

Module Integration Guide

UHF RFID Reader Module
#70117359 PH RADIO MODULE IUR-F191-FR2
FCC ID: IREIURF191
IC: 7037A-IURF191




CONFIDENTIAL acc. to ISO	Only valid as long as released in EDM!	scale:	date: 2022-08-22
 PEPPERL+FUCHS Mannheim	Module Integration Guide for #70117359	respons	14-4566
		DF.MSH	sheet 1 of 15

Table of Contents

1	General Description	4
1.1	Module description	4
1.2	Module features	4
1.3	Qualified personnel	4
1.4	Environmental conditions	4
1.5	Module components	4
1.6	Block Diagram	6
1.7	Interfacing of module	6
2	Mechanical characteristics	7
2.1	Housing	7
2.2	Dimensions	7
2.2.1	Minimum Distances	7
2.3	Labeling	7
2.4	Mounting host inside housing	8
2.4.1	PCB outline of host for integration into module housing	8
2.4.2	Position of host interface connector	8
2.4.3	Variants of host interface connectors	8
3	Electrical characteristics	9
3.1	Maximum Ratings	9
3.2	Pin definition	9
3.3	Supply voltage	9
3.4	Data Interface	9
3.5	ESD sensitivity	9
4	RF characteristics	10
4.1	Transmit characteristics	10
4.2	Hopping scheme	10
4.3	Antenna	10
4.3.1	Polarization	10
5	Firmware characteristics	11
5.1	Description of air interface	11
5.2	Country Identifier	11
5.3	Channel set and hopping	11
5.4	Indicator Elements	11
5.5	UART settings	11
5.5.1	Available commands and parameters	11
5.6	Special test modes needed for certification	11
6	FCC Regulatory Information	12
6.1	User Guide Requirements	12
6.2	Labeling Requirements	12
6.3	Approved Antennas	12

CONFIDENTIAL acc. to ISO	Only valid as long as released in EDM!	scale:	date: 2022-08-22
 PEPPERL+FUCHS Mannheim	Module Integration Guide for #70117359	respons	14-4566
		DF.MSH	sheet 2 of 15

7	IC Regulatory Information	13
7.1	User Guide Requirements	13
7.2	Labeling Requirements.....	13
7.3	Approved Antennas	13
8	Further Information to user	14
8.1	User Guide Requirements	14
9	Change history	15

CONFIDENTIAL acc. to ISO	Only valid as long as released in EDM!	scale:	date: 2022-08-22
 PEPPERL+FUCHS Mannheim	Module Integration Guide for #70117359	respons	14-4566
		DF.MSH	sheet 3 of 15

1 General Description

1.1 Module description

The module operates in the UHF frequency range and is optimized for use in industrial applications involving shorter distances. The device reads and writes passive tags in line with EPC Generation 2 (ISO/IEC 18000-63). The module can be used in the United States and Canada. The module is compliant with the relevant transmission regulations. Wide range of options supported for filtering data. The user can monitor the status of the module using the integrated LEDs. The module has a typical detection range of around 1 meter; this range is determined by the tag used and can be adjusted by configuring the transmission power. Other influencing factors include the setup and installation of the specific application and the surrounding materials, particularly metal. The read and write distances for the relevant tag, which are detailed separately, have been established in a test laboratory under ideal conditions. For the actual read and write distances under real conditions, the combination of module and tag must be tested in the desired application. The radio module can be interfaced to various industrial busses by host product.

1.2 Module features

- Flexible UHF read/write module with short detection range
- Compact and robust housing for harsh industrial environments
- Circular antenna polarization ensures reliable transponder detection and improves process flow
- Multi-tag reading of up to 20 tags ensures increased productivity
- Provides simple interface for host products

1.3 Qualified personnel

Only appropriately trained and qualified personnel may carry out mounting, installation, commissioning, operation, maintenance, and dismounting of the product. The personnel must have read and understood the instruction manual and the further documentation. Prior to using the product make yourself familiar with it. Read the document carefully.

1.4 Environmental conditions

Operating or storing the module outside the specified range may damage the module. Also this could lead to incorrect operation of desired module functionality.

Table 1 Environmental operating conditions

Absolute maximum rating	Value
Operation temperature (with non-transmission periods, adjustable)	-25 ... +70°C
Operation temperature (Continuous transmission mode)	-25 ... +60°C
Storage temperature	-40 ... +85°C

1.5 Module components

The radio module consist of 1 PCB with the electronic components and attached patch antenna element. The housing is part of module as it acts as antenna mounting.


CONFIDENTIAL acc. to ISO	Only valid as long as released in EDM!	scale:	date: 2022-08-22
 PEPPERL+FUCHS Mannheim	Module Integration Guide for #70117359	respons	14-4566
		DF.MSH	sheet 4 of 15



Figure 1 Example of module housing (with host to user connector mounted)

The top cover can be supplied in multiple color variants without affecting the module approval.

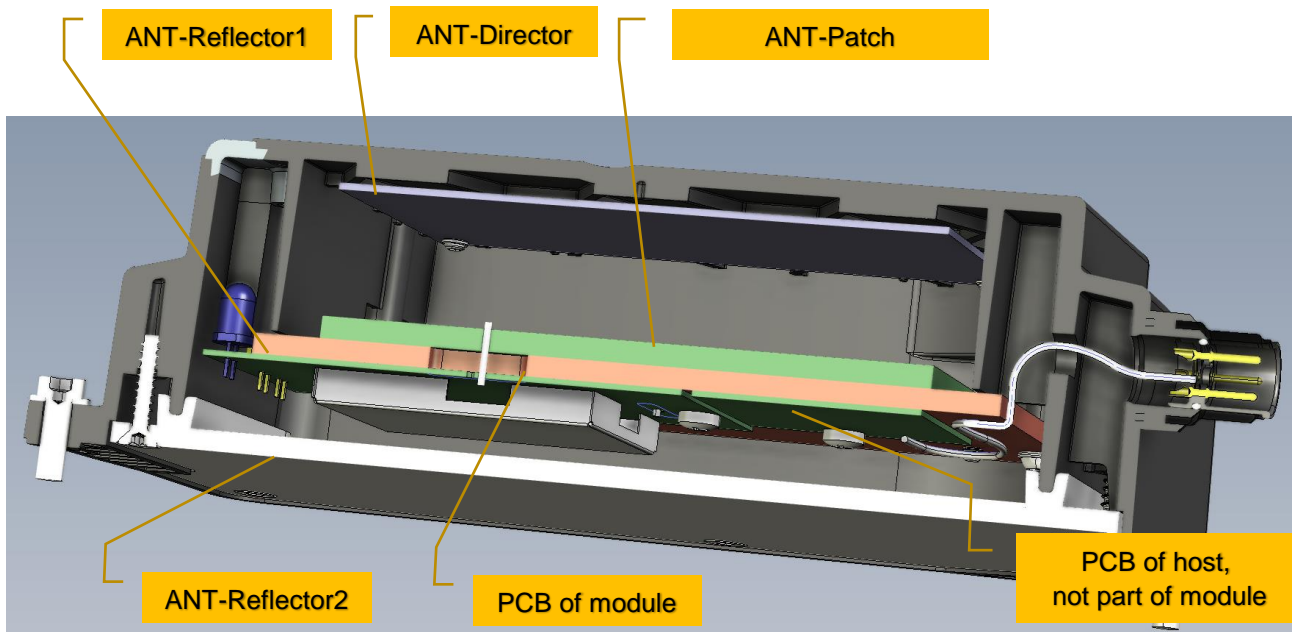



Figure 2 stack up of radio module (housing cut for visualization)

CONFIDENTIAL acc. to ISO	Only valid as long as released in EDM!	scale:	date: 2022-08-22
 PEPPERL+FUCHS Mannheim	Module Integration Guide for #70117359	respons	14-4566
		DF.MSH	sheet 5 of 15

1.6 Block Diagram

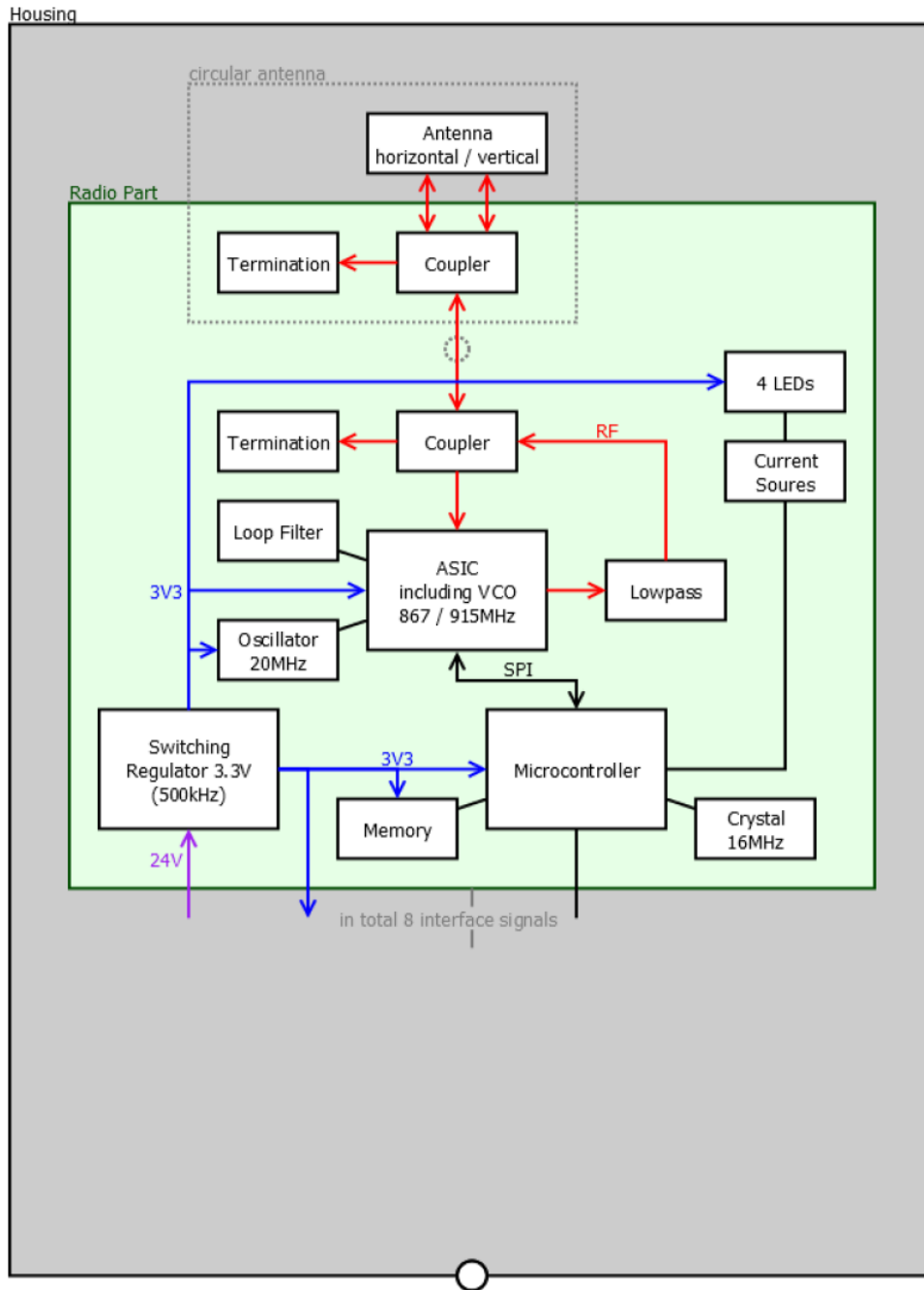



Figure 3 Block diagram

1.7 Interfacing of module

The interfacing of module is made in host product, which provides the typical 24V supply to the module. Also the digital interface of RFID reader is interfaced via serial interface at CMOS Levels. The housing of module is designed to be able to contain the host product as well and a variable amount of external connectors.

CONFIDENTIAL acc. to ISO	Only valid as long as released in EDM!	scale:	date: 2022-08-22
 PEPPERL+FUCHS Mannheim	Module Integration Guide for #70117359	respons	14-4566
		DF.MSH	sheet 6 of 15

2 Mechanical characteristics

2.1 Housing

The housing of module can also be the housing of end product, as there is space for implementing the interface PCB beside the RFID reader module. The housing can therefore be modified in part of external connection, as long as the module parts are not touched.

2.2 Dimensions

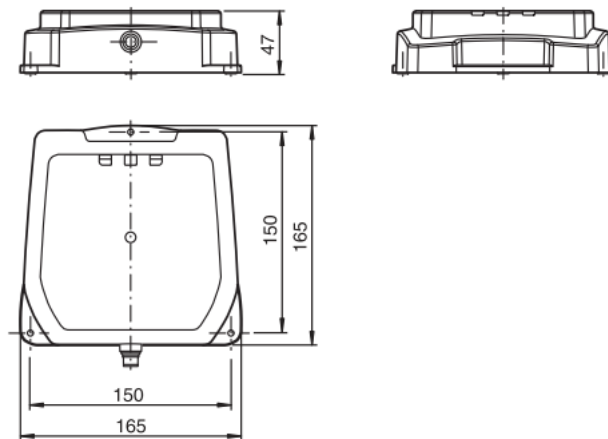


Figure 4 Dimensions of module housing (without host connections, one host connector showed for visualization)

2.2.1 Minimum Distances

When positioning the housing, please observe the minimum distances. The lateral distance between the housing and metals or liquids should be at least 50 cm. The distance between the housing and the ground should be at least 50 cm.

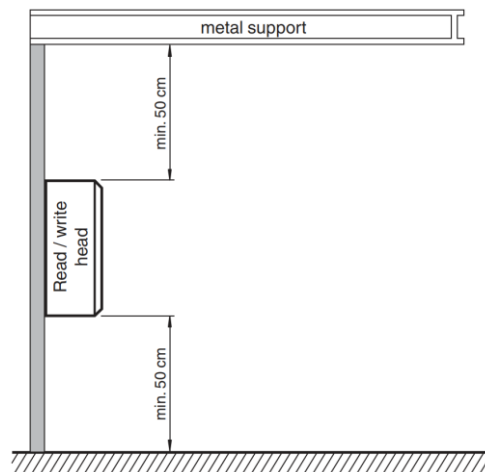



Figure 5 minimum distances

2.3 Labeling

The labeling of the module is applied on the shielding of module. The top cover of module may be used for host product labeling.

CONFIDENTIAL acc. to ISO	Only valid as long as released in EDM!	scale:	date: 2022-08-22
 PEPPERL+FUCHS Mannheim	Module Integration Guide for #70117359	respons	14-4566
		DF.MSH	sheet 7 of 15

2.4 Mounting host inside housing

2.4.1 PCB outline of host for integration into module housing


A 3D model of module can be requested by module integrator under a non-disclosure agreement.

2.4.2 Position of host interface connector

A 3D model of module containing position of interface connector can be requested by module integrator under a non-disclosure agreement.

2.4.3 Variants of host interface connectors

The housing has a connection area where different connection variants can derive from the module housing, without having influence on the modular approval of radio part. For this purpose the connection area is designed without touching the inner module parts and the shielding volume. The connection can be made by 1 or by multiple connectors. These connections are located outside the scope of approval and are only connected to the interface PCB (host part).

CONFIDENTIAL acc. to ISO	Only valid as long as released in EDM!	scale:	date: 2022-08-22
 PEPPERL+FUCHS	Module Integration Guide for #70117359	respons	14-4566
Mannheim		DF.MSH	sheet 8 of 15

3 Electrical characteristics

3.1 Maximum Ratings

Table 2 Electrical operating conditions

maximum ratings	Value
Supply voltage	typical 24V DC, allowed range of 10 ... 30V DC
All digital interfacing signals	3.3V LVCMOS

3.2 Pin definition

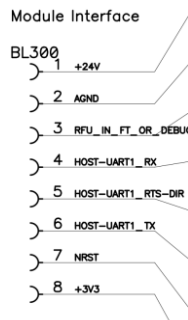


Figure 6 Pinning of module to host connection

Table 3 Pinning of module to host connection

Pin	Usage radio module	Direction	Usage host	Level
1	Supply voltage into module	To module	Provide supply here	10 ... 30V DC
2	GROUND	Bidirectional	GROUND	
3	Reserved		DO NOT CONNECT	
4	UART	To module	Serial data from host to module	3.3V LVCMOS
5	UART direction	To host	Low = RX/ High = TX is active	3.3V LVCMOS
6	UART	To host	Serial data from module to host	3.3V LVCMOS
7	RESET input	To module	Pull to low level, to reset module	3.3V LVCMOS
8	3V3 supply output	To host	max 50mA supply for host	3.3V

3.3 Supply voltage

Nominal power supply voltage is 24 VDC; voltage range is 10 ... 30 VDC.
 Supply must be SELV (Safety Extra Low Voltage).
 The current consumption is <=90mA at nominal voltage 24 VDC.
 The power consumption is <=2.2W.

3.4 Data Interface

UART interface is used for module configuration and RFID data transfer.

3.5 ESD sensitivity

The digital interfacing signals must be protected against electro static discharge on host side, if made available to end user.

CONFIDENTIAL acc. to ISO	Only valid as long as released in EDM!	scale:	date: 2022-08-22
 Mannheim	Module Integration Guide for #70117359	respons	14-4566
		DF.MSH	sheet 9 of 15

4 RF characteristics

4.1 Transmit characteristics

- UHF frequency range: 902 MHz ... 928 MHz
- Radiated Power: 3 ... 150 mW_{EIRP}; Default setting = 150 mW_{EIRP}
- Channel bandwidth: 500 kHz
- Channel spacing: 500 kHz
- Frequency access method: frequency hopping spread spectrum
- Number of channels: 50
- Channels used: 1, 2, 3, ... 50
Center frequencies: 902.25 MHz + (M x 0.5) MHz
All 50 channels are used according to pseudo random hopping scheme.

4.2 Hopping scheme

The ISM band from 902 MHz ... 928 MHz is available in the USA / Canada. The band is split into 50 channels, each with a 500 kHz bandwidth. FHSS with a maximum retention time of 0.4 seconds is used. All channels must be used. Channel restriction is not permitted. A pseudo random hopping scheme is used.

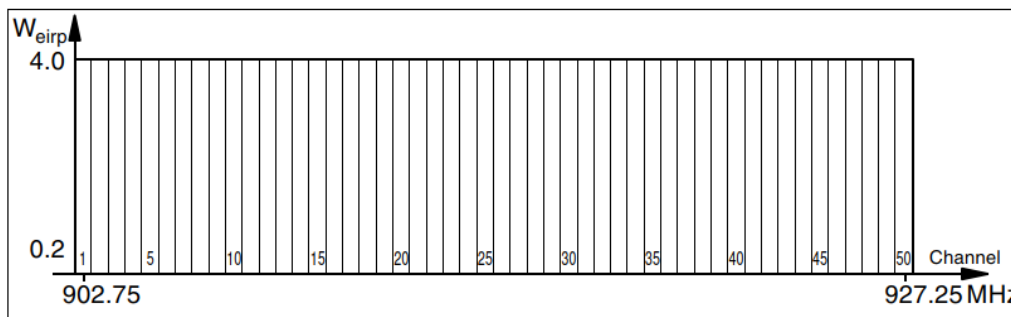


Figure 7 hopping scheme

4.3 Antenna

4.3.1 Polarization

The module has an integrated circular polarized antenna. This increases the reading reliability of tags with an unknown location in the room.

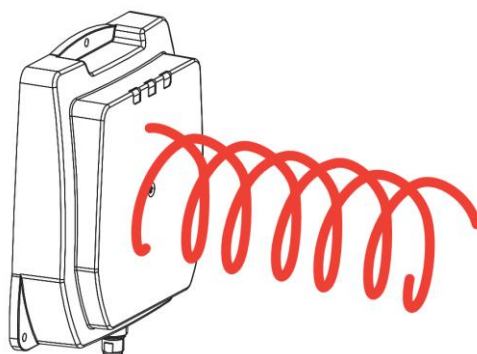



Figure 8 Polarization of integrated antenna

CONFIDENTIAL acc. to ISO	Only valid as long as released in EDM!	scale:	date: 2022-08-22
 PEPPERL+FUCHS Mannheim	Module Integration Guide for #70117359	respons	14-4566
		DF.MSH	sheet 10 of 15

5 Firmware characteristics

5.1 Description of air interface

For detailed information about the air interface protocol please refer to EPC Gen 2 (ISO/IEC 18000-63) and GS1 organization (<https://www.gs1.org/>).

5.2 Country Identifier

The module operates within their maximum frequency range with the appropriate settings for the relevant country. The country-specific settings are configured during production and cannot be subsequently modified.

5.3 Channel set and hopping

The number and position of the frequencies is fixed and cannot be changed by the user. All channels are used.

5.4 Indicator Elements

The module has 4 LEDs. The basic indicators denote:

- Green LED: Power on
- Blue LED: Transmission mode
- Yellow LED: Read/write operation successful
- Red LED: Error state

5.5 UART settings

The default interface setting is:


- 38400 baud
- 8 data bits
- 1 stop bit
- no parity
- no flow control

5.5.1 Available commands and parameters

The full command and parameter set can be requested under a non-disclosure agreement.

5.6 Special test modes needed for certification

For certification a firmware including test modes can be requested by test laboratory under a non-disclosure agreement. This firmware will not be available for end user.

CONFIDENTIAL acc. to ISO	Only valid as long as released in EDM!	scale:	date: 2022-08-22
 PEPPERL+FUCHS Mannheim	Module Integration Guide for #70117359	respons	14-4566
		DF.MSH	sheet 11 of 15

6 FCC Regulatory Information

6.1 User Guide Requirements

FCC Information

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: 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 A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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 30 cm from all persons and must not be co-located or operated in conjunction with any other antenna or transmitter.

Warning!

Malfunctions with pacemakers


This device does not exceed the permissible limits for electromagnetic fields. Maintain a minimum distance of 30 cm between the device and your pacemaker. Inadequate distance from the transmitter antenna can result in inhibitions, reprogramming, or incorrect stimulation pulses.

6.2 Labeling Requirements

Contains FCC ID: IREIURF191

6.3 Approved Antennas

Only module internal antenna can be used.

CONFIDENTIAL acc. to ISO	Only valid as long as released in EDM!	scale:	date: 2022-08-22
 PEPPERL+FUCHS Mannheim	Module Integration Guide for #70117359	respons	14-4566
		DF.MSH	sheet 12 of 15

7 IC Regulatory Information

7.1 User Guide Requirements

IC Information

This device complies with Industry Canada license exempt RSS standard(s) and with part 15 of the FCC Rules. 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.

IC Exposure Information

To comply with IC RF exposure compliance requirements, the antennas used for this transmitter must be installed to provide a separation distance of at least 30 cm from all persons and must not be co-located or operated in conjunction with any other antenna or transmitter.

Warning!

Malfunctions with pacemakers

This device does not exceed the permissible limits for electromagnetic fields. Maintain a minimum distance of 30 cm between the device and your pacemaker. Inadequate distance from the transmitter antenna can result in inhibitions, reprogramming, or incorrect stimulation pulses.

Warning!

Dysfonctionnement du stimulateur cardiaque


Cet appareil ne dépasse pas les limites admissibles pour les champs électromagnétiques. Maintenez une distance minimale de 30 cm entre l'appareil et votre stimulateur cardiaque. Si la distance à la tête de émetteur est trop courte, des impulsions d'inhibition, de reprogrammation ou de stimulation incorrecte peuvent se produire.

7.2 Labeling Requirements

Contains IC: 7037A-IURF191

7.3 Approved Antennas

Only module internal antenna can be used.

CONFIDENTIAL acc. to ISO	Only valid as long as released in EDM!	scale:	date: 2022-08-22
 PEPPERL+FUCHS Mannheim	Module Integration Guide for #70117359	respons	14-4566
		DF.MSH	sheet 13 of 15

8 Further Information to user

8.1 User Guide Requirements

Caution!

Mounting the read/write head

Make sure that the read/write head is firmly attached to the mounting surface.


Caution!

Assemblage de la tête de lecture / écriture

Assurez-vous que la tête de lecture / écriture est fermement connectée à la terre.


Note!

Do not route the connection cable in the detection range of the antenna.

CONFIDENTIAL acc. to ISO	Only valid as long as released in EDM!	scale:	date: 2022-08-22
 PEPPERL+FUCHS Mannheim	Module Integration Guide for #70117359	respons	14-4566
		DF.MSH	sheet 14 of 15

9 Change history

Version	Date	Author	Remarks
14-4566	2027-08-22	Martin Schmitt	Initial released version

CONFIDENTIAL acc. to ISO	Only valid as long as released in EDM!	scale:	date: 2022-08-22
 PEPPERL+FUCHS Mannheim	Module Integration Guide for #70117359	respons	14-4566
		DF.MSH	sheet 15 of 15