Substance	Test conditions		Evaluation
	Concentration [%]	Temperature [°C]	
n(n)	-	20 °C	++++
	-	60 °C	+++
Calcium chloride, w.	-	20 °C	++++
	-	60 °C	+++
Calcium nitrate, w.	c. s.	20 °C	++++
	c. s.	60 °C	+++
Chlorine	-	20 °C	
Chrome baths, tech.	-	20 °C	
Iron salts, w.	c. s.	60 °C	++++
Acetic acid, w.	50 %	20 °C	
Ethyl alcohol, w., undenaturated	95 %	20 °C	++++
	95 %	60 °C	+++
	50 %	60 °C	++++
Formaldehyde, w.	30 %	20 °C	+++
	10 %	20 °C	++++
	10 %	60 °C	+++
FORMALIN	-	20 °C	+++
Glycerine	-	60 °C	++++
Isopropanol	-	20 °C	++++
	-	60 °C	+++
Potassium hydroxide, w.	50 %	60 °C	++++
LYSOL	-	20 °C	++
Magnesium salts, w.	c. s.	60 °C	++++
Methyl alcohol, w.	50 %	60 °C	++++
Lactic acid, w.	50 %	20 °C	++
	10 %	20 °C	+++
	10 %	60 °C	++
Sodium carbonate, w. (soda)	c. s.	60 °C	++++
Sodium chloride, w.	c. s.	60 °C	++++
Sodium hydroxide	-	60 °C	++++
Nickel salts, w.	c. s.	60 °C	++++
Nitrobenzene	-	20 °C	+++
	-	60 °C	++
Phosphoric acid	10 %	20 °C	+
Propane	-	60 °C	++++
Mercury	-	60 °C	++++
Nitric acid	10 %	20 °C	+
Hydrochloric acid	10 %	20 °C	+
Sulfur dioxide	low	60 °C	++++
Sulfuric acid	25 %	20 °C	++
	10 %	20 °C	+++

Substance	Test conditions		Evaluation
	Concentration [%]	Temperature [°C]	
Hydrogen sulfide	low	60 °C	++++
Carbon tetrachloride	-	60 °C	++++
Toluene	-	20 °C	++++
	-	60 °C	+++
Detergent	high	60 °C	++++
Plasticizer	-	60 °C	++++

Explanation of the rating	
++++	Resistant
+++	Practically resistant
++	Conditionally resistant
+	Less resistant
	Not resistant
w.	Water solution
c. s.	Cold saturated

4.8.2.4 Polyamide 6.6 (PA 6.6)

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

Table 4- 15 Resistance to chemicals - PA 6.6

Substance	Test conditions		Evaluation
	Concentration [%]	Temperature [°C]	
Acetone	-	-	++++
Alcohols	-	-	++++
Gasoline	-	-	++++
Aliphatic hydrocarbons	-	-	++++
Aromatic hydrocarbons	-	-	++++
Weak alkaline solutions	-	-	++
Strong alkaline solutions	-	-	
Weak mineral acids	-	-	+++
Strong mineral acids	-	-	
Perchloroethylene	-	-	++++
Mineral lubricants	-	-	++++
Oxidizing acids	-	-	
Weak organic acids	-	-	++
Strong organic acids	-	-	

Substance	Test conditions		Evaluation
	Concentration [%]	Temperature [°C]	
Trichloroethylene	-	-	++++
Hot water (hydrolysis resistance)	-	-	++

Explanation of the rating	
++++	Resistant
+++	Practically resistant
++	Conditionally resistant
+	Less resistant
	Not resistant

4.8.2.5 Polyamide 6.6 GF (PA 6.6 GF)

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

Table 4- 16 Resistance to chemicals - PA 6.6 GF

Substance	Test conditions		Evaluation
	Concentration [%]	Temperature [°C]	
Ammonia, w.	conc.	60 °C	++++
	20 %	60 °C	++++
Benzene	-	60 °C	++++
Bleach solution (12.5 % effective chlorine)	-	60 °C	
Butane, gas, liquid	-	20 °C	++++ 1)
Butyl acetate (acetic acid butyl ester)	-	20 °C	++++ 1)
Calcium chloride, saturated 10 % solution	-	20 °C	++++
	-	60 °C	++
Chlorine	-	20 °C	
Chrome baths, tech.	-	20 °C	
Iron salts, w.	c. s.	20 °C	
Acetic acid, w.	10 %	20 °C	++
	10 %	60 °C	
Ethyl alcohol, w., undenaturated	40 %	20 °C	++++
Formaldehyde	30 %	20 °C	++++
FORMALIN	-	20 °C	++++
Glycerine	-	20 °C	++++
Isopropanol	-	60 °C	++++
Potassium hydroxide, w.	10 ... 15 %	20 °C	++

Substance	Test conditions		Evaluation
	Concentration [%]	Temperature [°C]	
Magnesium salts, w.	-	20 °C	++++ 1)
Methyl alcohol, w.	50 %	20 °C	++++
Lactic acid, w.	-	20 °C	++++
	-	60 °C	
Sodium carbonate, w. (soda)	-	20 °C	++++
Sodium chloride, w.	-	20 °C	++
Sodium hydroxide	10	20 °C	++++
Nitrobenzene	-	20 °C	++ 1)
Phosphoric acid	10 %	20 °C	
Propane	-	20 °C	++++
Nitric acid	10 %	20 °C	
Hydrochloric acid	10 %	20 °C	
Sulfur dioxide	low	20 °C	++
Sulfuric acid	25 %	20 °C	
	10 %	20 °C	
Hydrogen sulfide	dry	20 °C	++++
	dry	60 °C	
Carbon tetrachloride	1 ... 4	20 °C	++++

1) Nothing specified for stainless steel

Explanation of the rating	
++++	Resistant
+++	Practically resistant
++	Conditionally resistant
+	Less resistant
	Not resistant
conc.	Concentrated solution
w.	Water solution
c. s.	Cold saturated

4.8.2.6 Polyethylene terephthalate (PET)

The following table provides an overview of the chemical resistance of the transponder made of polyethylene terephthalate.

Table 4- 17 Chemical resistance - polyethylene terephthalate

Substance	Test conditions		Evaluation
	Concentration [%]	Temperature [°C]	
Acetone	100 %	20 °C	++++
	60 %	60 °C	
Formic acid	10 %	20 °C	++++
	10 %	60 °C	
	95 %	20 °C	+
Ammonium hydroxide	10 %	20 °C	
Gasoline (normal)	-	60 °C	++++
Gasoline (super)	-	60 °C	++++
Benzene	100 %	20 °C	++++
Chlorobenzene	100 %	20 °C	++++
Chloroform	10 %	20 °C	
Citric acid	100 %	20 °C	++++
Cyclohexane	100 %	20 °C	++++
Diethyl ether	100 %	20 °C	++++
Dimethyl formamide	100 %	20 °C	++++
Dioxane	100 %	20 °C	++++
	100 %	60 °C	
Acetic acid	conc.	20 °C	++++
	conc.	60 °C	++
	conc.	80 °C	
	10 %	20 °C	++++
Ethanol	96 %	20 °C	++++
Hydrofluoric acid	50 %	20 °C	
	5 %	20 °C	++++
Formaldehyde	30 %	20 °C	++++
Freon 11	-	20 °C	++++
Fruit juices	-	20 °C	++++
Glycerine	-	60 °C	++++
Heptane	100 %	20 °C	++++
Potassium dichromate	10 %	20 °C	++++
Potassium permanganate	10 %	20 °C	++++
Copper sulfate	10 %	20 °C	++++
Methanol	100 %	20 °C	++++
Methyl ethyl ketone	100 %	20 °C	++++
Milk	-	20 °C	++++

Substance	Test conditions		Evaluation
	Concentration [%]	Temperature [°C]	
Lactic acid	10 %	20 °C	++++
Sodium chloride	10 %	80 °C	++++
Antichlor	10 %	20 °C	++++
Paraffin oil	-	60 °C	++++
Perchloroethylene	100 %	20 °C	++++
Petroleum	-	80 °C	++++
Phenol	30 %	20 °C	++
Propanol	diluted	20 °C	++++
Nitric acid	40 %	20 °C	
	36 %	20 °C	
Hydrochloric acid	100 %	20 °C	++++
Carbon disulfide	98 %	20 °C	++++
Sulfuric acid	30 %	20 °C	
	5 %	60 °C	++++
	diluted	80 °C	++++
Hydrogen sulfide	10 %	20 °C	++++
Silicon oil	-	80 °C	++++
Edible fat	-	80 °C	++++
Cooking oil	100 %	80 °C	++++
Carbon tetrachloride	100 %	23	++++
Toluene	-	20 °C	++++
Water	-	20 °C	++++
Hydrogen peroxide	5 %	20 °C	++++
	5 %	20 °C	++++
Xylene	10 %	20 °C	++++
Zinc chloride	-	20 °C	++++

Explanation of the rating	
++++	Resistant
+++	Practically resistant
++	Conditionally resistant
+	Less resistant
	Not resistant
conc.	Concentrated solution

4.8.2.7 Polypropylene (PP)

The following table provides an overview of the chemical resistance of the transponder made of polyethylene terephthalate.

Table 4- 18 Chemical resistance - polypropylene

Substance	Test conditions		Evaluation
	Concentration [%]	Temperature [°C]	
Emissions alkaline/containing hydrogen fluoride /carbon dioxide	low	50 °C	++++
Emissions containing hydrochloric acid	-	50 °C	++++
Emissions containing sulfuric acid	-	20 °C	++++
	-	50 °C	
Battery acid	38 %	50 °C	++++
Aluminum acetate, w.	-	50 °C	++++
Aluminum chloride	10 %	50 °C	++++
Aluminum nitrate, w.	-	50 °C	++++
Aluminum salts	-	50 °C	++++
Formic acid	50 %	20 °C	++++
	50 %	50 °C	
Aminoacetic acid (glycocoll, glycine)	10 %	50 °C	++++
Ammonia, gaseous	-	50 °C	++++
Ammonia	25 %	50 °C	++++
Ammonia, w.	conc.	50 °C	++++
	10 %	50 °C	++++
Arsenic acid, w.	-	50 °C	++++
Ascorbic acid, w.	-	50 °C	++++
Gasoline	-	20 °C	
Benzene	-	20 °C	
Prussic acid, w.	-	50 °C	++++
Sodium hypochlorite solution	diluted / 20 %	20 °C	++++
	diluted / 20 %	50 °C	++
	50 %	50 °C	++
Borax	-	50 °C	++++
Boric acid, w.	10 %	50 °C	++++
Brake fluid	-	50 °C	++++
Bromine	-	20 °C	
Butane, gas, liquid	technically clean	50 °C	++++
Butyl acetate (acetic acid butyl ester)	-	20 °C	++
	-	50 °C	

Substance	Test conditions		Evaluation
	Concentration [%]	Temperature [°C]	
Calcium chloride, w./ alcoholic	-	20 °C	++++
	-	50 °C	+++
Calcium chloride,	-	50 °C	++++
Calcium nitrate, w.	-	50 °C	++++
	50 %	50 °C	++++
Chlorine	-	20 °C	
Chloroacetic acid	-	50 °C	++++
Chloric acid	20 %	20 °C	++++
	20 %	50 °C	
Chrome baths, tech.	-	20 °C	
Chromium salts	-	50 °C	++++
Chromic acid	10 %	50 °C	++++
	20 / 50	50 °C	++
Chromosulfuric acid	conc.	20 °C	
Citric acid	10 %	50 °C	++++
Diesel fuel	-	20 °C	++++
Diesel oil	100 %	20 °C	++++
Diglycole acid	30 %	50 °C	++++
Iron salts, w.	c. s.	50 °C	++++
Vinegar	-	50 °C	++++
Acetic acid	5 / 50	50 °C	++++
Ethanol	50 / 96	50 °C	++++
Ethyl alcohol	96 / 40	50 °C	++++
Fluoride	-	50 °C	++++
Formaldehyde	10 %	50 °C	++++
	40 %	50 °C	+++
Formaldehyde solution	30 %	50 °C	++++
Glycerine	any	50 °C	++++
Glycol	-	50 °C	++++
Uric acid	-	20 °C	++++
HD oil, motor oil, without aromatic compounds	-	20 °C	++++
Heating oil	-	20 °C	++++
Isopropanol	technically clean	50 °C	++++
Potassium hydroxide, w.	-	50 °C	++++
Potassium hydroxide	10 / 50	50 °C	++++
Silicic acid	any	50 °C	++++
Common salt	-	50 °C	++++
Carbonic acid	saturated	50 °C	++++
LYSOL	-	50 °C	++
Magnesium salts, w.	c. s.	50 °C	++++

Substance	Test conditions		Evaluation
	Concentration [%]	Temperature [°C]	
Magnesium salts	any	50 °C	++++
Machine oil	100 %	20 °C	++++
Sea water	-	50 °C	++++
Methanol	-	50 °C	++++
Methyl alcohol, w.	50 %	50 °C	++++
Lactic acid, w.	-	50 °C	++++
Lactic acid	3 / 85	20 °C	++++
	3 / 85	50 °C	+++
	80 %	50 °C	++++
Engine oil	-	20 °C	++++
Sodium carbonate, w. (soda)	c. s.	50 °C	++++
Sodium carbonate	-	50 °C	++++
Sodium chloride, w.	c. s.	50 °C	++++
Sodium hydroxide, w.	-	50 °C	++++
Sodium hydroxide solution, w.	-	50 °C	++++
Sodium hydroxide solution	30 / 45 / 60	50 °C	++++
Nickel salts, w.	c. s.	50 °C	++++
Nickel salts	saturated	50 °C	++++
Nitrobenzene	-	20 °C	+++
	-	50 °C	++
Oxalic acid	-	50 °C	++++
Petroleum	technically clean	20 °C	++++
Phosphoric acid	1 ... 5 / 30	50 °C	++++
	85 %	50 °C	+++
Phosphoric acid, w	20 %	50 °C	++++
Propane	liquid	20 °C	++++
Propane	gaseous	20 °C	++
Mercury	pure	50 °C	++++
Crude oil	100 %	-	++
Ammonium chloride	100 %	50 °C	++++
Ammonium chloride, w.	-	50 °C	++++
Nitric acid	-	20 °C	
	50 %	20 °C	++
	1 ... 10 %	50 °C	++++
Hydrochloric acid	1 ... 5 / 20	50 °C	++++
	35 %	20 °C	++++
	35 %	50 °C	+++
	conc.	50 °C	++++

Substance	Test conditions		Evaluation
	Concentration [%]	Temperature [°C]	
Sulfur dioxide	low	50 °C	++++
	moist	20 °C	++++
	moist	50 °C	++
	liquid	50 °C	
Sulfuric acid	1 ... 6 / 40 / 80	50 °C	++++
	20 %	20 °C	++++
	20 %	50 °C	+++
	60 %	20 °C	++++
	60 %	50 °C	++
	95 %	20 °C	++
	95 %	50 °C	
	fuming	20 °C	
Hydrogen sulfide	low / saturated	50 °C	++++
Detergent	high	50 °C	++++
Water	-	50 °C	++++
Hydrogen	technically clean	50 °C	++++
Plasticizer	-	20 °C	++++
	-	50 °C	++

Explanation of the rating	
++++	Resistant
+++	Practically resistant
++	Conditionally resistant
+	Less resistant
	Not resistant
conc.	Concentrated solution
w.	Water solution
c. s.	Cold saturated

4.8.2.8 Polyphenylene sulfide (PPS)

The following table provides an overview of the chemical resistance of the transponder made of polyphenylene sulfide (PPS). The transponder has special chemical resistance to solutions up to a temperature of 200 °C. A reduction in the mechanical properties has been observed in aqueous solutions of hydrochloric acid (HCl) and nitric acid (HNO3) at 80 °C. The plastic housings are resistant to all types of fuel including methanol.

Table 4- 19 Chemical resistance - polyphenylene sulfide (PPS)

Substance	Test conditions		Evaluation
	Concentration [%]	Temperature [°C]	
Acetone	-	55 °C	++++
n-butanol (butyl alcohol)	-	80 °C	++++
Butanone-2 (methyl ethyl ketone)	-	60 °C	++++
n-butyl acetate	-	80 °C	++++
Brake fluid	-	80 °C	++++
Calcium chloride (saturated)	-	80 °C	++++
Diesel fuel	-	80 °C	++++
Diethyl ether	-	23 °C	++++
Frigene 113	-	23 °C	++++
Anti-freeze	-	120 °C	++++
Kerosene	-	60 °C	++++
Methanol	-	60 °C	++++
Engine oil	-	80 °C	++++
Sodium chloride (saturated)	-	80 °C	++++
Sodium hydroxide	30 %	80 °C	++++
Sodium hypochlorite (30 or 180 days)	5 %	80 °C	++
	5 %	80 °C	-
Sodium hydroxide solution	30 %	90 °C	++++
Nitric acid	10 %	23 °C	++++
Hydrochloric acid	10 %	80 °C	-
Sulfuric acid	10 %	23 °C	++++
	10 %	80 °C	++
	30 %	23 °C	++++
Tested fuels	-	80 °C	++++
FAM testing fluid acc. to DIN 51 604-A Toluene	-	80 °C	++
1, 1, 1-Trichloroethane Xylene	-	80 °C	++++
Zinc chloride (saturated)	-	80 °C	++
	-	75 °C	++++

Explanation of the rating	
++++	Resistant
+++	Practically resistant
++	Conditionally resistant
+	Less resistant
	Not resistant

4.8.2.9 Polyvinyl chloride (PVC)

The following table provides an overview of the chemical resistance of the transponder made of polyvinyl chloride (PVC).

Table 4- 20 Chemical resistance - polyvinyl chloride (PVC)

Substance	Test conditions		Evaluation
	Concentration [%]	Temperature [°C]	
Salt water	5 %	-	++++
Sugared water	10 %	-	++++
Acetic acid, w.	5 %	-	++++
Sodium carbonate, w.	5 %	-	++++
Ethyl alcohol, w.	60 %	-	++++
Ethylene glycol	50 %	-	++++
Fuel B (acc. to ISO 1817)	-	-	++++
Human sweat	-	-	++++

Explanation of the rating	
++++	Resistant
++++	Practically resistant
++	Conditionally resistant
+	Less resistant
	Not resistant
w.	Water solution

4.9 Regulations applicable to frequency bands

Overview of the frequency bands

The frequency ranges are standardized by EPCglobal Inc. Since these are changed regularly, we recommend that you check the current country-specific frequency bands and approvals directly on the Internet page of EPCglobal®.

You will find the current country-specific frequency bands and approvals on the following Internet page:

EPCglobal (http://www.gs1.org/docs/epcglobal/UHF_Regulations.pdf)

You will find a list of all the country-specific approvals for SIMATIC RFID systems on the following Internet page:

Wireless approvals of SIMATIC RFID systems (http://www.siemens.com/rfid-approvals)

4.10 Guidelines for electromagnetic compatibility (EMC)

4.10.1 Overview

These EMC directives answer the following questions:

- Why are EMC directives necessary?
- What types of external interference have an impact on the system?
- How can interference be prevented?
- How can interference be eliminated?
- Examples of interference-free plant design

The description is aimed at "qualified personnel":

- Configuration engineers and planners who plan system configurations with RFID modules and have to observe the necessary guidelines.
- Installation and service engineers who install the connecting cables in accordance with this description or who rectify defects in this area in the event of interference.

Note

Observe the EMC directives

Failure to observe the specifically emphasized notes can result in dangerous conditions in the plant or the destruction of individual components or the entire plant.

4.10.2 What does EMC mean?

The increasing use of electrical and electronic devices is accompanied by:

- Higher component density
- More switched power electronics
- Increasing switching rates
- Lower power consumption of components due to steeper switching edges

The higher the degree of automation, the greater the risk of interaction between devices.

Electromagnetic compatibility (EMC) is the ability of an electrical or electronic device to operate satisfactorily in an electromagnetic environment without affecting or interfering with the environment over and above certain limits.

EMC can be broken down into three different areas:

- Internal immunity to interference:

  Immunity to internal (own) electrical disturbance
- External immunity to interference:

  Immunity to external electromagnetic disturbances
- Degree of interference emission:

  Emission of interference and its effect on the electrical environment

All three areas are considered when testing an electrical device.

The RFID modules are tested for conformity with the limit values required by the CE and RED directives. Since the RFID modules are merely components of an overall system, and sources of interference can arise as a result of combining different components, certain directives have to be followed when setting up a plant.

EMC measures usually consist of a complete package of measures, all of which need to be implemented in order to ensure that the plant is immune to interference.

Note

Adherence to EMC directives

The plant manufacturer is responsible for the observance of the EMC directives; the plant operator is responsible for radio interference suppression in the overall plant.

All measures taken when setting up the plant prevent expensive retrospective modifications and interference suppression measures.

The plant operator must comply with the locally applicable laws and regulations. They are not covered in this document.

4.10.3 Basic rules

It is often sufficient to follow a few elementary rules in order to ensure electromagnetic compatiblity (EMC).

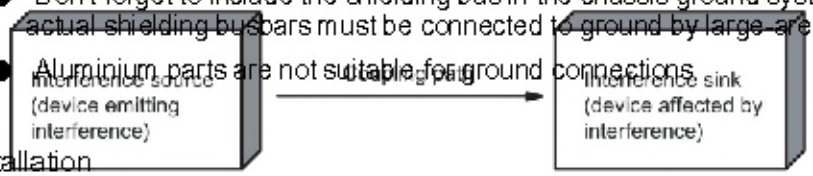
The following rules must be observed:

Shielding by enclosure

- Protect the device against external interference by installing it in a cabinet or housing. The housing or enclosure must be connected to the chassis ground.
- Use metal plates to shield against electromagnetic fields generated by inductances.
- Use metal connector housings to shield data conductors.

Wide-area ground connection

- Plan a meshed grounding concept.
- Bond all passive metal parts to chassis ground, ensuring large-area and low-HF-impedance contact.
- Establish a large-area connection between the passive metal parts and the central grounding point.
- Don't forget to include the shielding bus in the chassis ground system. That means the actual shielding busbars must be connected to ground by large-area contact.
- Aluminium parts are not suitable for ground connections.



Plan the cable installation

- Break the cabling down into cable groups and install these separately.
- Always route power cables, signal cables and HF cables through separated ducts or in separate bundles.
- Feed the cabling into the cabinet from one side only and, if possible, on one level only.
- Route the signal cables as close as possible to chassis surfaces.
- Twist the feed and return conductors of separately installed cables.
- Routing HF cables:
  avoid parallel routing of HF cables.
- Do not route cables through the antenna field.

Shielding for the cables

- Shield the data cables and connect the shield at both ends.
- Shield the analog cables and connect the shield at one end, e.g. on the drive unit.
- Always apply large-area connections between the cable shields and the shielding bus at the cabinet inlet and make the contact with clamps.

- Feed the connected shield through to the module without interruption.
- Use braided shields, not foil shields.

Line and signal filter

- Use only line filters with metal housings
- Connect the filter housing to the cabinet chassis using a large-area low-HF-impedance connection.
- Never fix the filter housing to a painted surface.
- Fix the filter at the control cabinet inlet or in the direction of the source.

4.10.4 Propagation of electromagnetic interference

Three components have to be present for interference to occur in a system:

- Interference source
- Coupling path
- Interference sink

Figure 4-19 Propagation of interference

If one of the components is missing, e.g. the coupling path between the interference source and the interference sink, the interference sink is unaffected, even if the interference source is transmitting a high level of noise.

The EMC measures are applied to all three components, in order to prevent malfunctions due to interference. When setting up a plant, the manufacturer must take all possible measures in order to prevent the occurrence of interference sources:

- Only devices fulfilling limit class A of VDE 0871 may be used in a plant.
- Interference suppression measures must be introduced on all interference-emitting devices. This includes all coils and windings.
- The design of the system must be such that mutual interference between individual components is precluded or kept as small as possible.

Information and tips for plant design are given in the following sections.

Interference sources

In order to achieve a high level of electromagnetic compatibility and thus a very low level of disturbance in a plant, it is necessary to recognize the most frequent interference sources. These must then be eliminated by appropriate measures.

Table 4- 21 Interference sources: origin and effect

Interference source	Interference results from	Effect on the interference sink
Contactor, electronic valves	Contacts	System disturbances
	Coils	Magnetic field
Electrical motor	Collector	Electrical field
	Winding	Magnetic field
Electric welding device	Contacts	Electrical field
	Transformer	Magnetic field, system disturbance, transient currents
Power supply unit, switched-mode	Circuit	Electrical and magnetic field, system disturbance
High-frequency appliances	Circuit	Electromagnetic field
Transmitter (e.g. professional mobile radio)	Antenna	Electromagnetic field
Ground or reference potential difference	Voltage difference	Transient currents
Operator	Static charge	Electrical discharge currents, electrical field
Power cable	Current flow	Electrical and magnetic field, system disturbance
High-voltage cable	Voltage difference	Electrical field

What interference can affect RFID?

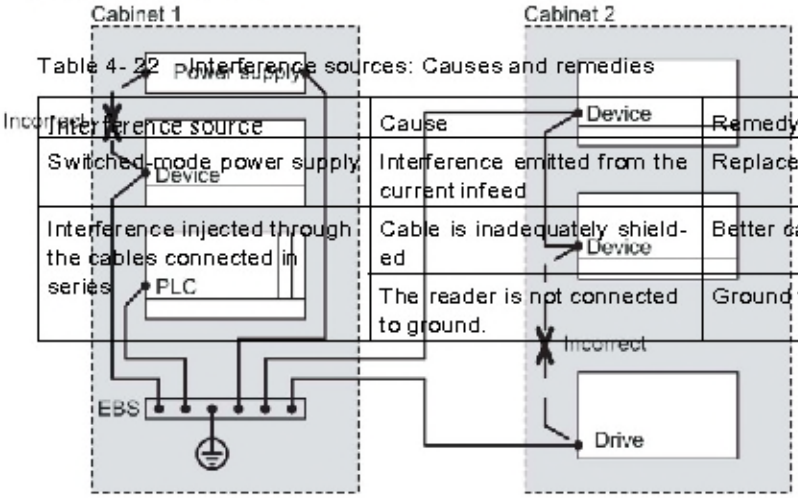


Table 4- 22 Interference sources: Causes and remedies

Interference source	Cause	Remedy
Switched-mode power supply	Interference emitted from the current infeed	Replace the power supply
Interference injected through the cables connected in series	Cable is inadequately shielded	Better cable shielding
	The reader is not connected to ground.	Ground the reader

Interference source	Cause	Remedy
HF interference over the antennas	caused by another reader	▪ Position the antennas further apart. ▪ Erect suitable damping materials between the antennas. ▪ Reduce the power of the readers. Please follow the instructions in the section *Installation guidelines/reducing the effects of metal*

4.10.5 Equipotential bonding

Potential differences between different parts of a plant can arise due to the different design of the plant components and different voltage levels. If the plant components are connected across signal cables, transient currents flow across the signal cables. These transient currents can corrupt the signals.

Proper equipotential bonding is thus essential.

- The equipotential bonding conductor must have a sufficiently large cross section (at least 10 mm²).
- The distance between the signal cable and the associated equipotential bonding conductor must be as small as possible (antenna effect).
- A fine-strand conductor must be used (better high-frequency conductivity).
- When connecting the equipotential bonding conductors to the centralized equipotential bonding strip (EBS), the power components and non-power components must be combined.
- The equipotential bonding conductors of the separate modules must lead directly to the equipotential bonding strip.

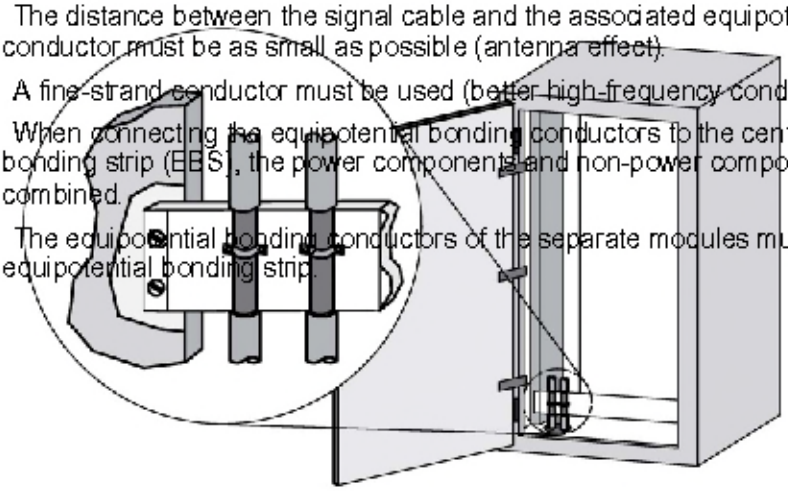
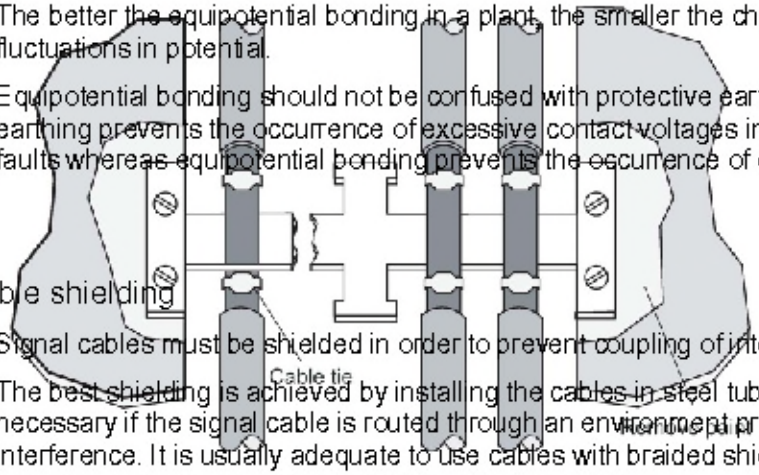


Figure 4-20 Equipotential bonding (EBS = Equipotential bonding strip)

The better the equipotential bonding in a plant, the smaller the chance of interference due to fluctuations in potential.

Equipotential bonding should not be confused with protective earthing of a plant. Protective earthing prevents the occurrence of excessive contact voltages in the event of equipment faults whereas equipotential bonding prevents the occurrence of differences in potential.



4.10.6 Cable shielding

Signal cables must be shielded in order to prevent coupling of interference.

The best shielding is achieved by installing the cables in steel tubes. However, this is only necessary if the signal cable is routed through an environment prone to particular interference. It is usually adequate to use cables with braided shields. In either case, however, correct connection is vital for effective shielding.

The following generally applies:

- For analog signal cables, the shield has to be connected at one end on the receiver side
- For digital signals, the shield has to be connected to the enclosure at both ends
- Since interference signals are frequently within the HF range (> 10 kHz), a large-area HF-proof shield contact is necessary

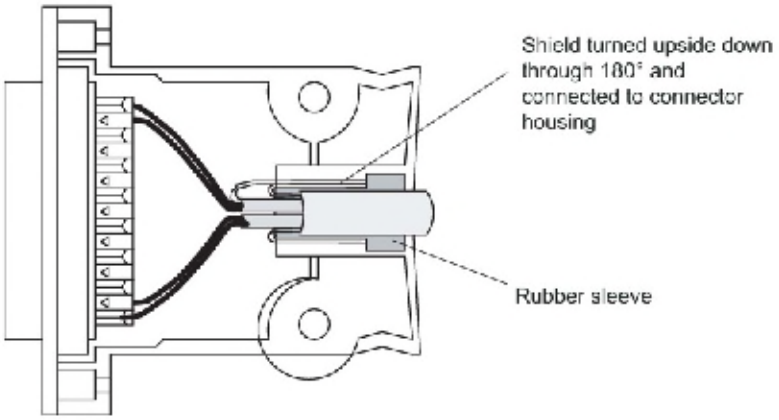


Figure 4-21 Cable shielding

The shielding bus should be connected to the control cabinet enclosure in a manner allowing good conductance (large-area contact) and must be situated as close as possible to the cable inlet. The cable insulation must be removed and the cable clamped to the shielding bus (high-frequency clamp) or secured using cable ties. Care should be taken to ensure that the connection allows good conductance.

Figure 4-22 Connection of shielding bus

The shielding bus must be connected to the PE busbar.

If shielded cables have to be interrupted, the shield must be continued via the corresponding connector housing. Only suitable connectors may be used for this purpose.

Figure 4-23 Interruption of shielded cables

If intermediate connectors, which do not have a suitable shield connection are used, the shield must be continued by fixing cable clamps at the point of interruption. This ensures a large-area, HF-conducting contact.

Readers

5

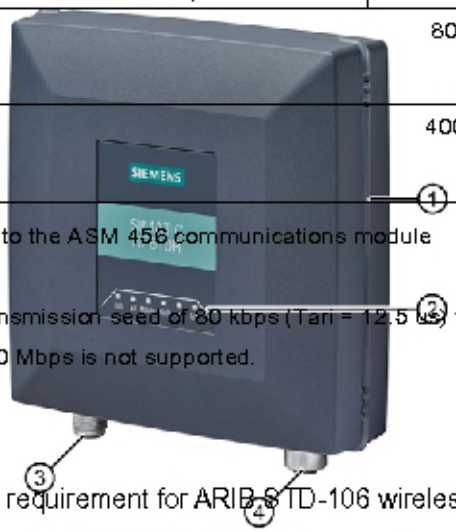
5.1 Overview

The following table shows the most important features of the stationary RF600 readers at a glance:

Table 5- 1 Characteristics of the readers

Characteristics	SIMATIC RF610R	SIMATIC RF615R	SIMATIC RF650R	SIMATIC RF680R	SIMATIC RF685R
Air interface / standards supported	ISO 18000-62 ISO 18000-63				
Radio profile variants	ETSI, FCC, CMIIT		ETSI, FCC, CMIIT, ARIB (STD-T107)	ETSI, FCC, CMIIT, ARIB (STD-T106)	
LEDs	7		6	17	
Interfaces					
Number of external antennas via RP-TNC	--	1	4		1
Available internal antennas	1		--		1
Ethernet	1 x M12 connector (4-pin)		1 x RJ45 connector (8-pin) according to IEC PAS 61076-3-117	2 x M12 connector (4-pin)	
PROFINET	--				
RS-422	1 x plug (M12, 8-pin) 1)		--	1 x plug (M12, 8-pin) 1)	
Digital inputs	--	1 x (M12, 5-pin) log "0": 0...7 V log "1": 15...24 V	4 x (M12, 12-pin) log "0": 0...7 V log "1": 15...24 V		
Digital outputs (short-circuit-proof)	--	1 x (M12, 5-pin)	4 x (M12, 12-pin)		
Power supply	24 V DC (M12, 8-pin) 20...30 V (0.3 A) external		24 V DC (M12, 8-pin) 20...30 V (2 A) external		

Characteristics	SIMATIC RF610R	SIMATIC RF615R	SIMATIC RF650R	SIMATIC RF680R	SIMATIC RF685R
Max. radiated power ETSI in ERP	200 mW ERP	200 mW ERP [2] 1 W ERP	2 W ERP		2 W ERP [2] 2 W ERP
Max. radiated power CMIIT in ERP	250 mW ERP	250 mW ERP [2] 1 W ERP	2 W ERP		2 W ERP [2] 2 W ERP
Max. radiated power FCC in EIRP	400 mW EIRP	400 mW EIRP [2] 1.4 W EIRP	4 W EIRP		4 W EIRP [2] 4 W EIRP
Max. radiated power ARIB in EIRP	--		0.5 W EIRP	4 W EIRP	
Max. transmit power ETSI and CMIIT [3]	26 dBm 0.4 W		30 dBm 1 W	33 dBm 2 W	
Max. transmit power FCC [3]	26 dBm 0.4 W		30 dBm 1 W	33 dBm 2 W	
Max. transmit power ARIB [3]	--		24 dBm 0.25 W	30 dBm 1 W	
Max. transmission speed of the communications interface [4]	100 Mbps or 115.2 kbps		100 Mbps	100 Mbps or 115.2 kbps	
Max. transmission speed reader ⇒ transponder	80 kbps				
Max transmission speed transponder ⇒ reader	400 kbps				



[1] Connection of the readers to the ASM 456 communications module

[2] Internal antenna

[3] With a profile with a Tx transmission speed of 80 kbps (Tari = 12.5 µs) the transmit power is 1 W.

[4] A transmission speed of 10 Mbps is not supported.

Note

License requirement for ARIB STD-106 wireless profile

Note that the ARIB STD-106 wireless profile requires a license. When using the SIMATIC RF680R and RF685R readers in the ARIB STD-106 wireless profile, you need a valid license from the relevant authority.

5.2 SIMATIC RF610R

5.2.1 Description

5.2.1.1 Overview

The SIMATIC RF610R is a stationary reader in the UHF frequency band with an integrated antenna.

The maximum transmit power is 400 mW, the radiant power of the internal antenna is 200 or 250 mW ERP / 400 mW EIRP. The interfaces (Ethernet, power supply) are located on the lower front edge. These interfaces can be used to connect the reader to the power supply and a PC for parameter assignment.

The degree of protection is IP67.

	Pos.	Description
	①	"PRESENCE" LED (PRE)
	②	LED operating display
	③	Interface to power supply (RS422), 24 V DC [1]: X80 DC24V (M12, 8-pin)
	④	Ethernet interface, TCP/IP: X1 P1 (M12, 4-pin)

[1]) Connection of the readers to the ASM 456 communications module via the RS-422 interface.

5.2.1.2 Ordering data

Table 5- 2 RF610R ordering data

Product	Article number
RF610R (ETSI)	6GT2811-6BC10-0AA0
RF610R (FCC)	6GT2811-6BC10-1AA0
RF610R (CMIIT)	6GT2811-6BC10-2AA0

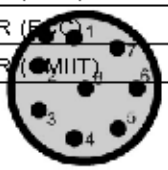


Table 5- 3 Ordering data accessories

Product		Article number
SIMATIC antenna holder for RF600 devices		6GT2890-2AB10
Connecting cable and connectors		
▪ Ethernet plug on the reader FastConnect M12 (IP65)		6GK1901-0DB20-6AA0
▪ Ethernet plug Standard IE FastConnect RJ45 180 (IP20)		6GK1901-1BB10-2AA0
▪ Industrial Ethernet cable M12 / M12	5 m	6XV1870-8AH50
▪ Industrial Ethernet connecting cable M12-180 / RJ45	2 m	6XV1871-5TH20
	3 m	6XV1871-5TH30
	5 m	6XV1871-5TH50
▪ Industrial Ethernet cable by the meter, green (minimum 20 m)		6XV1840-2AH10
▪ Connecting cable reader ↔ CM M12-180 / M12-180	2 m	6GT2891-4FH20
	5 m	6GT2891-4FH50
	10 m	6GT2891-4FN10
	20 m	6GT2891-4FN20
	50 m	6GT2891-4FN50
Wide-range power supply unit for SIMATIC RF systems		
▪ With EU plug		6GT2898-0AC00
▪ With UK plug		6GT2898-0AC10
▪ With US plug		6GT2898-0AC20
24 V connecting cable reader ↔ wide-range power supply unit		
with plug, 5 m		6GT2891-0PH50
with open ends, 2 m		6GT2891-4EH20
with open ends, 5 m		6GT2891-4EH50
DVD "Ident Systems Software & Documentation"		6GT2080-2AA20

5.2.1.3 Pin assignment of the power supply interface (X80 24VDC)

Table 5- 4 Pin assignment of the RS422 interface (reader end)

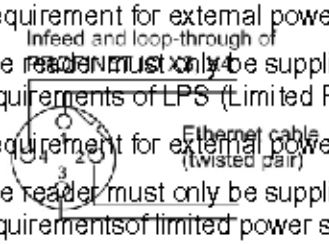
View of interface (M12 socket, 8-pin)	Pin	Wire colors	Assignment
	1	White	+ 24 V
	2 1)	Brown	- Tx
	3	Green	0 V
	4 1)	Yellow	+ Tx
	5 1)	Gray	+ Rx
	6 1)	Pink	- Rx
	7	--	Unassigned
	8	--	Earth (shield)

1) These pins are not required if the reader is operated via Ethernet.

Note

Requirement for external power sources

The reader must only be supplied with power by power supply units that meet the requirements of LPS (Limited Power Source) and NEC Class 2.



Requirement for external power sources

The reader must only be supplied with power by power supply units that meet the requirementsof limited power source (LPS) and NEC Class 2.

Spécification des sources de tension externes

L'alimentation du plot de lecture/écriture doit être exclusivement assurée par des blocs d'alimentation conformes aux spécifications des sources à puissance limitée (Limited Power Sources LPS) et de NEC class 2.

Notes on connectors and cables

The cables with open cable ends (6GT2891-4EH20, 6GT2891-4EH50) have an 8-pin M12 plug at one end, while the other end of the cable is "open". There are 8 color-coded single wires there for connecting to external devices.

The product range includes additional cables of the type 6GT2891-4Fxxx (2 to 50 m) with an M12 connector at both ends. These cables can be used as extension cables. Long cables can be shortened if necessary.

NOTICE
Insulate unused single wires Unused single wires must be insulated individually to prevent unwanted connections of signal lines.

NOTICE
For long cables: Adapt the power supply and transmission speed Note that even with long cables, the supply voltage of 24 VDC must always be guaranteed. Note also that the transmission speed on the serial interface must, if necessary, be reduced. SIMATIC standard cables (e.g. 6GT2891-4FN10) have a loop resistance of 160 mOhm / meter. This results in a voltage drop of 0.8 volts on the 24 V cable for every 10 meters of connecting cable and with a power requirement of 500 mA. If the power requirement increases through the use of the digital inputs/outputs, the voltage drop increases accordingly.

5.2.1.4 Pin assignment of the Industrial Ethernet interface (X1 P1)

Table 5- 5 Pin assignment of the Industrial Ethernet interface (reader end)

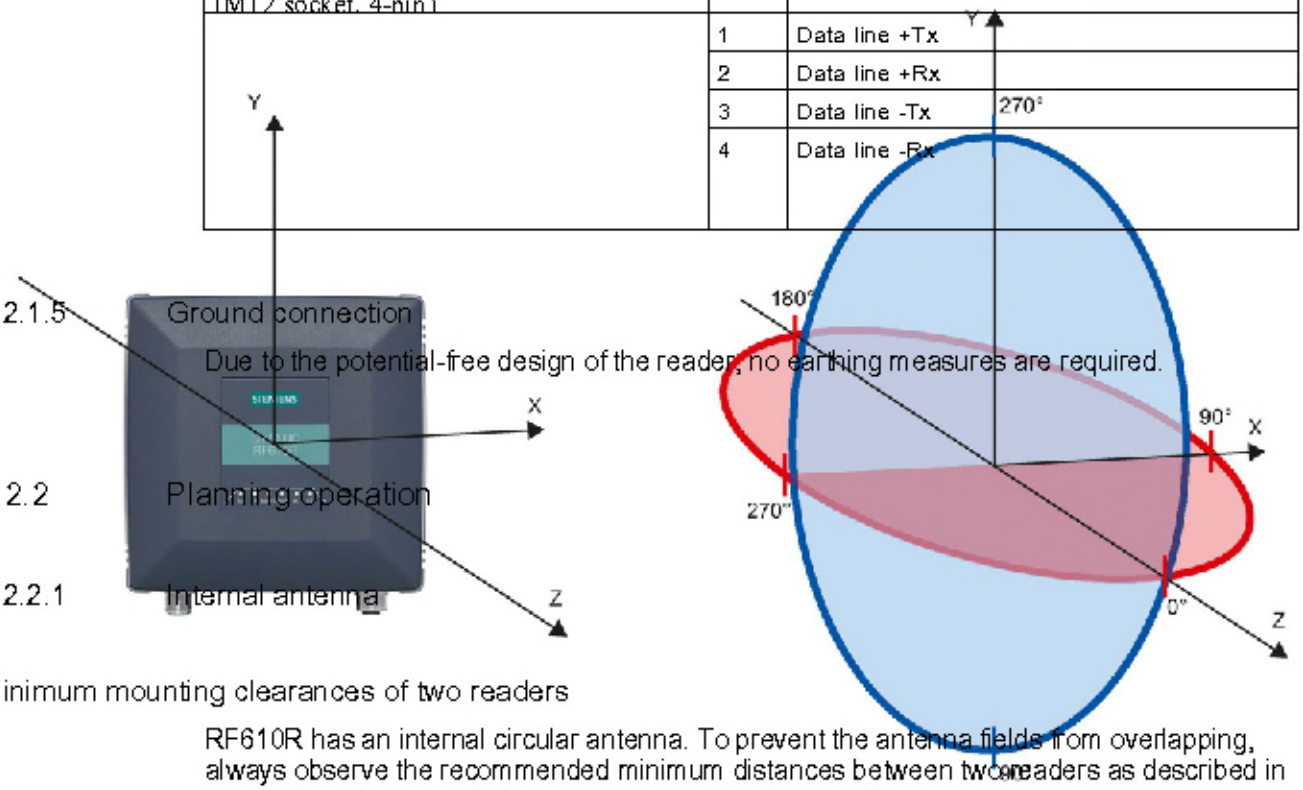
View of interface (M12 socket, 4-pin)	Pin	Pin assignment
	1	Data line +Tx
	2	Data line +Rx
	3	Data line -Tx
	4	Data line -Rx

5.2.1.5 Ground connection

Due to the potential-free design of the reader, no earthing measures are required.

5.2.2 Planning operation

5.2.2.1 Internal antenna



Minimum mounting clearances of two readers

RF610R has an internal circular antenna. To prevent the antenna fields from overlapping, always observe the recommended minimum distances between two readers as described in the section "Reciprocal influence of read points (Page 47)".

Dense Reader Mode (DRM)

The readers can also interfere with each other (secondary fields), if the channels (Reader TX, Transponder TX) overlap. In order to prevent a transponder channel overlapping with a reader channel, we recommend that the Dense Reader Mode (DRM) is used.

Note

Protective cap

If you only use the internal antenna of the reader, we recommend that you close the external, unused antenna connector on the reader using the protective cap.

Antenna diagram RF610R (ETSI)

The following radiation diagrams show the directional characteristics of the internal antenna of the RF610R (ETSI) reader. For the spatial presentation of the directional characteristics, the horizontal plane (azimuth section) as well as the vertical plane (elevation section) must be considered. This results in a spatial image of the directional radiation pattern of the antenna.

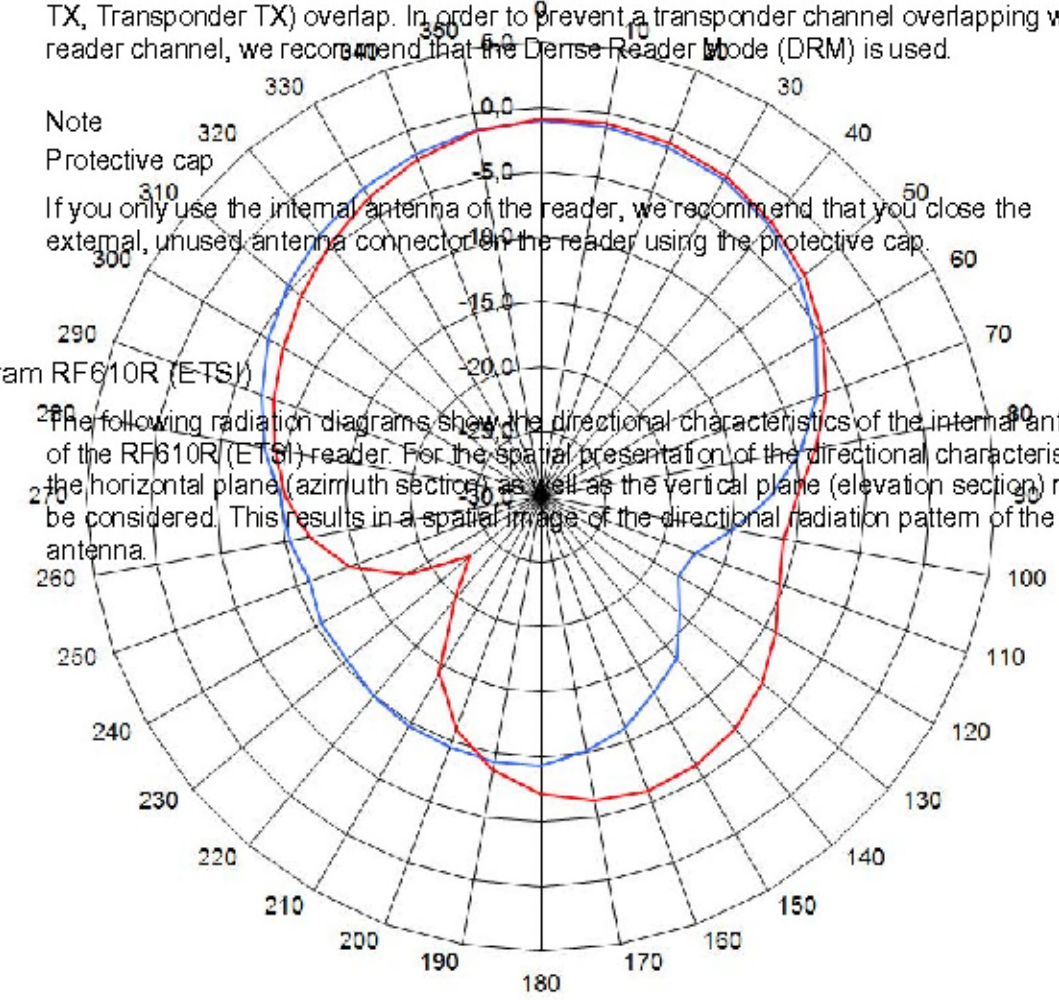


Figure 5-1 Reference system

Radiation diagram (ETSI)

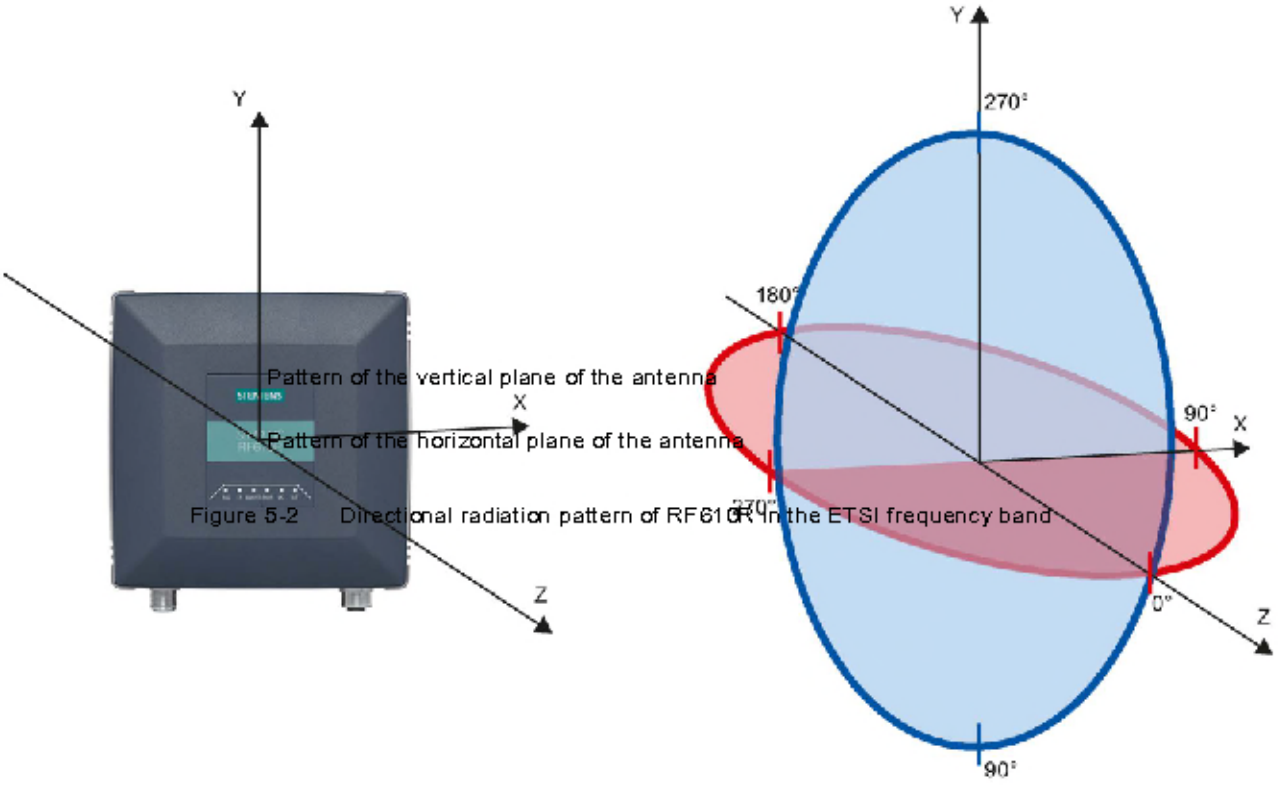


Figure 5-2 Directional radiation pattern of RF610R in the ETSI frequency band

Overview of the antenna parameters

Table 5- 6 Maximum linear electrical aperture angle at 865 MHz:

	Polarization (circular)
Azimuth section	100°
Elevation section	100°
Typical antenna gain in the frequency band 865 to 868 MHz	-1 dBi
Antenna axis ratio	2 dB

You will find more information on the antennas in the section "Guidelines for selecting RFID UHF antennas (Page 51)".

Antenna diagram for RF610R (FCC)

The following radiation diagrams show the directional characteristics of the internal antenna of the RF610R (FCC) reader. For the spatial presentation of the directional characteristics, the horizontal plane (azimuth section) as well as the vertical plane (elevation section) must be considered. This results in a spatial image of the directional radiation pattern of the antenna.

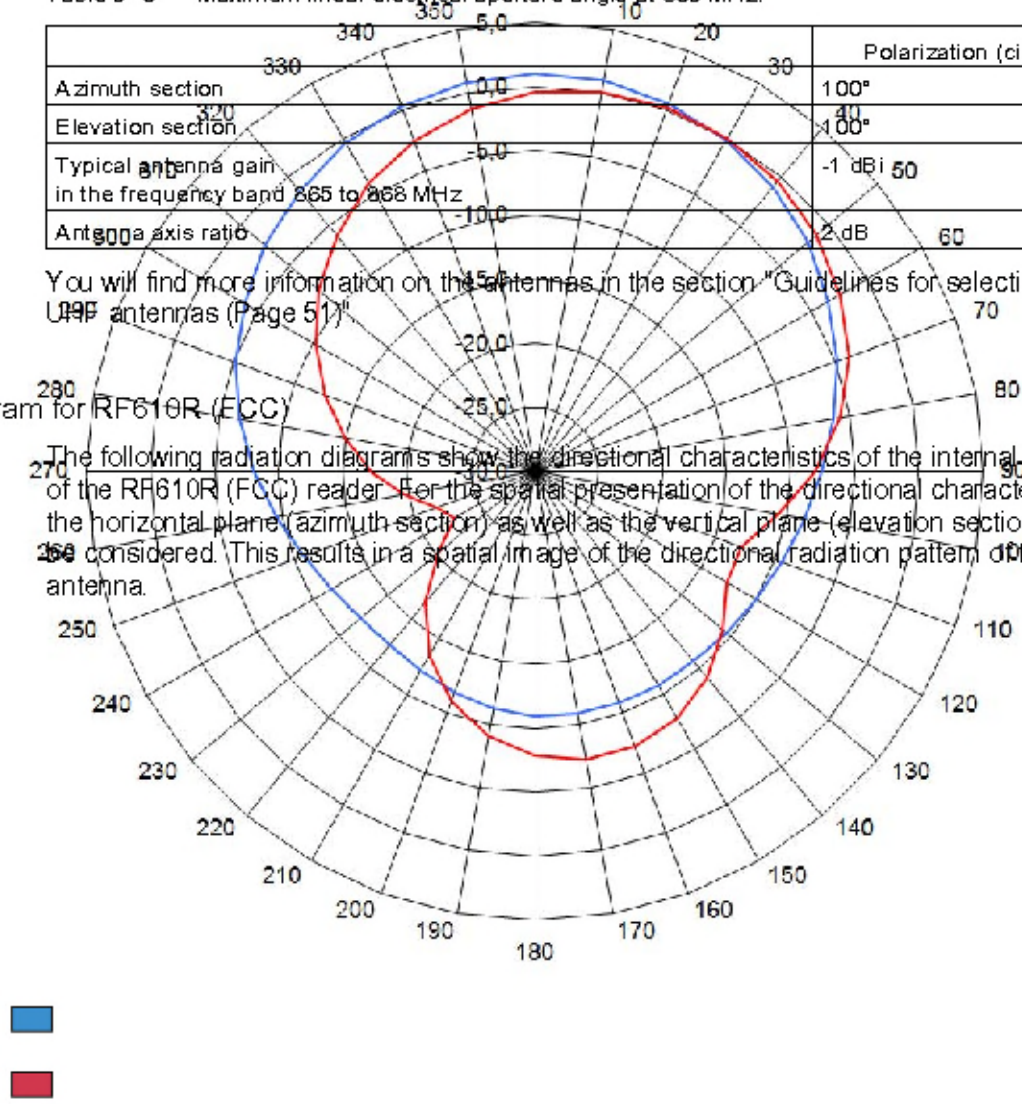


Figure 5-3 Reference system

Radiation diagram (FCC)

Pattern of the vertical plane of the antenna

Pattern of the horizontal plane of the antenna

Figure 5-4 Directional radiation pattern of RF610R in the FCC frequency band

Overview of the antenna parameters

Table 5- 7 Maximum linear electrical aperture angle at 915 MHz:

	Polarization (circular)
Azimuth section	100°
Elevation section	100°
Typical antenna gain in the frequency band 902 to 928 MHz	0 dBi
Antenna axis ratio	2 dB

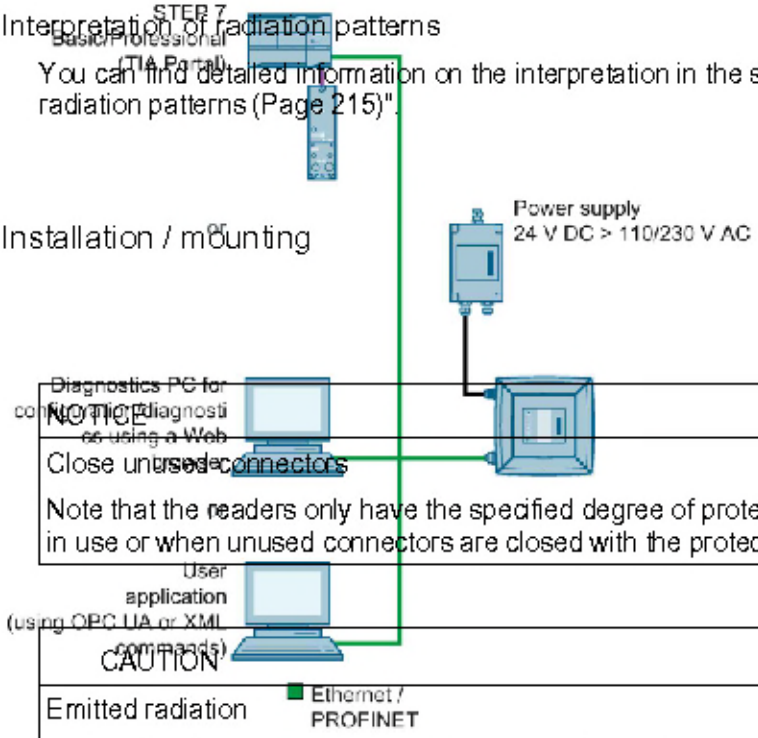
You will find more information on the antennas in the section "Guidelines for selecting RFID UHF antennas (Page 51)".

5.2.2.2 Interpretation of radiation patterns

You can find detailed information on the interpretation in the section "Interpretation of radiation patterns (Page 215)".

5.2.3 Installation / mounting

Requirement



NOTICE

Close unused connectors

Note that the readers only have the specified degree of protection when all connectors are in use or when unused connectors are closed with the protective caps.

CAUTION

Emitted radiation

The transmitter complies with the requirements of Health Canada and the FCC limit values for subjecting persons to HF radiation, provided that a minimum spacing of 26 cm exists between antenna and person. When the antennas are installed, you must therefore ensure that a minimum spacing of 26 cm is maintained between personnel and antennas.

Mounting/installing the device

You can mount the reader in the following ways:

- directly on a flat surface using the VESA 100 mounting system (torque 1.5 Nm).

  The positions of the mounting holes for the device are shown in the section Dimension drawing (Page 120).

5.2.4 Configuration/integration

An Ethernet interface is available for integrating the device into system environments/networks. RF610R can be configured via the Ethernet interface and with direct connection to the PC. You can configure and program the reader using the following tools:

- STEP 7 Basic/Professional (TIA Portal)
- or via EtherNet/IP
- Web Based Management (WBM)
- OPC UA or XML based user applications

Note that configuration in parallel is not possible using different tools. Simple process controls (e.g. a traffic signal) can be implemented directly using the reader via the digital input/output.

Figure 5-5 Overview: Configuration of RF610R readers

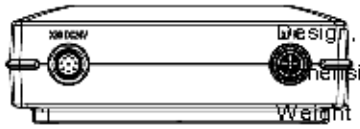
5.2.5 Technical specifications

Table 5- 8 Technical specifications of the RF610R reader

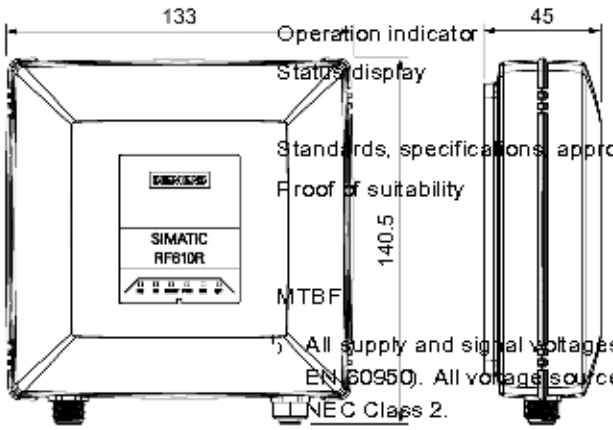
	6GT2811-6BC10-xAA0
Product type designation	SIMATIC RF610R
Radio frequencies	
Operating frequency	
▪ ETSI	▪ 865 to 868 MHz
▪ FCC	▪ 902 to 928 MHz
▪ CMIIT	▪ 920 to 925 MHz
Transmit power	
▪ ETSI	▪ 3 ... 400 mW
▪ FCC	▪ 3 ... 400 mW
▪ CMIIT	▪ 3 ... 400 mW
Maximum radiated power	
▪ ETSI	▪ 200 mW ERP
▪ FCC	▪ 400 mW EIRP
▪ CMIIT	▪ 250 mW ERP
Electrical data	
Range (internal antenna)	
▪ ETSI	▪ ≤ 1 m
▪ FCC	▪ ≤ 1 m
▪ CMIIT	▪ ≤ 1 m
Protocol	ISO 18000-62/-63
Transmission speed	≤ 300 kbps
Frequency accuracy	≤ ±10 ppm
Channel spacing	
▪ ETSI	▪ 600 kHz
▪ FCC	▪ 500 kHz
▪ CMIIT	▪ 250 kHz
Modulation methods	ASK: DSB modulation & PR-ASK modulation encoding; Manchester or Pulse Interval (PIE)
Multitag capability	Yes

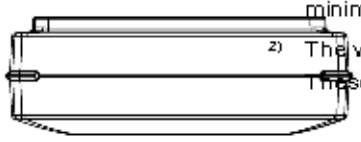
	6GT2811-6BC10-xAA0
Typical transmission time per byte	
▪ Write access	▪ 2 ms
▪ Read access	▪ 0.15 ms
Supply voltage	24 VDC (20 ... 30 VDC) [1]
Maximum permitted current consumption	0.3 A
Current consumption (on standby), typical	
▪ 20 V input voltage on the reader	▪ 200 mA / 4 W
▪ 24 V input voltage on the reader	▪ 170 mA / 4.1 W
▪ 30 V input voltage on the reader	▪ 150 mA / 4.2 W
Current consumption (at 400 mW transmit power), typical	
▪ 20 V input voltage on the reader	▪ 260 mA / 5.2 W
▪ 24 V input voltage on the reader	▪ 220 mA / 5.3 W
▪ 30 V input voltage on the reader	▪ 170 mA / 5.1 W
Interfaces	
Power supply	1x M12 (8-pin)
Ethernet interface	1x M12 (4-pin), 100 Mbps
Mechanical specifications	
Material	Pocan (silicone-free)
Color	TI-Grey
Permitted ambient conditions	
Ambient temperature	
▪ During operation	▪ -25 ... +55 °C
▪ During transportation and storage	▪ -40 ... +85 °C
Conditions relating to UL approval	▪ for indoor use only (dry location) ▪ Mounting height shall be equal or less than 2 m (MS1 classification according UL/IEC 62368-1). La hauteur de montage doit être égale ou inférieure à 2 m (classification MS1 selon CEI 62368-1).
Degree of protection	IP67
Shock resistant to EN 60068-2-27	25.5 g [2]
Vibration to EN 60068-2-6	3.1 g [2]

6GT2811-6BC10-xAA0



Design, dimensions and weight	
Dimensions (W × H × D)	140.5 × 133 × 45 mm
Weight	370 g
Type of mounting	VESA 100 4x screws M4 (1.5 Nm)
Operation indicator	8 LEDs
Status display	1 LED (enclosure, all round)
Standards, specifications, approvals	
Proof of suitability	EN 301 489-1 V2.2.0 / EN 301 489-3 V2.1.1 / EN 302 208 V3.1.1 FCC CFR 47, Part 15 section 15.247
MTBF	29 years





1) All supply and signal voltages must be safety extra low voltage (SELV/PELV according to EN 60950). All voltage sources must meet the requirements of limited power sources (LPS) and NEC Class 2.
Note that, depending on the power consumption, using extension cables > 20 m (6GT2891-4FN50) may lead to a voltage drop on the reader. This voltage drop can mean that the necessary minimum voltage on the reader is below the required 20 V.

2) The values for shock and vibration are maximum values and must not be applied continuously. These values only apply to mounting using screws.

5.2.6 Dimension drawing

Figure 5-6 Dimension drawing RF610R

All dimensions in mm (± 0.5 mm tolerance)

5.2.7 Certificates and approvals

5.2.7.1 CE mark

Note

Marking on the readers according to specific approval

The certificates and approvals listed here apply only if the corresponding mark is found on the readers.

Table 5- 9 6GT2811-6BC10-0AA0

Labeling	Description
	Conformity with the RED directive 2014/53/EU Conformity with the RoHS directive 2011/65/EU

5.2.7.2 Country-specific certifications

Table 5- 10 6GT2811-6BC10-1AA0

Labeling	Description
Federal Communications Commission	FCC CFR 47, Part 15 section 15.247 Radio Frequency Interference Statement This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. FCC ID: NXW-RF610R
Industry Canada Radio Standards Specifications	RSS-247 Issue 2 IC: 267X-RF610R
	This product is UL-certified for the USA and Canada. It meets the following safety standard(s): UL/IEC 62368-1, 2nd Ed CAN/CSA C22.2 No. 62368-1-14, 2nd Ed Audio/video, information and communication technology equipment - Part 1: Safety requirements

Table 5- 11 6GT2811-6BC10-2AA0

Standard	
CMIIT Certification	China radio approval Marking on the reader: CMIIT ID: 2018DJxxxx

5.2.7.3 FCC information

Siemens SIMATIC RF610R (FCC): 6GT2811-6BC10-1AA0

FCC ID: NXW-RF610R

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.

Caution

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules.

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.

FCC Notice

To comply with FCC part 15 rules in the United States, the system must be professionally installed to ensure compliance with the Part 15 certification.

It is the responsibility of the operator and professional installer to ensure that only certified systems are deployed in the United States. The use of the system in any other combination (such as co-located antennas transmitting the same information) is expressly forbidden.

FCC Exposure Information

To comply with FCC RF exposure compliance requirements, the antennas used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

5.2.7.4 IC-FCB information

Siemens SIMATIC RF610R (FCC): 6GT2811-6BC10-1AA0

IC: 267X-RF610R

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions:

(1) This device may not cause interference, and

(2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d`Industrie Canada applicables aux appareils radio exempts de licence. L`exploitation est autorisée aux deux conditions suivantes :

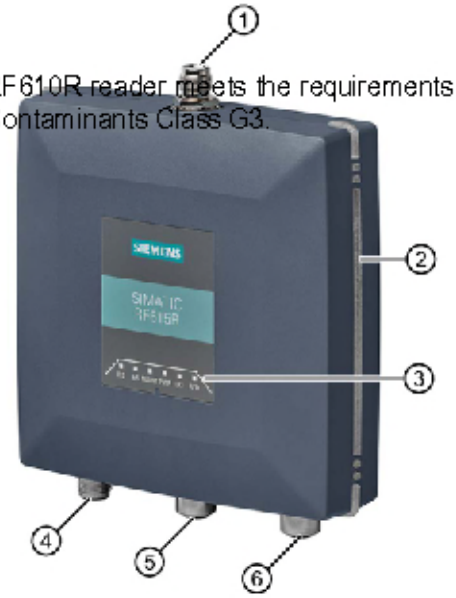
(1) L`appareil ne doit pas produire de brouillage, et

(2) l'utilisateur de l`appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d`en compromettre le fonctionnement.

5.2.7.5 Other certificates and approvals

ISA-S71.04-1985

RF610R reader meets the requirements according to ISA-S71.04-1985 Airborne Contaminants Class G3.



5.3 SIMATIC RF615R

5.3.1 Description

5.3.1.1 Overview

The SIMATIC RF615R is a stationary reader in the UHF frequency band with an integrated antenna. An external UHF RFID antenna can be connected via an RP-TNC connector.

The maximum transmit power is 400 mW, the radiant power of the internal antenna is 200 or 250 mW ERP / 400 mW EIRP. A radiated power of up to 1000 mW ERP / 1400 mW EIRP is achieved when the appropriate antennas and antenna cables are used. The interfaces (Ethernet, power supply, DI/DQ interface) are located on the lower front edge. These interfaces can be used to connect the reader to the power supply, to a digital input/output, and to a PC for parameter assignment.

The degree of protection is IP67.

	Pos.	Description
	①	RP-TNC interface for connection of an external antenna
	②	"PRESENCE" LED (PRE)
	③	LED operating display
	④	Interface to power supply (RS422), 24 V DC [1]: X80 DC24V (M12, 8-pin)
	⑤	DI/DQ interface: X10 DI/DQ (M12, 5-pin)
	⑥	Ethernet interface, TCP/IP: X1 P1 (M12, 4-pin)

[1]) Connection of the readers to the ASM 456 communications module via the RS-422 interface.

5.3.1.2 Ordering data

Table 5- 12 RF615R ordering data

Product	Article number
RF615R (ETSI)	6GT2811-6CC10-0AA0
RF615R (FCC)	6GT2811-6CC10-1AA0
RF615R (CMIIT)	6GT2811-6CC10-2AA0

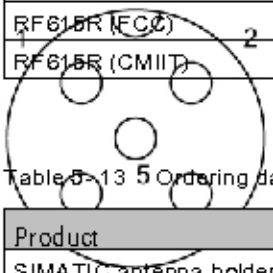


Table 5- 13 Ordering data accessories

Product		Article number
SIMATIC antenna holder for RF600 devices		6GT2890-2AB10
Connecting cable and connectors		
▪ DI/DO plug M12 for fabrication		3RK1902-4BA00-5AA0
▪ Ethernet plug on the reader FastConnect M12 (IP65)		6GK1901-0DB20-6AA0
▪ Ethernet plug Standard IE FastConnect RJ45 180 (IP20)		6GK1901-1BB10-2AA0
▪ Industrial Ethernet cable M12 / M12	5 m	6XV1870-8AH50
▪ Industrial Ethernet connecting cable M12-180 / RJ45	2 m	6XV1871-5TH20
	3 m	6XV1871-5TH30
	5 m	6XV1871-5TH50
▪ Industrial Ethernet cable by the meter, green (minimum 20 m)		6XV1840-2AH10
▪ Connecting cable reader ↔ CM M12-180 / M12-180	2 m	6GT2891-4FH20
	5 m	6GT2891-4FH50
	10 m	6GT2891-4FN10
	20 m	6GT2891-4FN20
	50 m	6GT2891-4FN50
Wide-range power supply unit for SIMATIC RF systems		
▪ With EU plug		6GT2898-0AC00
▪ With UK plug		6GT2898-0AC10
▪ With US plug		6GT2898-0AC20
24 V connecting cable reader ↔ wide-range power supply unit		
▪ with plug, 5 m		6GT2891-0PH50
▪ with open ends, 2 m		6GT2891-4EH20
▪ with open ends, 5 m		6GT2891-4EH50
DVD "Ident Systems Software & Documentation"		6GT2080-2AA20

5.3.1.3 Pin assignment of the DI/DQ interface (X10 DI/DQ)

Table 5- 14 Pin assignment of the DI/DQ interface (reader end)

View of interface (M12 socket, 5-pin)	Pin	Pin assignment
	1	DI Common / Input Common
	2	DO / Output
	3	DO Common / Output Common
	4	DI / Input
	5	Not connected

Note

Requirement for external power sources

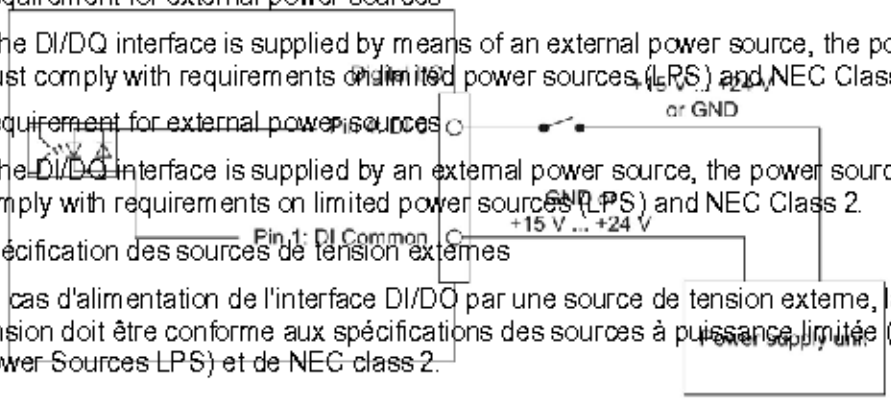
If the DI/DQ interface is supplied by means of an external power source, the power source must comply with requirements on limited power sources (LPS) and NEC Class 2.

Requirement for external power sources

If the DI/DQ interface is supplied by an external power source, the power source must comply with requirements on limited power sources (LPS) and NEC Class 2.

Spécification des sources de tension externes

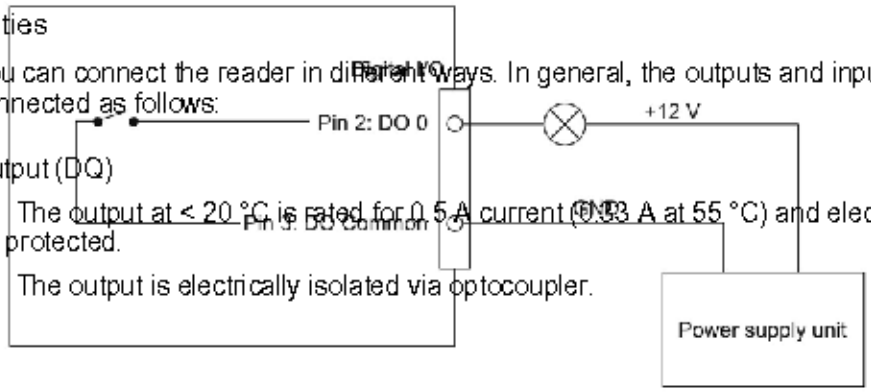
En cas d'alimentation de l'interface DI/DQ par une source de tension externe, la source de tension doit être conforme aux spécifications des sources à puissance limitée (Limited Power Sources LPS) et de NEC class 2.



5.3.1.4 Switching scheme for the DI/DQ interface

Connection possibilities

You can connect the reader in different ways. In general, the outputs and inputs should be connected as follows:



Output (DQ)

- The output at < 20 °C is rated for 0.5 A current (0.33 A at 55 °C) and electronically protected.
- The output is electrically isolated via optocoupler.

Input (DI)

- The input is set up with electrical isolation via optocoupler.
- Level
  - Low: 0 ... 7 V
  - High: 15 ... 24 V

The following diagrams illustrate various connection possibilities.

Note

Minimum time between changes

Note that changes on the DI/DQ interface that are not applied for at least 1.5 seconds are not detected by the reader.

Voltage infeed from external source

Figure 5-7 Circuit example 1: Digital input

Voltage infeed from external source

Figure 5-8 Circuit example 2: Digital output

Voltage infeed from an external source is shown here for 12 V as an example. Other voltages are also permissible.

5.3.1.5 Pin assignment of the power supply interface (X80 24VDC)

Table 5- 15 Pin assignment of the RS422 interface (reader end)

View of interface (M12 socket, 8-pin)	Pin	Wire colors	Assignment
	1	White	+ 24 V
	2 [1]	Brown	- Tx
	3	Green	0 V
	4 [1]	Yellow	+ Tx
	5 [1]	Gray	+ Rx
	6 [1]	Pink	- Rx
	7	--	Unassigned
	8	--	Earth (shield)

[1] These pins are not required if the reader is operated via Ethernet.

Note

Requirement for external power sources

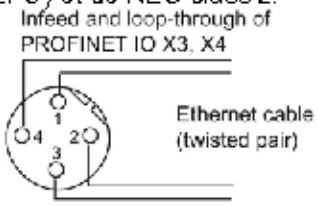
The reader must only be supplied with power by power supply units that meet the requirements of LPS (Limited Power Source) and NEC Class 2.

Requirement for external power sources

The reader must only be supplied with power by power supply units that meet the requirementsof limited power source (LPS) and NEC Class 2.

Spécification des sources de tension externes

L'alimentation du plot de lecture/écriture doit être exclusivement assurée par des blocs d'alimentation conformes aux spécifications des sources à puissance limitée (Limited Power Sources LPS) et de NEC class 2.



Notes on connectors and cables

The cables with open cable ends (6GT2891-4EH20, 6GT2891-4EH50) have an 8-pin M12 plug at one end, while the other end of the cable is "open". There are 8 color-coded single wires there for connecting to external devices.

The product range includes additional cables of the type 6GT2891-4Fxxx (2 to 50 m) with an M12 connector at both ends. These cables can be used as extension cables. Long cables can be shortened if necessary.

NOTICE
Insulate unused single wires Unused single wires must be insulated individually to prevent unwanted connections of signal lines.

NOTICE
For long cables: Adapt the power supply and transmission speed Note that even with long cables, the supply voltage of 24 VDC must always be guaranteed. Note also that the transmission speed on the serial interface must, if necessary, be reduced. SIMATIC standard cables (e.g. 6GT2891-4FN10) have a loop resistance of 160 mOhm / meter. This results in a voltage drop of 0.8 volts on the 24 V cable for every 10 meters of connecting cable and with a power requirement of 500 mA. If the power requirement increases through the use of the digital inputs/outputs, the voltage drop increases accordingly.

5.3.1.6 Pin assignment of the Industrial Ethernet interface (X1 P1)

Table 5- 16 Pin assignment of the Industrial Ethernet interface (reader end)

View of interface (M12 socket, 4-pin)	Pin	Pin assignment
	1	Data line +Tx
	2	Data line +Rx
	3	Data line -Tx
	4	Data line -Rx

5.3.1.7 Ground connection

Due to the potential-free design of the reader, no earthing measures are required.

5.3.2 Planning operation

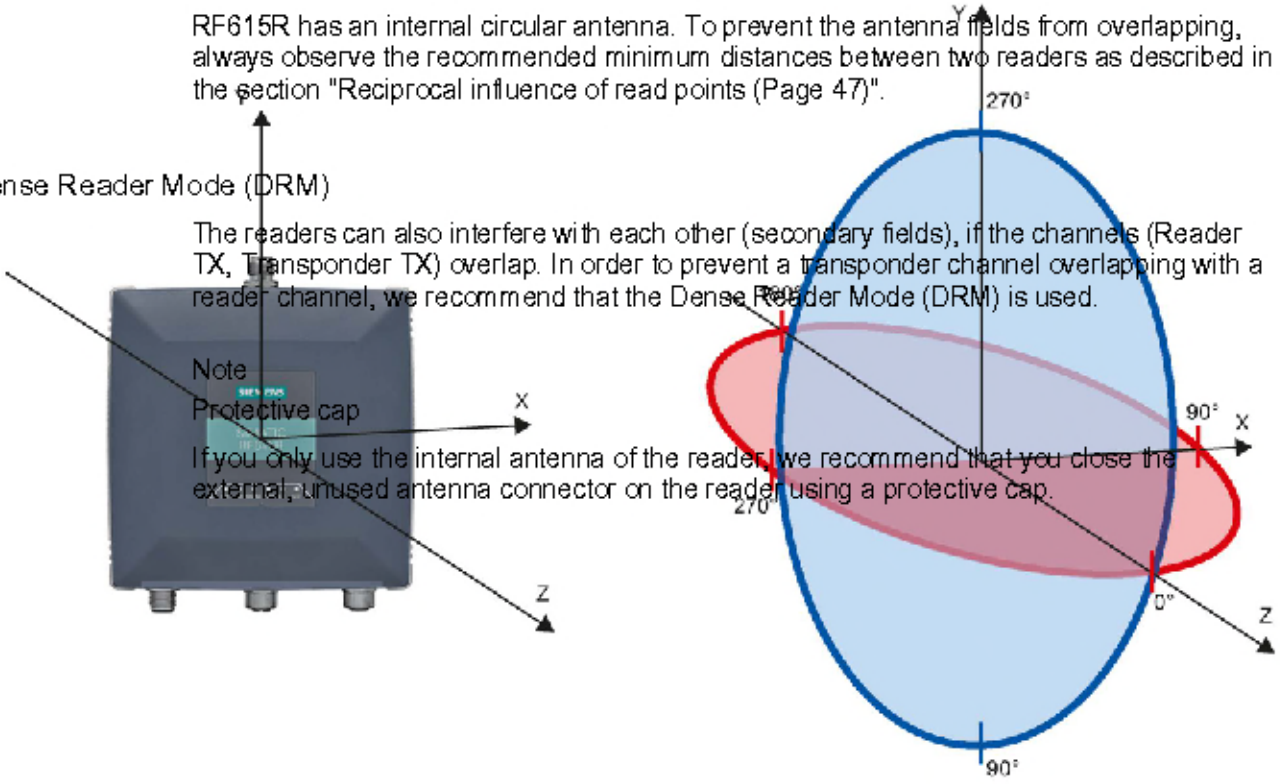
5.3.2.1 Internal antenna

Minimum mounting clearances of two readers

RF615R has an internal circular antenna. To prevent the antenna fields from overlapping, always observe the recommended minimum distances between two readers as described in the section "Reciprocal influence of read points (Page 47)".

Dense Reader Mode (DRM)

The readers can also interfere with each other (secondary fields), if the channels (Reader TX, Transponder TX) overlap. In order to prevent a transponder channel overlapping with a reader channel, we recommend that the Dense Reader Mode (DRM) is used.



Note

Protective cap

If you only use the internal antenna of the reader, we recommend that you close the external, unused antenna connector on the reader using a protective cap.

Antenna diagram RF615R (ETSI)

The following radiation diagrams show the directional characteristics of the internal antenna of the RF615R (ETSI) reader. For the spatial presentation of the directional characteristics, the horizontal plane (azimuth section) as well as the vertical plane (elevation section) must be considered. This results in a spatial image of the directional radiation pattern of the antenna.

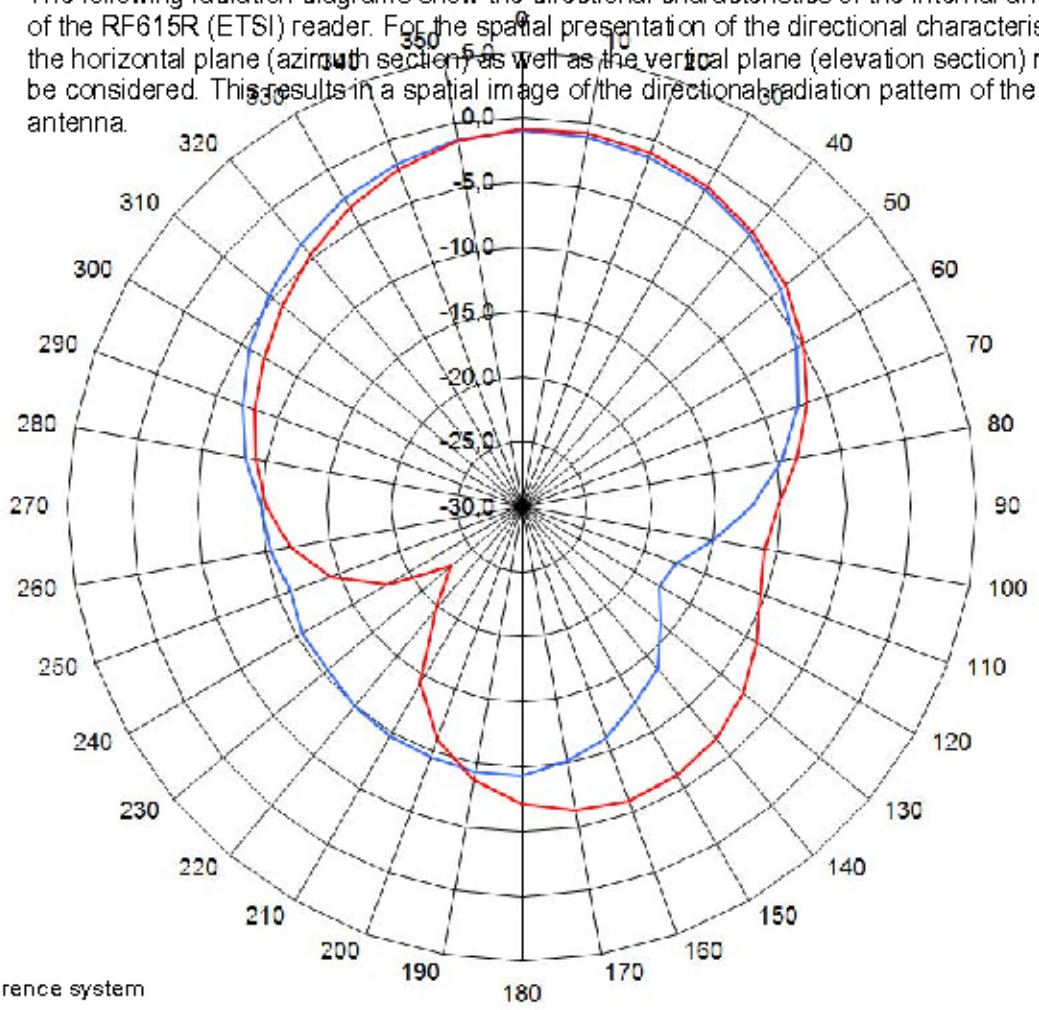


Figure 5-9 Reference system

Radiation diagram (ETSI)

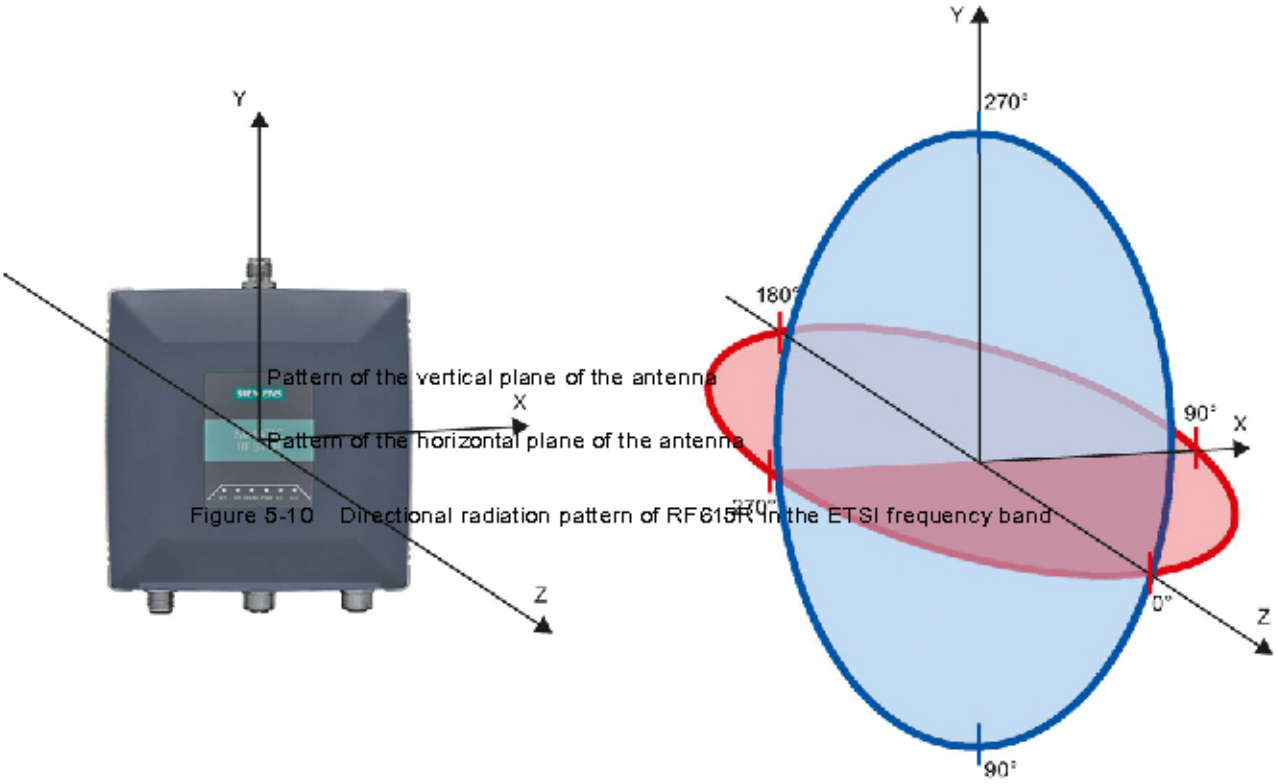


Figure 5-10 Directional radiation pattern of RF615R in the ETSI frequency band

Overview of the antenna parameters

Table 5- 17 Maximum linear electrical aperture angle at 865 MHz:

	Polarization (circular)
Azimuth section	100°
Elevation section	100°
Typical antenna gain in the frequency band 865 to 868 MHz	-1 dBi
Antenna axis ratio	2 dB

You will find more information on the antennas in the section "Guidelines for selecting RFID UHF antennas (Page 51)".

Antenna diagram for RF615R (FCC)

The following radiation diagrams show the directional characteristics of the internal antenna of the RF615R (FCC) reader. For the spatial presentation of the directional characteristics, the horizontal plane (azimuth section) as well as the vertical plane (elevation section) must be considered. This results in a spatial image of the directional radiation pattern of the antenna.

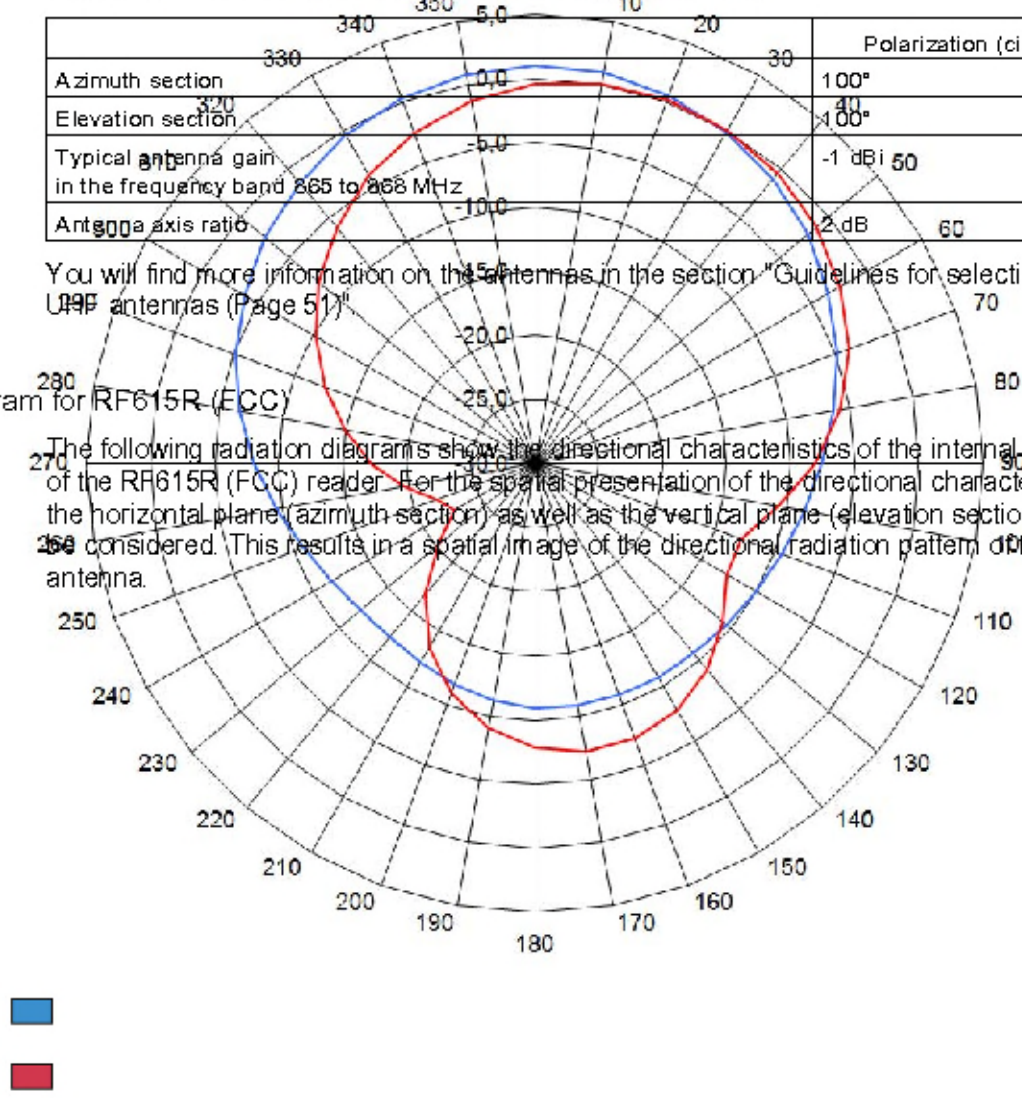


Figure 5-11 Reference system

Radiation diagram (FCC)

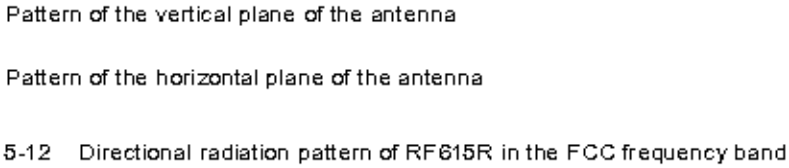


Figure 5-12 Directional radiation pattern of RF615R in the FCC frequency band

Overview of the antenna parameters

Table 5- 18 Maximum linear electrical aperture angle at 915 MHz:

	Polarization (circular)
Azimuth section	100°
Elevation section	100°
Typical antenna gain in the frequency band 902 to 928 MHz	0 dBi
Antenna axis ratio	2 dB

You will find more information on the antennas in the section "Guidelines for selecting RFID UHF antennas (Page 51)".

Interpretation of radiation patterns

You can find detailed information on the interpretation in the section "Interpretation of radiation patterns (Page 215)".

5.3.2.2 External antenna

Preassembled standard cables in lengths of 1 m, 3 m, 5 m, 10 m, 15 m, 20 m and 40 m are available to connect the antenna.

The read range is limited by the cable loss. The maximum range can be achieved with the cable 6GT2815-0BH10 (length 1 m) since this has the lowest cable loss.

Examples of possible antenna reading point configurations

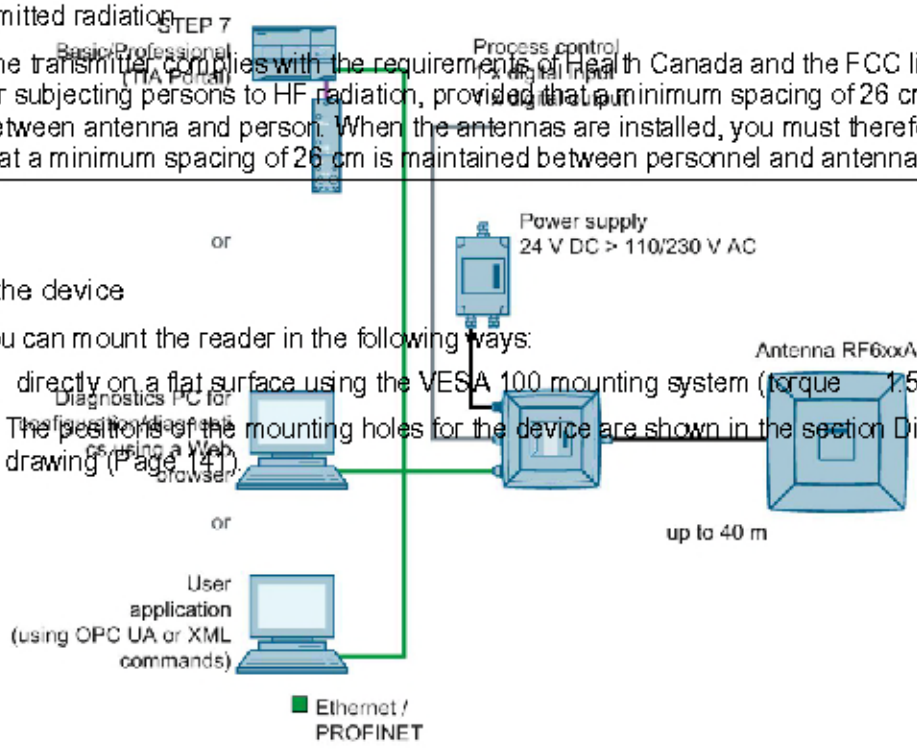
- A data source with an external antenna for a reading point.
- As an alternative, a data source with an internal antenna for a reading point.

5.3.3 Installing/mounting

Requirement

NOTICE
Close unused connectors Note that the readers only have the specified degree of protection when all connectors are in use or when unused connectors are closed with the protective caps.

CAUTION
Emitted radiation The transmitter complies with the requirements of Health Canada and the FCC limit values for subjecting persons to HF radiation, provided that a minimum spacing of 26 cm exists between antenna and person. When the antennas are installed, you must therefore ensure that a minimum spacing of 26 cm is maintained between personnel and antennas.



Mounting/installing the device

You can mount the reader in the following ways:

- directly on a flat surface using the VESA 100 mounting system (torque 1.5 Nm).

The positions of the mounting holes for the device are shown in the section Dimension drawing (Page 141).

5.3.4 Configuration/integration

An Ethernet interface is available for integrating the device into system environments/networks. RF615R can be configured via the Ethernet interface and with direct connection to the PC. You can configure and program the reader using the following tools:

- STEP 7 Basic/Professional (TIA Portal)
- or via EtherNet/IP
- Web Based Management (WBM)
- OPC UA or XML based user applications

Note that configuration in parallel is not possible using different tools. Simple process controls (e.g. a traffic signal) can be implemented directly using the reader via the digital input/output.

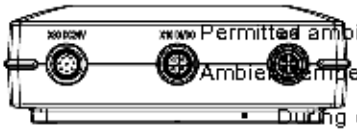
Figure 5-13 Overview: Configuration of RF615R readers

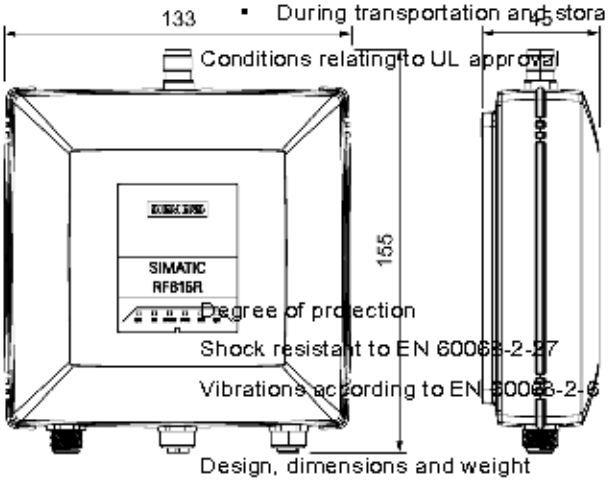
5.3.5 Technical specifications

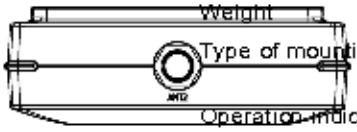
Table 5- 19 Technical specifications of the RF615R reader

	6GT2811-6CC10-xAA0
Product type designation	SIMATIC RF615R
Radio frequencies	
Operating frequency	
▪ ETSI	▪ 865 to 868 MHz
▪ FCC	▪ 902 to 928 MHz
▪ CMIIT	▪ 920 to 925 MHz
Transmit power 1)	
▪ ETSI	▪ 3 ... 400 mW
▪ FCC	▪ 3 ... 400 mW
▪ CMIIT	▪ 3 ... 400 mW
Maximum radiated power per antenna	
▪ ETSI	▪ 1000 mW ERP
▪ FCC	▪ 1400 mW EIRP
▪ CMIIT	▪ 1000 mW ERP
Electrical data	
Range (internal antenna)	
▪ ETSI	▪ ≤ 1 m
▪ FCC	▪ ≤ 1 m
▪ CMIIT	▪ ≤ 1 m
Protocol	ISO 18000-62/-63
Transmission speed	≤ 300 kbps
Frequency accuracy	≤ ±10 ppm
Channel spacing	
▪ ETSI	▪ 600 kHz
▪ FCC	▪ 500 kHz
▪ CMIIT	▪ 250 kHz
Modulation methods	ASK: DSB modulation & PR-ASK modulation encoding, Manchester or Pulse Interval (PIE)
Multitag capability	Yes

	6GT2811-6CC10-xAA0
Typical transmission time per byte	
• Write access	• 2 ms
• Read access	• 0.15 ms
Supply voltage	24 V DC (20 ... 30 V DC) 2)
Maximum permitted current consumption	0.3 A
Maximum permitted current consumption via DI/DQ interface	
• < 20 °C	• 0.5 A
• 55 °C	• 0.33 A
Current consumption (on standby), typical	
• 20 V input voltage on the reader	• 200 mA / 4 W
• 24 V input voltage on the reader	• 170 mA / 4.1 W
• 30 V input voltage on the reader	• 150 mA / 4.2 W
Current consumption (at 400 mW transmit power), typical	
• 20 V input voltage on the reader	• 260 mA / 5.2 W
• 24 V input voltage on the reader	• 220 mA / 5.3 W
• 30 V input voltage on the reader	• 170 mA / 5.1 W
Interfaces	
Antenna connectors	1x RP-TNC
Power supply	1x M12 (8-pin)
DI/DQ interface	1x M12 (5-pin)
Digital inputs	1
Digital outputs	1
Ethernet interface	1x M12 (4-pin), 100 Mbps
Mechanical specifications	
Material	Pocan (silicone-free)
Color	TI-Grey

	6GT2811-6CC10-xAA0
	
Permitted ambient conditions	
Ambient temperature	
▪ During operation	▪ -25 ... +55 °C
▪ During transportation and storage	▪ -40 ... +85 °C
Conditions relating to UL approval	▪ for indoor use only (dry location) ▪ Mounting height shall be equal or less than 2 m (MS1 classification according UL/IEC 62368-1). La hauteur de montage doit être égale ou inférieure à 2 m (classification MS1 selon CEI 62368-1).
Degree of protection	IP67
Shock resistant to EN 60068-2-27	25.5 g 3)
Vibrations according to EN 60068-2-6	0.1 g 3)
Design, dimensions and weight	
Dimensions (W × H × D)	155 × 133 × 45 mm
Weight	370 g
Type of mounting	VESA 100 4x screws M4 (1.5 Nm)
Operation indicator	6 LEDs
Status display	1 LED (enclosure, all-round)
Standards, specifications, approvals	
Proof of suitability	EN 301 489-1 V2.2.0 / EN 301 489-3 V2.1.1 / EN 302 208 V3.1.1 FCC CFR 47, Part 15 section 15.247
MTBF	29 years





1) Measured at the output of the antenna socket.

2) All supply and signal voltages must be safety extra low voltage (SELV/PELV according to EN 60950). All voltage sources must meet the requirements of limited power sources (LPS) and NEC Class 2.
Note that, depending on the power consumption, using extension cables > 20 m (6GT2891-4FN50) may lead to a voltage drop on the reader. This voltage drop can mean that the necessary minimum voltage on the reader is below the required 20 V.

3) The values for shock and vibration are maximum values and must not be applied continuously. These values only apply to mounting using screws.

5.3.6 Dimension drawing

Figure 5-14 Dimension drawing RF615R

All dimensions in mm (± 0.5 mm tolerance)

5.3.7 Certificates and approvals

5.3.7.1 CE mark

Note

Marking on the readers according to specific approval

The certificates and approvals listed here apply only if the corresponding mark is found on the readers.

Table 5- 20 6GT2811-6CC10-0AA0

Labeling	Description
	Conformity with the RED directive 2014/53/EU Conformity with the RoHS directive 2011/65/EU

5.3.7.2 Country-specific certifications

Table 5- 21 6GT2811-6CC10-1AA0

Labeling	Description
Federal Communications Commission	FCC CFR 47, Part 15 section 15.247 Radio Frequency Interference Statement This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. FCC ID: NXW-RF615R
Industry Canada Radio Standards Specifications	RSS-247 Issue 2 IC: 267X-RF615R
	This product is UL-certified for the USA and Canada. It meets the following safety standard(s): UL/IEC 62368-1, 2nd Ed CAN/CSA C22.2 No. 62368-1-14, 2nd Ed Audio/video, information and communication technology equipment - Part 1: Safety requirements

Table 5- 22 6GT2811-6CC10-2AA0

Standard	
CMIIT Certification	China radio approval Marking on the reader: CMIIT ID: 2019DJ2356

5.3.7.3 FCC information

Siemens SIMATIC RF615R (FCC): 6GT2811-6CC10-1AA0

FCC ID: NXW-RF615R

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.

Caution

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules.

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.

FCC Notice

To comply with FCC part 15 rules in the United States, the system must be professionally installed to ensure compliance with the Part 15 certification.

It is the responsibility of the operator and professional installer to ensure that only certified systems are deployed in the United States. The use of the system in any other combination (such as co-located antennas transmitting the same information) is expressly forbidden.

FCC Exposure Information

To comply with FCC RF exposure compliance requirements, the antennas used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

5.3.7.4 IC-FCB information

Siemens SIMATIC RF615R (FCC): 6GT2811-6CC10-1AA0

IC: 267X-RF615R

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions:

(1) This device may not cause interference, and

(2) this device must accept any interference, including interference that may cause undesired operation of the device.

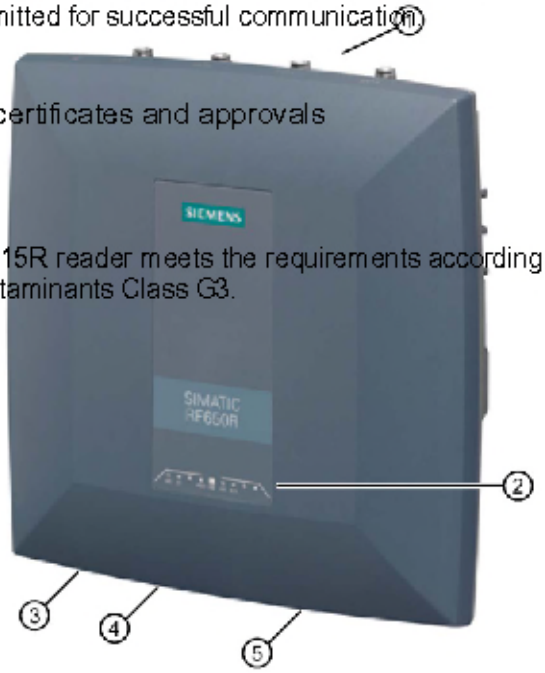
Le présent appareil est conforme aux CNR d`Industrie Canada applicables aux appareils radio exempts de licence. L`exploitation est autorisée aux deux conditions suivantes :

(1) L`appareil ne doit pas produire de brouillage, et

(2) l'utilisateur de l`appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d`en compromettre le fonctionnement.

Industry Canada Notice

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that permitted for successful communication.



5.3.7.5 Other certificates and approvals

ISA-S71.04-1985

RF615R reader meets the requirements according to ISA-S71.04-1985 Airborne Contaminants Class G3.

5.4 SIMATIC RF650R

5.4.1 Description

5.4.1.1 Overview

The SIMATIC RF650R is a stationary reader in the UHF frequency band without an integrated antenna. Up to four external UHF RFID antennas can be connected via RP-TNC connectors.

The maximum transmit power is 1000 mW at the reader output. A radiated power of up to 2000 mW ERP / 4000 mW EIRP is achieved when the appropriate antennas and antenna cables are used. The interfaces (Ethernet, power supply, DI/DQ interface) are located on the lower front edge. These interfaces can be used to connect the reader to the power supply and a PC for parameter assignment.

The degree of protection is IP30.

	Pos.	Description
	①	RP-TNC interfaces for connecting up to 4 external antennas
	②	LED operating display
	③	DI/DQ interface: X10 DI/DQ (M12, 12-pin)
	④	Interface to power supply (RS422), 24 V DC [1]: X80 DC24V (M12, 8-pin)
	⑤	Ethernet interface, TCP/IP: X1 P1 (RJ45, 8-pin)

5.4.1.2 Ordering data

Table 5- 23 Ordering data RF650R

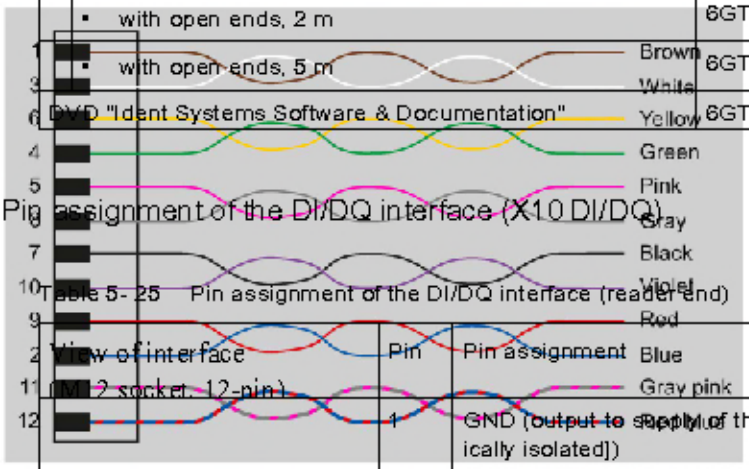
Product	Article number
RF650R (ETSI)	6GT2811-6AB20-0AA0
RF650R (FCC)	6GT2811-6AB20-1AA0
RF650R (CMIIT)	6GT2811-6AB20-2AA0
RF650R (ARIB)	6GT2811-6AB20-4AA0

Table 5- 24 Ordering data accessories

Product		Article number
Holders for securing the reader ▪ DIN rail T35 (S7-1200) ▪ S7-300 standard rail ▪ S7-1500 standard rail		6GT2890-0AB00
SIMATIC antenna holder for RF600 devices		6GT2890-2AB10
Connecting cable and connectors		
▪ DI/DQ cable connector open cable ends	5 m	6GT2891-0CH50
▪ Ethernet plug Standard IE FastConnect RJ45 180 (IP20)		6GK1901-1BB10-2AA0
▪ Industrial Ethernet cable RJ45 / RJ45	10 m	6XV1870-3QN10
▪ Industrial Ethernet connecting cable M12-180 / RJ45	2 m	6XV1871-5TH20
	3 m	6XV1871-5TH30
	5 m	6XV1871-5TH50
▪ Industrial Ethernet cable by the meter, green (minimum 20 m)		6XV1840-2AH10
▪ Connecting cable reader ↔ CM M12-180 / M12-180	2 m	6GT2891-4FH20
	5 m	6GT2891-4FH50
	10 m	6GT2891-4FN10
	20 m	6GT2891-4FN20
	50 m	6GT2891-4FN50
Wide-range power supply unit for SIMATIC RF systems		
▪ With EU plug		6GT2898-0AC00
▪ With UK plug		6GT2898-0AC10
▪ With US plug		6GT2898-0AC20

Product	Article number
24 V connecting cable reader ↔ wide-range power supply unit	
▪ with plug, 5 m	6GT2891-0PH50
▪ with open ends, 2 m	6GT2891-4EH20
▪ with open ends, 5 m	6GT2891-4EH50
DVD "Ident Systems Software & Documentation"	6GT2080-2AA20

5.4.1.3 Pin assignment of the DI/DQ interface (X10 DI/DQ)



View of interface (M12 socket, 12-pin)

Table 5- 25 Pin assignment of the DI/DQ interface (reader end)

Pin	Pin assignment
1	GND (output to supply of the digital inputs/outputs [not galvanically isolated])
2	VCC (output to the supply of the digital inputs/outputs [not galvanically isolated])
3	DO Common / Output Common
4	DO 0 / Output 00
5	DO 1 / Output 01
6	DO 2 / Output 02
7	DO 3 / Output 03
8	DI 0 / Input 00
9	DI Common / Input Common
10	DI 1 / Input 01
11	DI 2 / Input 02
12	DI 3 / Input 03

Note

Requirement for external power sources

When the DI/DQ interface is supplied with power by an external power source, this source must meet the requirements for LPS (Limited Power Sources) and NEC Class 2.

Color scheme of the DI/DQ standard cable with M12 connector

The following figure shows the color scheme of the DI/DQ standard cable from Siemens (6GT2891-0CH50). You can use the color scheme to assign the wire colors to the pins.

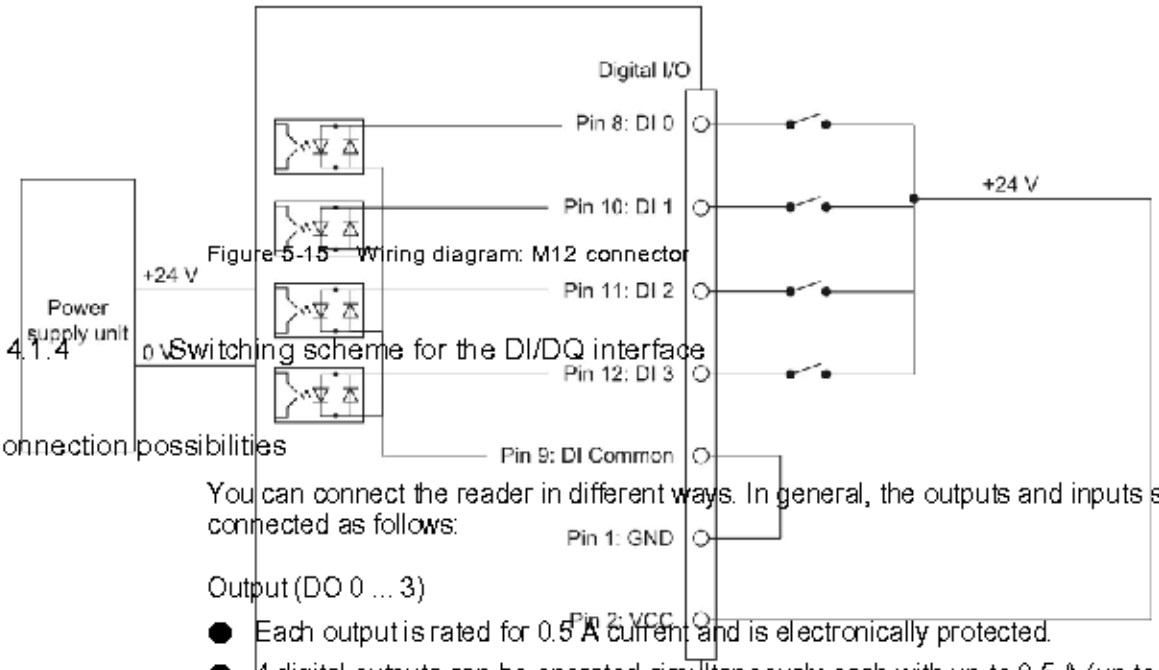


Figure 5-15 Wiring diagram: M12 connector

5.4.1.4 Switching scheme for the DI/DQ interface

Connection possibilities

You can connect the reader in different ways. In general, the outputs and inputs should be connected as follows:

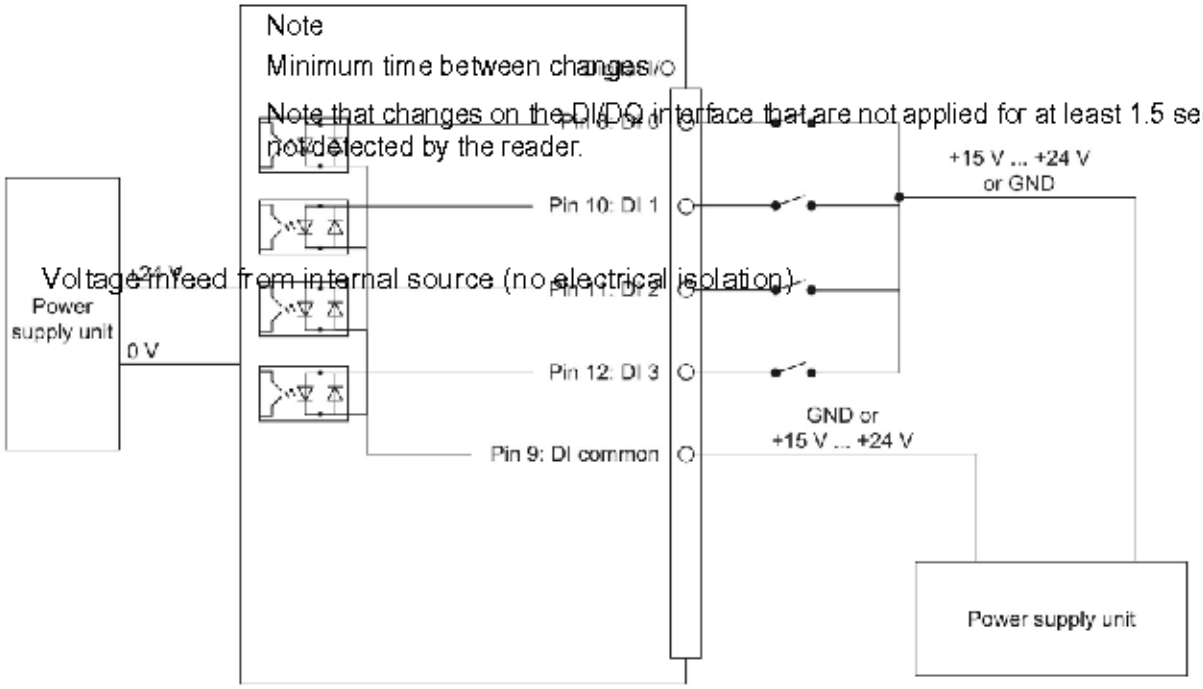
Output (DO 0 ... 3)

- Each output is rated for 0.5 A current and is electronically protected.
- 4 digital outputs can be operated simultaneously each with up to 0.5 A (up to 1 A in total). With a total current > 1 A, you need to use an external power supply.
- The outputs are optically isolated through optocouplers.

input (DI 0 ... 3)

- The inputs are optically isolated through optocouplers.
- Level
  - Low: 0 ... 7 V
  - High: 15 ... 24 V

The following diagrams illustrate various connection possibilities.



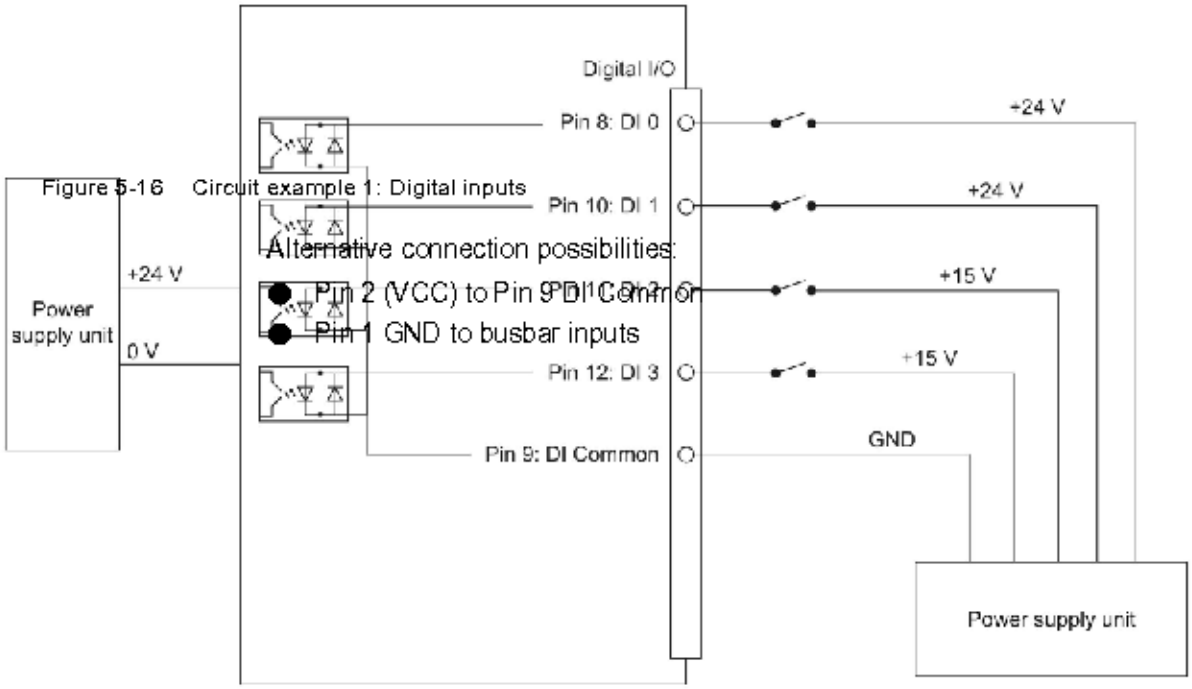


Figure 5-16 Circuit example 1: Digital inputs

Alternative connection possibilities:

- Pin 2 (VCC) to Pin 9 DI Common
- Pin 1 GND to busbar inputs

Voltage infeed from external source

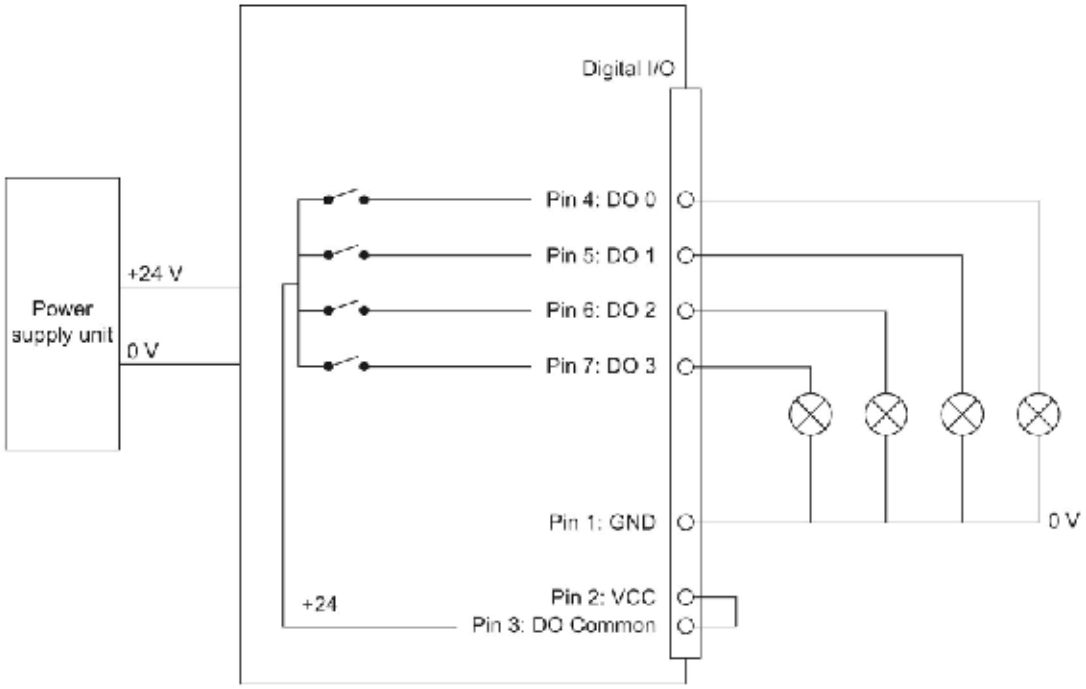


Figure 5-17 Circuit example 2: Digital inputs

Voltage infeed from external source with various voltages

Figure 5-18 Circuit example 3: Digital inputs

Voltage infeed from internal source

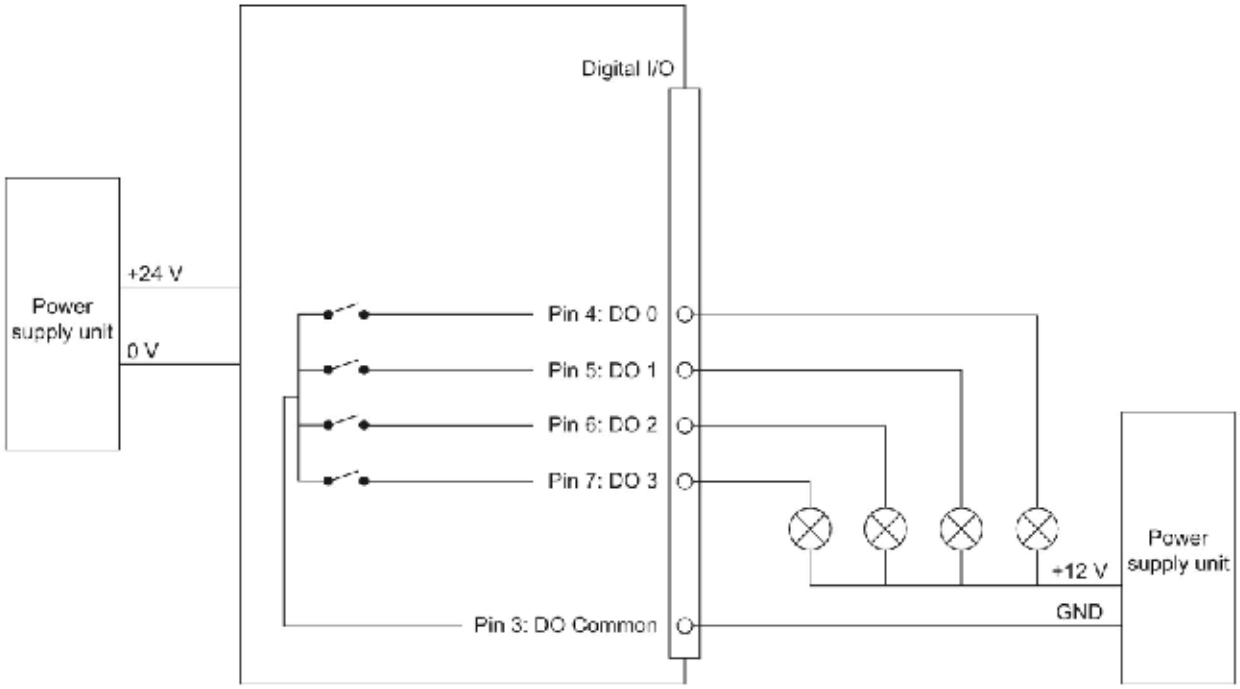


Figure 5-19 Circuit example 4: Digital outputs

Alternative connection possibilities:

- Pin 1 GND to Pin 3 DO Common
- Pin 2 (VCC) to busbar outputs

Voltage infeed from external source

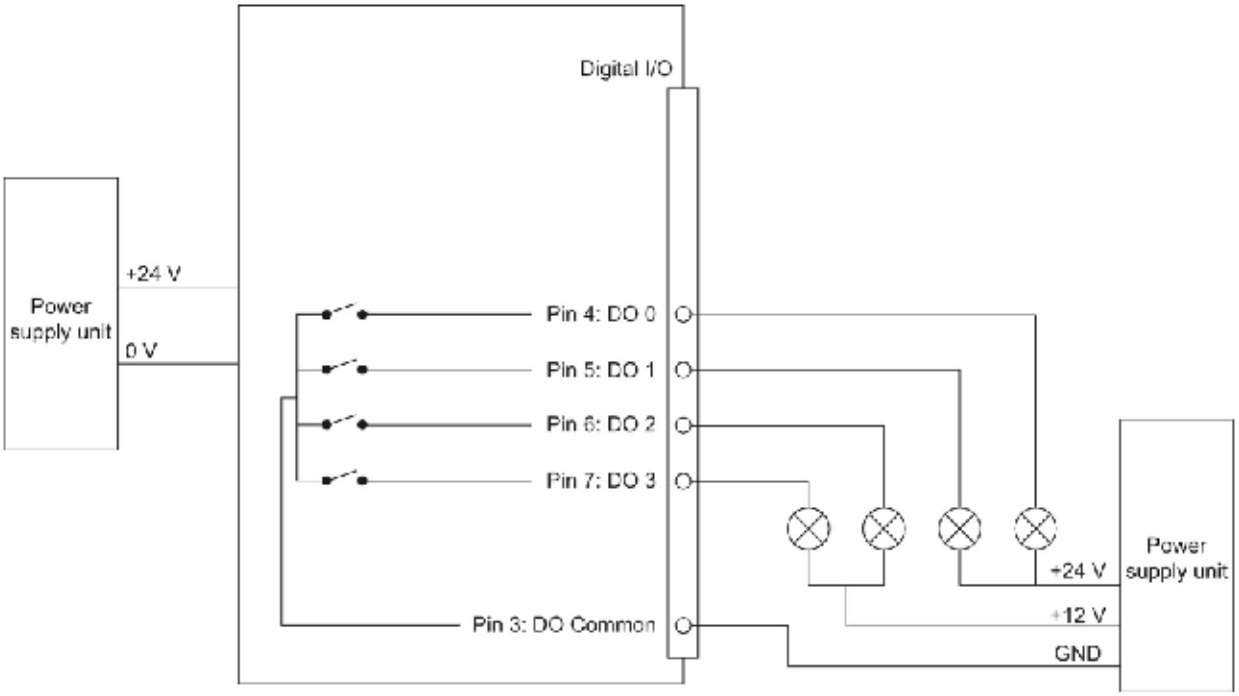


Figure 5-20 Circuit example 5: Digital outputs

Voltage infeed from an external source is shown here for 12 V as an example. Other voltages are also permissible.

Voltage infeed from external source with various voltages

Figure 5-21 Circuit example 6: Digital outputs

5.4.1.5 Pin assignment of the power supply interface (X80 24VDC)

Table 5- 26 Pin assignment of the RS422 interface (reader end)

View of interface (M12 socket, 8-pin)	Pin	Wire colors	Assignment
	1	White	+ 24 V
	2 [1]	Brown	- Tx
	3	Green	0 V
	4 [1]	Yellow	+ Tx
	5 [1]	Gray	+ Rx
	6 [1]	Pink	- Rx
	7	--	Unassigned
	8	--	Earth (shield)

[1] These pins are not required if the reader is operated via Ethernet.

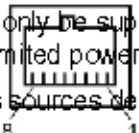
Note

Requirement for external power sources

The reader must only be supplied with power by power supply units that meet the requirements of LPS (Limited Power Source) and NEC Class 2.

Requirement for external power sources

The reader must only be supplied with power by power supply units that meet the requirementsof limited power source (LPS) and NEC Class 2.



Spécification des sources de tension externes

L'alimentation du plot de lecture/écriture doit être exclusivement assurée par des blocs d'alimentation conformes aux spécifications des sources à puissance limitée (Limited Power Sources LPS) et de NEC class 2.

Notes on connectors and cables

The cables with open cable ends (6GT2891-4EH20, 6GT2891-4EH50) have an 8-pin M12 plug at one end, while the other end of the cable is "open". There are 8 color-coded single wires there for connecting to external devices.

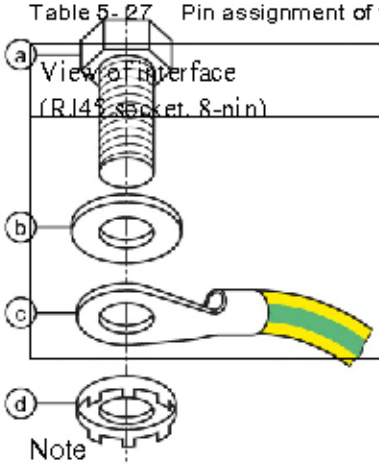
The product range includes additional cables of the type 6GT2891-4Fxxx (2 to 50 m) with an M12 connector at both ends. These cables can be used as extension cables. Long cables can be shortened if necessary.

NOTICE
Insulate unused single wires Unused single wires must be insulated individually to prevent unwanted connections of signals.

NOTICE
For long cables: Adapt the power supply and transmission speed Note that even with long cables, the supply voltage of 24 VDC must always be guaranteed. Note also that the transmission speed on the serial interface must, if necessary, be reduced. SIMATIC standard cables (e.g. 6GT2891-4FN10) have a loop resistance of 160 mOhm / meter. This results in a voltage drop of 0.8 volts on the 24 V cable for every 10 meters of connecting cable and with a power requirement of 500 mA. If the power requirement increases through the use of the digital inputs/outputs, the voltage drop increases accordingly.

5.4.1.6 Pin assignment of the Industrial Ethernet interface (X1 P1)

Table 5- 27 Pin assignment of the Industrial Ethernet interface (reader end)

View of interface (RJ45 socket, 8-pin)	Pin	Pin assignment
	1	Transmit Data (+)
	2	Transmit Data (-)
	3	Receive Data (+)
	4	Terminated
	5	Terminated
	6	Receive Data (-)
	7	Terminated
	8	Terminated

Note

Use of Siemens cables

We recommend that you only use original Siemens cables and connectors (refer to the section "Ordering data (Page 146)") to connect to the Ethernet socket of the reader. If plug-in connectors from other manufacturers are used, it may be difficult or even impossible to remove the plug from the reader.

5.4.1.7 Grounding connection

On the top of the reader there is a blind drill hole (M4 x 8) for grounding. Tighten the screw with a torque of 1.5 Nm.

WARNING
Hazardous voltage due to lightning strikes Death or serious injury may occur as a result of lightning strikes to antennas mounted outside buildings. If the reader is operated with antennas mounted outside buildings, it is imperative that the reader is electrically connected to the ground potential.

NOTICE
Installation only in protected areas The antenna can be installed in the protected part of a building. When implementing your lightning protection concept, make sure you adhere to the VDE 0182 or IEC 62305 standards.

Ground connection		
	(a)	Screw (M4 x 8)
	(b)	Flat washer
	(c)	Cable lug
	(d)	Contact washer

5.4.2 Planning operation

5.4.2.1 Antenna/read point configurations

You can connect up to four external antennas to the RF650R reader. The standard setting is that an antenna is connected when the reader is started. When connecting multiple antennas, note the information in the section "Specified minimum and maximum spacing of antennas (Page 46)".

With the WBM, you can set up various different configurations of antennas and/or reading points as required. Based on the number of data sources and subsequent assignment of the antennas, many tasks can be accomplished.

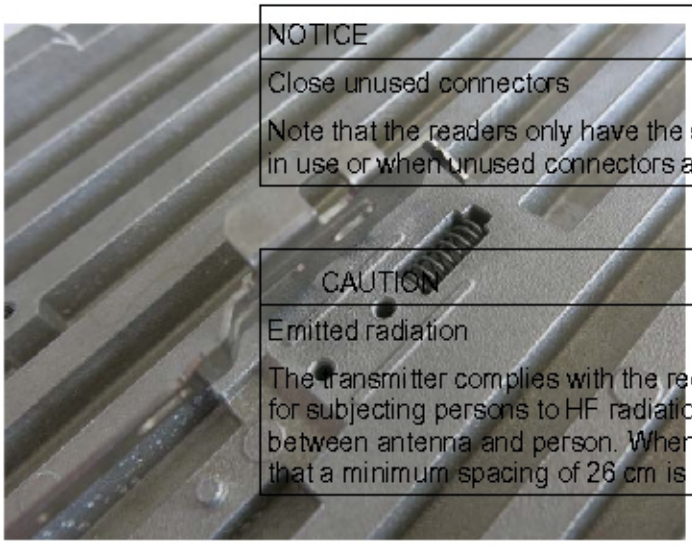
Examples of possible antenna reading point configurations

- Four data sources each with one antenna for four different reading points.
- Two data sources each with two antennas for small portals.
- One data source with 4 antennas for large portals.

You will find further information in the online help of the products.

5.4.3 Installation/mounting

Requirement



NOTICE

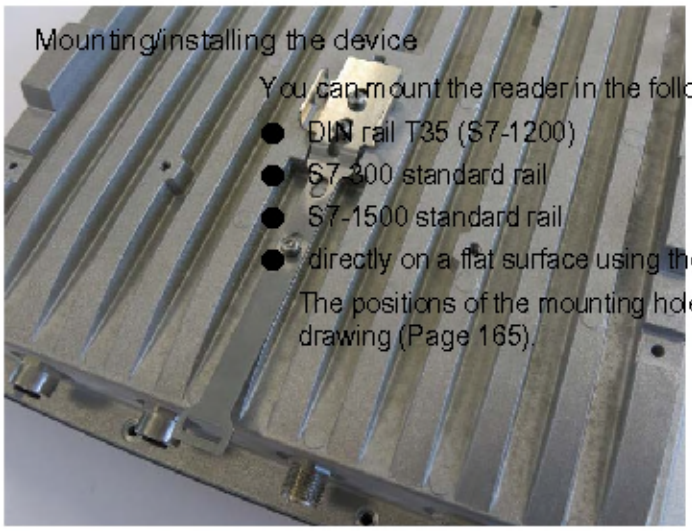
Close unused connectors

Note that the readers only have the specified degree of protection when all connectors are in use or when unused connectors are closed with the protective caps.

CAUTION

Emitted radiation

The transmitter complies with the requirements of Health Canada and the FCC limit values for subjecting persons to HF radiation, provided that a minimum spacing of 26 cm exists between antenna and person. When the antennas are installed, you must therefore ensure that a minimum spacing of 26 cm is maintained between personnel and antennas.



Mounting/installing the device

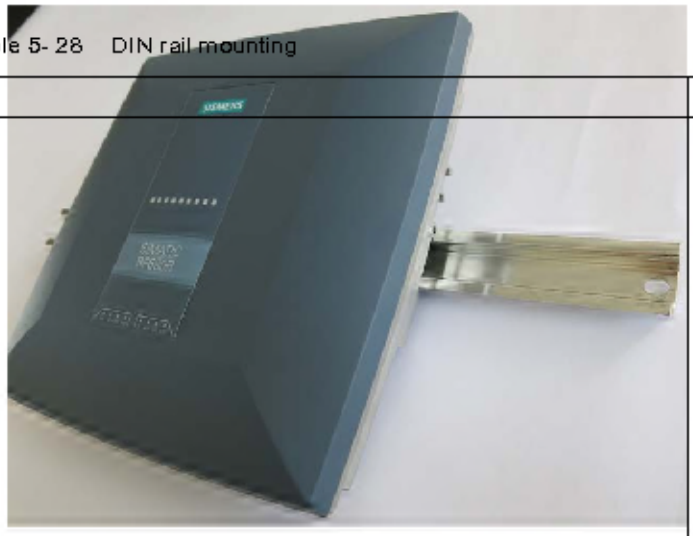
You can mount the reader in the following ways:

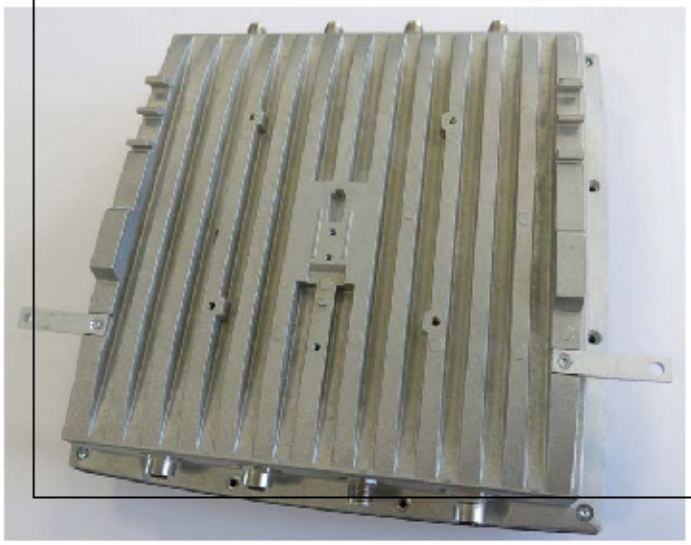
- DIN rail T35 (S7-1200)
- S7-300 standard rail
- S7-1500 standard rail
- directly on a flat surface using the VESA 100 mounting system (torque 1.5 Nm).

The positions of the mounting holes for the device are shown in the section Dimension drawing (Page 165).

Mounting the reader on a DIN/standard rail

Table 5- 28 DIN rail mounting

	Description	
	1.	Place the spring in the groove.
	2.	Mount the holder using the supplied Torx screws. When mounting the holder, make sure that the angled tip is positioned above the spring in the groove.

	Description	
	3.	Fit the lower part of the locking mechanism of the reader into the DIN rail. To be able to mount the reader on or remove it from the DIN rail, pull down the holder mounted in step 2.