limited to operate within the power levels indicated above, when it is inside the following regions:

| | Geographic coordinates | Region/Department | Radius of the region with max. power of 500 mW ERP |
|---|---|---|---|
| AVON LES ROCHES (camp Le Ruchard) | 47° 12' 04" N-000° 28' 48" E | 37 - Indre-et-Loire | 20 km |
| BEIGNON (camp de COETQUIDAN) | 47° 56' 56" N-002° 09' 26" W | 56 - Morbihan | 15 km |
| BITCHE | 49° 03' 09" N-007° 28' 43" E | 57 - Moselle | 20 km (only in French territory) |
| CAYLUS | 44° 16' 42" N-001° 44' 57" E | 82 - Tarn-et-Garonne | 20 km |
| LA CAVALERIE (camp du LARZAC) | 44° 00' 40" N-003° 10' 16" E | 12 - Aveyron | 10 km |
| LA COURTINE | 45° 42' 40" N-002° 15' 18" E | 23 - Creuse | 20 km |
| MAILLY LE CAMP | 48° 39' 55" N-004° 13' 04" E | 10 - Aube | 20 km |
| MONTFERRAT (camp de CANJUERS) | 43° 38' 47" N-006° 28' 05" E | 83 - Var | 10 km |
| MOURMELON | 49° 07' 30" N-004° 21' 59" E | 51 - Marne | 15 km |
| SISSONNE | 49° 34' 08" N-003° 54' 57" E | 02 - Aisne | 20 km |
| SUIPPES | 49° 07' 37" N-004° 33' 05" E | 51 - Marne | 20 km |
| VALDAHON LYAUTEY | 47° 09' 24" N-006° 19' 25" E | 25 - Doubs | 20 km |

## A.3 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
  E-mail (mailto:support.automation@siemens.com)
- Internet: Online support request form: (www.siemens.com/automation/support-request)

### Contact partner

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 (www.siemens.com/automation/partner)
- In Catalog CA 01
- In Catalog FS 10 specially for factory automation sensors

### Service & support for industrial automation and drive technologies

You can find various services on the Support homepage (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".

### RFID homepage

For general information about our identification systems, visit RFID homepage (www.siemens.com/simatic-sensors/rf).

### Technical documentation on the Internet

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

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

### Online catalog and ordering system

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

### 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)

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# Index

## S



## T



## U



## V



## W

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