

SIMATIC Sensors

RFID systems

SIMATIC RF640T



II 2 G Ex ib IIC T6 bis T3






II 2 D Ex ibD 21 T140°C

Operating Instructions

Safety Guidelines

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

 DANGER
indicates that death or severe personal injury will result if proper precautions are not taken.
 WARNING
indicates that death or severe personal injury may result if proper precautions are not taken.
 CAUTION
with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.
CAUTION
without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.
NOTICE
indicates that an unintended result or situation can occur if the corresponding information is not taken into account.


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

Qualified Personnel

The device/system may only be set up and used in conjunction with this documentation. Commissioning and operation of a device/system may only be performed by **qualified personnel**. Within the context of the safety notes in this documentation qualified persons are defined as persons who are authorized to commission, ground and label devices, systems and circuits in accordance with established safety practices and standards.

Prescribed Usage

Note the following:

 WARNING
This device may only be used for the applications described in the catalog or the technical description and only in connection with devices or components from other manufacturers which have been approved or recommended by Siemens. Correct, reliable operation of the product requires proper transport, storage, positioning and assembly as well as careful operation and maintenance.

Trademarks

All names identified by ® are registered trademarks of the Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

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

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SIMATIC RF640T Operating Instructions


1.1 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: <ul style="list-style-type: none"> • RF660R readers and • RF660A antennas 	
	Installation	Suitable for direct mounting on conductive materials (preferably metal)	

1.2 Ordering data

Ordering data	Order no.
<p>SIMATIC RF640T (Europe)</p> <ul style="list-style-type: none"> • For attaching to metal surfaces • Frequency 865 MHz to 868 MHz, • 216-byte user memory • -25 °C to +85 °C operating temperature • Dimensions 50 mm x 8 mm (DxH) • IP 68 / IP x9K degree of protection • ATEX 	<p>6GT2810-0DC00</p>
<p>SIMATIC RF640T (USA / Canada)</p> <ul style="list-style-type: none"> • For attaching to metal surfaces • Frequency 915 MHz • 216-byte user memory • -25 °C to +85 °C operating temperature • Dimensions 50 mm x 8 mm (DxH) • IP 68 / IP x9K degree of protection 	<p>6GT2810-0DC10</p>

1.3 Planning the use

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

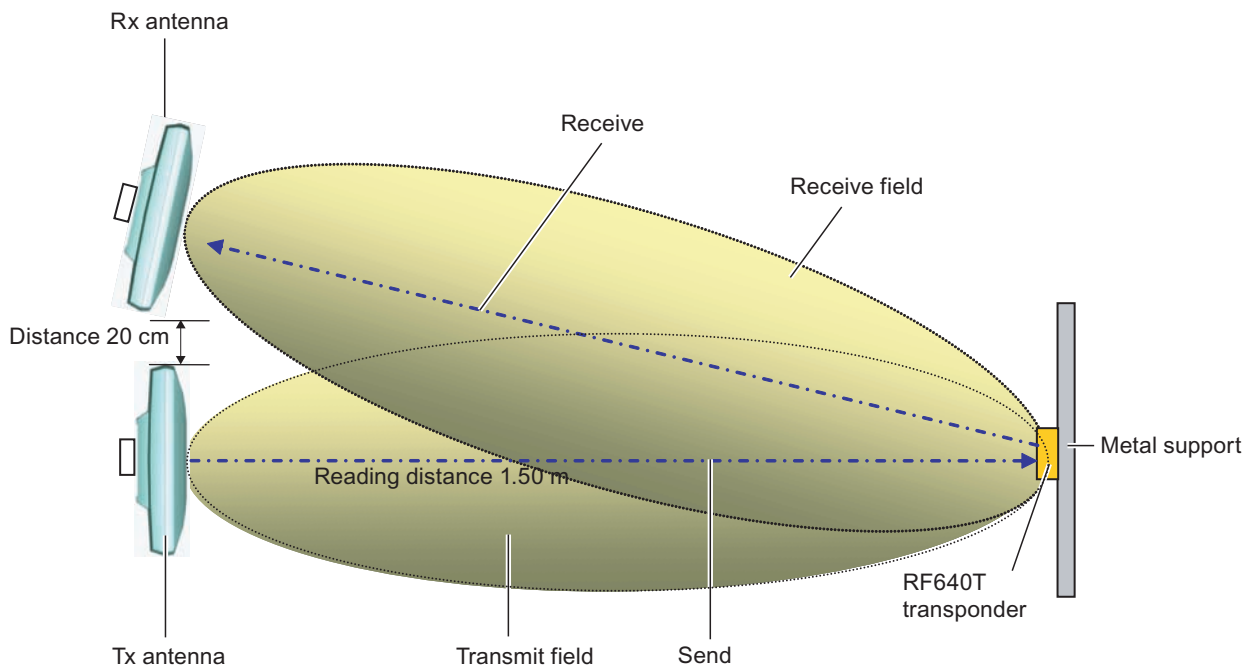


Figure 1-1 Example of optimum antenna/transponder positioning

1.3.2 Reading range 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.

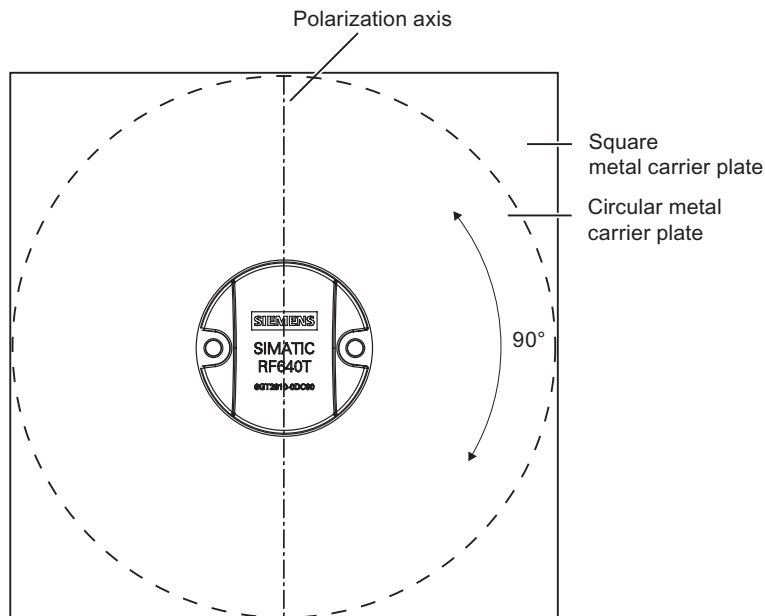


Figure 1-2 Optimum positioning of the transponder on a (square or circular) metal plate

Table 1-1 Reading range on flat metallic carrier plates

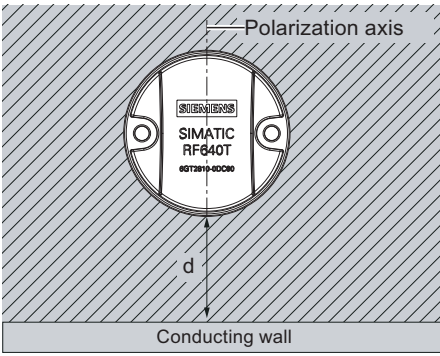
Carrier plate material	Reading range
Metal plate of at least Ø 150 mm	100 %
Metal plate Ø 120 mm	Approx. 80 %
Metal plate Ø 85 mm	Approx. 55 %
Metal plate Ø 65 mm	Approx. 40 %

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.

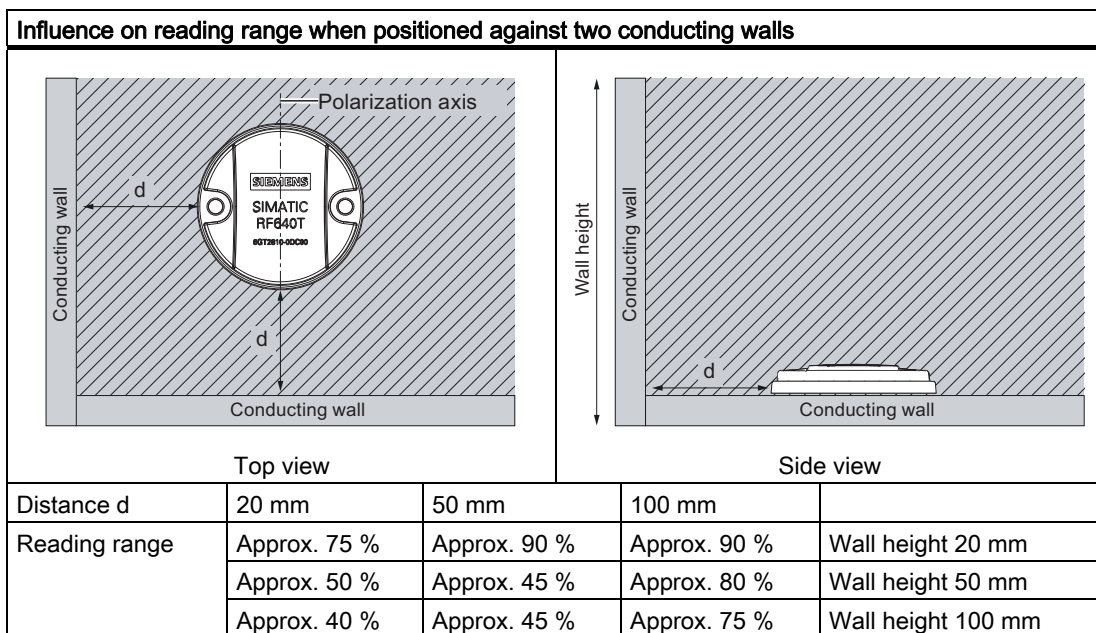
1.3.3 Influence of conducting walls on the reading range

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				
 <p style="text-align: center;">Top view</p>				
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



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

1.3.4 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

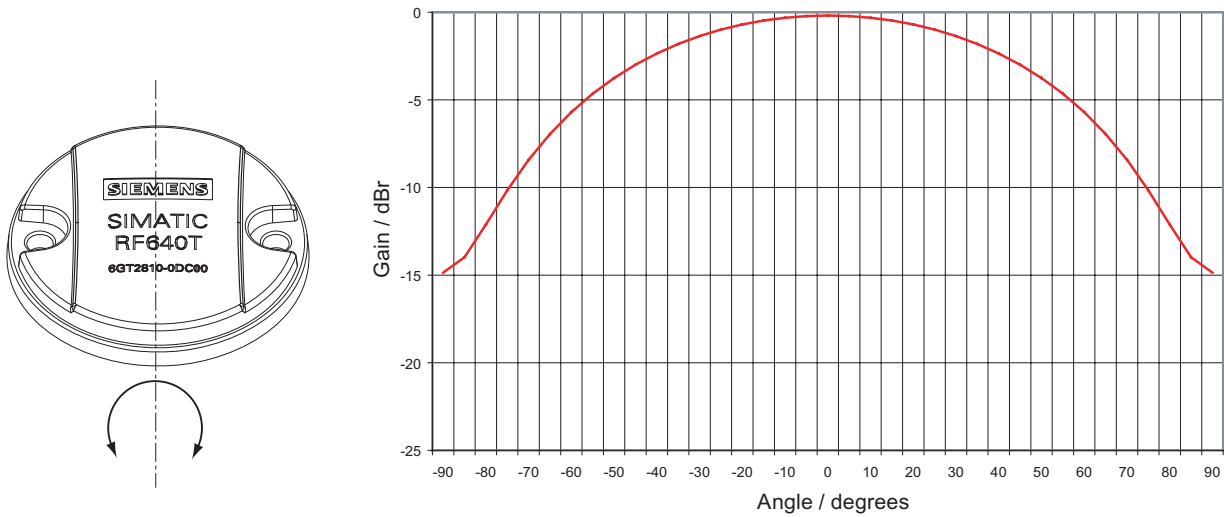


Figure 1-3 Transponder characteristics when rotated about the polarization axis

Rotation orthogonal to the polarization axis

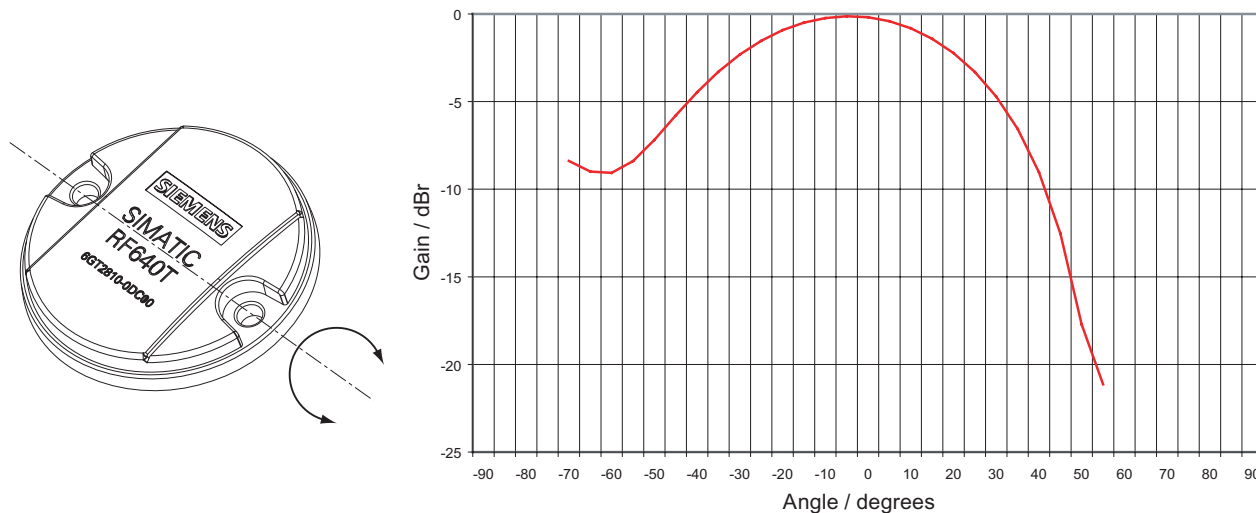


Figure 1-4 Transponder characteristics when rotated orthogonally to the polarization axis (within the tag plane)

1.3.5 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 1-2 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.

1.3.6 Use of the transponder in hazardous areas

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

The essential health and safety requirements are satisfied in accordance with standards EN 60079-0:2004, EN 50020:2002, 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

1.3.7 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.

1.3.8 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.

1.4 Mounting instructions

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

1.5 Technical Specifications

1.5.1 Mechanical data

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

1.5.2 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 Mounting on metal ²⁾	at least 1.5 m typically 2.0 m	at least 1.5 m typically 2.0 m
Writing range Mounting on metal ²⁾	at least 1.2 m typically 1.5 m	at least 1.2 m 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 \geq 50 mm ³⁾	Yes, minimum distance between data carriers \geq 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 on flat metallic carrier plates (Page 8)

Directional radiation pattern of the transponder (Page 11)

1.5.3 Memory specifications

Property	Description	
Type	256 byte EEPROM	
Data retention time	10 years	
Read cycles	Unlimited	
Write cycles	Minimum at +22 °C 100 000 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

1.5.4 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 also Use of the transponder in hazardous areas for gases (Page 14) ²⁾
Temperature range when operating in areas at risk of dust explosions with T140 °C	See also Use of the transponder in hazardous areas for dusts (Page 15) ²⁾
Temperature range during storage	-40 °C ... 125 °C ¹⁾
Shock Vibration compliant with EN 60721-3-7 Class 7 M3	100 g, ³⁾ 20 g, ³⁾
Torsion and bending load	Not permissible
Degree of protection	IP 68 according to EN 60529: (45 minutes. immersion in water; water depth 1 m from top edge of housing at +20 °C)
	IP x9K according to EN 60529: <ul style="list-style-type: none"> • Steam blaster nozzle distance 150 mm • 10 to 15 l of water per minute • Pressure 100 bar • Temperature 75 °C • Test time 30 seconds
MTBF	1,54 x 10 ⁷ h

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.

1.5.5 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	oo	-
Ammonia gas		oooo	oooo
Ammonia, w.	conc.	oooo	oooo
	10	oooo	oooo
Benzol		oooo	ooo
Bleach solution (12.5 % effective chlorine)		oo	-
Butane, gas, liquid		oooo	oooo
Butyl acetate (acetic acid butyl ester)		oooo	oooo
Calcium chloride, w.		oooo	ooo
Calcium nitrate, w.	k. g.	oooo	ooo
Chlorine		-	-
Chrome baths, tech.		-	-
Iron salts, w.	k. g.	oooo	oooo
Acetic acid, w.	50	-	-
Ethyl alcohol, w., undenaturated	96	oooo	ooo
	50	oooo	oooo
Formaldehyde, w.	30	ooo	-
	10	oooo	ooo
Formalin		ooo	-
Glycerine		oooo	oooo
Isopropanol		oooo	ooo
Potassium hydroxide, w.	50	oooo	oooo
Lysol		oo	-
Magnesium salts, w.	k. g.	oooo	oooo
Methyl alcohol, w.	50	oooo	oooo
Lactic acid, w.	50	oo	-
	10	ooo	oo
Sodium carbonate, w. (soda)	k. g.	oooo	oooo
Sodium chloride, w.	k. g.	oooo	oooo
Sodium hydroxide		oooo	oooo
Nickel salts, w.	k. g.	oooo	oooo
Nitrobenzol		ooo	oo
Phosphoric acid	10	o	V
Propane		oooo	oooo
Mercury		oooo	oooo
Nitric acid	10	o	-
Hydrochloric acid	10	o	-

	Concentration	20 °C	60 °C
Sulphur dioxide	Low	oooo	oooo
Sulphuric acid	25	oo	-
	10	ooo	-
Hydrogen sulphide	Low	oooo	oooo
Carbon tetrachloride		oooo	oooo
Toluene		oooo	ooo
Detergent	High	oooo	oooo
Plasticizer		oooo	oooo

Abbreviations	
oooo	Resistant
ooo	Virtually resistant
oo	Limited resistance
o	Less resistant
-	Not resistant
w.	Aqueous solution
k. g.	Cold saturated

1.6 Certificates and approvals

Table 1-3 6GT2810-0DC00 - RF640T UHF Tool Tag - Europe



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

Table 1-4 6GT2810-0DC10 - RF640T UHF Tool Tag - USA / Canada

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

1.6.1 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.

1.7 Dimension drawing

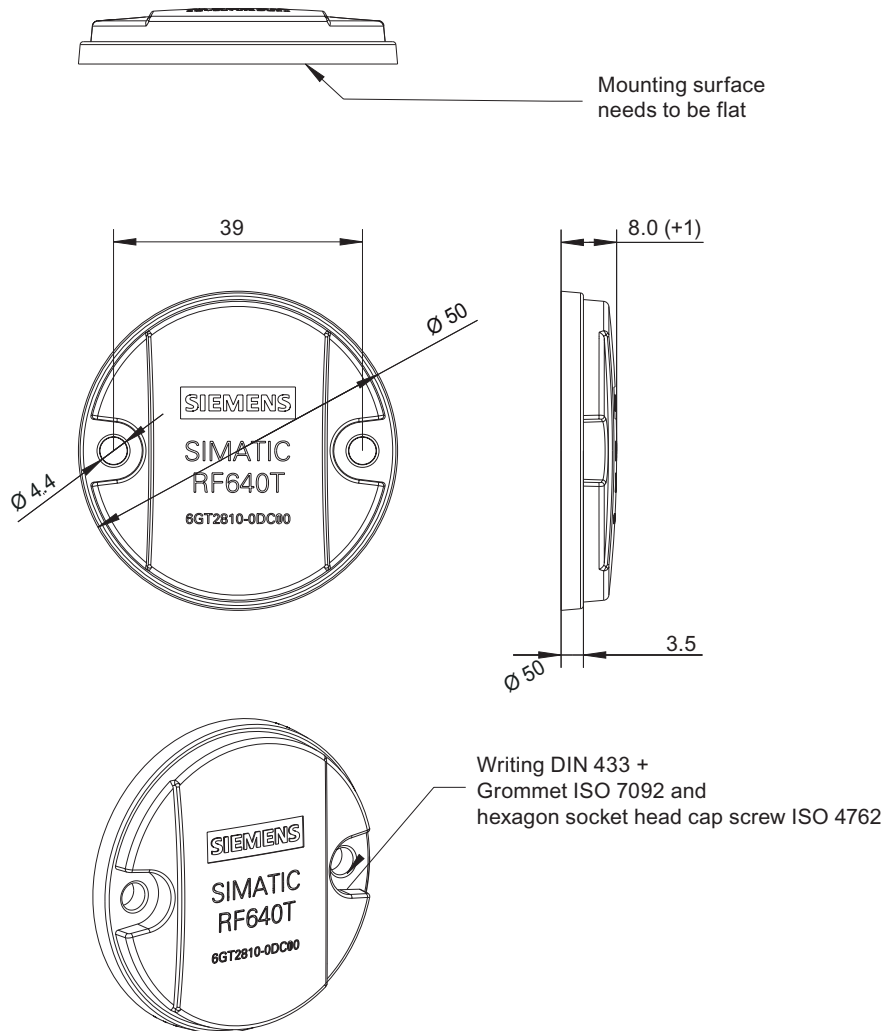


Figure 1-5 SIMATIC RF640T UHF Tool Tag Version 1

Units of measurement: All dimensions in mm