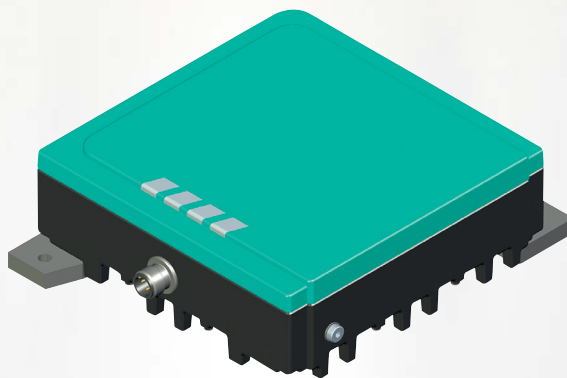


**IUH1-F7xx-V1-FR\***

# **UHF RFID Read/Write Devices for IDENTControl**

**Manual**



**IDENTControl**

Your automation, our passion.

**PEPPERL+FUCHS**

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#### **Worldwide**

Pepperl+Fuchs Group  
Lilienthalstr. 200  
68307 Mannheim  
Germany  
Phone: +49 621 776 - 0  
E-mail: [info@de.pepperl-fuchs.com](mailto:info@de.pepperl-fuchs.com)

#### **North American Headquarters**

Pepperl+Fuchs Inc.  
8093 Darrow Road  
Twinsburg, Ohio 44087  
+1 330 425-3555  
[sales@us.pepperl-fuchs.com](mailto:sales@us.pepperl-fuchs.com)  
United States of America  
E-mail: [sales@us.pepperl-fuchs.com](mailto:sales@us.pepperl-fuchs.com)

#### **Asia Headquarters**

Pepperl+Fuchs Pte. Ltd.  
P+F Building  
18 Ayer Rajah Crescent  
Singapore 139942  
Phone: +65 6779-9091  
E-mail: [sales@sg.pepperl-fuchs.com](mailto:sales@sg.pepperl-fuchs.com)  
<https://www.pepperl-fuchs.com>

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# 1 Introduction

## 1.1 Content of this Document

This document contains information that you need in order to use your product throughout the applicable stages of the product life cycle. These can include the following:

- Product identification
- Delivery, transport, and storage
- Mounting and installation
- Commissioning and operation
- Maintenance and repair
- Troubleshooting
- Dismounting
- Disposal



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**Note**

For full information on the product, refer to the further documentation on the Internet at [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com).

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**Note**

For specific device information such as the year of construction, scan the QR code on the device. As an alternative, enter the serial number in the serial number search at [www.pepperl-fuchs.com/device-information](http://www.pepperl-fuchs.com/device-information).

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The documentation consists of the following parts:

- Present document
- Datasheet

Additionally, the following parts may belong to the documentation, if applicable:

- EU-type examination certificate
- EU declaration of conformity
- Attestation of conformity
- Certificates
- Control drawings
- Instruction manual
- Functional safety manual
- Cybersecurity documentation
- Other documents

## 1.2 Target Group, Personnel

Responsibility for planning, assembly, commissioning, operation, maintenance, and dismantling lies with the plant operator.

Only appropriately trained and qualified personnel may carry out mounting, installation, commissioning, operation, maintenance, and dismantling 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.

## 1.3 Intended Use

Always operate the device as described in these instructions. Only in this way, the safe function of the device and the connected systems is guaranteed.

The protection of operating personnel and plant is only given if the device is used in accordance with its intended use.

## 1.4 Symbols Used

This document contains symbols used to identify warning messages and informative messages.

### Warning messages

Warnings are provided whenever your actions may result in hazards. Always observe these warning messages to ensure your personal safety and to prevent property damage.

Depending on the level of risk, warnings are presented in descending order as follows:



#### **Danger!**

This symbol indicates an imminent danger.

Non-observance will result in personal injury or death.



#### **Warning!**

This symbol indicates a possible fault or danger.

Non-observance may cause personal injury or serious property damage.



#### **Caution!**

This symbol indicates a possible fault.

Non-observance could interrupt the device and any connected systems and plants, or result in their complete failure.

### Informative messages



#### **Note**

This symbol brings important information to your attention.



### Action

1. This symbol indicates a paragraph with instructions. You are prompted to perform an action or a sequence of actions.

## 1.5

### Definitions

The data representation format varies in the following documentation. The following formats are used:

#### ASCII

Example: "A"; "B"; "1"; "2"

An ASCII character corresponds to one byte.  $2^8 = 256$  different characters can be represented.

#### Binary

Example:  $1001_{\text{bin}}$

Binary numbers are indicated by the suffix  $_{\text{bin}}$ .

#### DECIMAL

Example: 1234

Decimal numbers are shown without any additional notation.

#### HEX

Example: 0x41; 0x42; 0x31; 0x32

The hexadecimal representation of a byte consists of two digits (e.g., 0x41). The section on the left side is the higher nibble (0x4). The lower nibble is on the right side (0x1). The range of values is between 0x00 ... 0xFF.



---

#### Note

In the TIA Portal from Siemens, hexadecimal numbers are displayed as follows:

#### Example:

16#00 (equivalent to 0x00)

---

## 1.6 Abbreviations and Terms

### Abbreviations

|             |                                                                        |
|-------------|------------------------------------------------------------------------|
| <b>AFI</b>  | <b>A</b> pplication <b>F</b> amily <b>I</b> dentifier                  |
| <b>CRC</b>  | <b>C</b> yclic <b>R</b> edundancy <b>C</b> heck                        |
| <b>EIRP</b> | <b>E</b> quivalent <b>I</b> sotopically <b>R</b> adiated <b>P</b> ower |
| <b>EPC</b>  | <b>E</b> lectronic <b>P</b> roduct <b>C</b> ode                        |
| <b>ERP</b>  | <b>E</b> ffective <b>R</b> adiated <b>P</b> ower                       |
| <b>FCC</b>  | <b>F</b> ederal <b>C</b> ommunications <b>C</b> ommission              |
| <b>FHSS</b> | <b>F</b> requency <b>H</b> opping <b>S</b> pread <b>S</b> pectrum      |
| <b>IC</b>   | <b>I</b> ndustry <b>C</b> anada                                        |
| <b>ISO</b>  | <b>I</b> nternational <b>S</b> tandardisation <b>O</b> rganisation     |
| <b>MDID</b> | <b>M</b> ask <b>D</b> esigner <b>I</b> dentifier                       |
| <b>PC</b>   | <b>P</b> rotocol <b>C</b> ontrol                                       |
| <b>RFID</b> | <b>R</b> adio <b>F</b> requency <b>I</b> dentification                 |
| <b>PLC</b>  | <b>P</b> rogrammable <b>L</b> ogic <b>C</b> ontroller                  |
| <b>Tag</b>  | Read/write tag; tag                                                    |
| <b>TID</b>  | <b>T</b> ag <b>I</b> dentifier                                         |
| <b>TMN</b>  | <b>T</b> ag <b>M</b> odel <b>N</b> umber                               |
| <b>UHF</b>  | <b>U</b> ltra- <b>H</b> igh <b>F</b> requency                          |
| <b>UII</b>  | <b>U</b> nique <b>I</b> tem <b>I</b> dentifier                         |

### Terms

|                        |                                                                                                 |
|------------------------|-------------------------------------------------------------------------------------------------|
| Read/write tag         | Mobile data carrier containing user data and a unique number                                    |
| Fixed code             | Unique and unchangeable number of a read/write tag                                              |
| IUC                    | Pepperl+Fuchs-specific designation of a UHF read/write tag                                      |
| ISO/IEC 18000-63       | Standard for data transmission in a UHF MHz-RFID system                                         |
| RFID read/write device | RFID read/write device with integrated IDENTControl interface for contactless data transmission |
| PLC                    | Programmable logic controller; device for controlling a machine or plant                        |

## 2 Cybersecurity

The device is secure developed according to IEC 62443-4-1 for the application area defined here.

To ensure cybersecure operation and to protect the device, implement the following measures.

### Security Context

The RFID read/write device is intended for operation on an IDENTControl RFID evaluation unit from Pepperl+Fuchs.

The Communication is realized via a proprietary, unencrypted, serial protocol.

No physical protection against unauthorized access is required.

### Maintenance and Management

Check the website regularly for security advisories publications: <https://www.pepperl-fuchs.com/cybersecurity>.

Report incidents to the manufacturer.

### Decommissioning

Reset the device to factory setting.

The device stores certain operating data permanently.

### 3 Certificates and approvals

#### 3.1 General

This manual applies to several types and variants of the device. The applicable approvals can be found in the relevant data sheet for your device. Further approvals are available on request.

#### 3.2 CE Marking

This product was developed and manufactured in line with the applicable European standards and directives.



**Note**

A Declaration of Conformity can be requested from the manufacturer or downloaded from [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com).

#### 3.3 FCC Compliance Statement

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.

**Attention:**

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.

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.

To comply with FCC RF exposure compliance requirements, the antennas used for this transmitter must be installed to provide a minimum separation distance from all persons as specified in the table below and must not be co-located or operated in conjunction with any other antenna or transmitter.

| Type/Design      | Minimum separation distance |
|------------------|-----------------------------|
| IUH1-F7xx-V1-FR* | 25 cm                       |



### 3.4 IC Compliance Statement

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's license-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique 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.
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

To comply with IC RF exposure compliance requirements, the antennas used for this transmitter must be installed to provide a minimum separation distance from all persons as specified in the table below and must not be co-located or operated in conjunction with any other antenna or transmitter.

| Type/Design      | Minimum separation distance |
|------------------|-----------------------------|
| IUH1-F7xx-V1-FR* | 25 cm                       |

### 3.5 IFT Information

This device complies with Federal Telecommunications Institute IFT 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.

Este dispositivo cumple con las normas del Instituto Federal de Telecomunicaciones IFT. La operación de este equipo está sujeta a las siguientes dos condiciones:

1. es posible que este equipo o dispositivo no cause interferencia perjudicial y
2. este equipo o dispositivo debe aceptar cualquier interferencia, incluyendo la que pueda causar su operación no deseada.

### 3.6 NCC-Information

The company, firm or user shall not

1. change the frequency,
2. increase the power or
3. change the features and functions of the original design of the certified low power RF equipment without approval.

The use of low-power RF equipment shall not affect flight safety or interfere with legal communications; if interference is found, it shall be immediately discontinued and improved until there is no interference before continued use.

The aforementioned legal communication refers to the radio communication operated in accordance with the Telecommunications Control Law. Low-power RF equipment shall tolerate interference with legal communications or radioactive electrical equipment for industrial, scientific and medical use.

取得審驗證明之低功率射頻器材，非經核准，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。低功率射頻器材之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。前述合法通信，指依電信管理法規定作業之無線電通信。低功率射頻器材須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

### 3.7 ANATEL-Information

This equipment is not entitled to protection against harmful interference and may not cause interference in duly authorized systems. For more information, consult the ANATEL website [www.anatel.gov.br](http://www.anatel.gov.br)

*Este equipamento não tem direito à proteção contra interferência prejudicial e não pode causar interferência em sistemas devidamente autorizados. Para maiores informações, consulte o site da ANATEL – [www.anatel.gov.br](http://www.anatel.gov.br)*

### 3.8 UL Information

This device may be operated in altitudes up to 5000 m.

The ambient temperature range is from -25 °C ... +70 °C for operation. The Pollution degree is 2.

The maximum relative humidity is 80 % for temperatures up to 31 °C decreasing linearly to 50 % relative humidity at 40 °C.

Nominal power supply voltage is 24 V<sub>DC</sub>, voltage range is 18 V ... 30 V<sub>DC</sub>. Supply must be LEC (Limited Energy Circuit), LPS (Limited Power Source) or CLASS 2. The Overvoltage Category II is applied.

The degree of protection is not included in the UL approval. The degree of protection is tested by Pepperl+Fuchs SE.

The ext. circuits intended to be connected to this unit shall be galv. separated from mains supply or hazardous live voltage by reinforced or double insulation and meet the limits of clauses 6.3 and 9.4 of UL 61010-1.



#### Caution!

##### Cable Specifications

The maximum permissible temperature of the connection cable must be at least +90 °C.

The minimum diameter of the connection cable must be 22 AWG or 0.34 mm<sup>2</sup>.

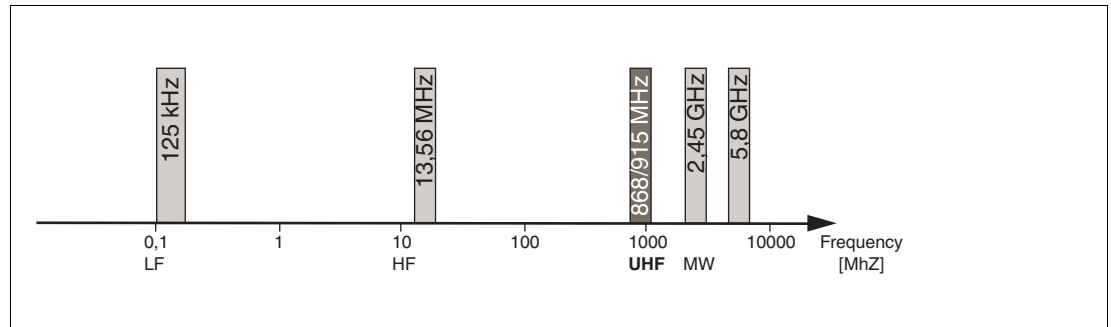
Connection cables with cULus / cURus approval (PVVA/7, PVVA2/8, CYJV/7, CYJV2/8) must be used.

The rated current of the connection cable must be at least 1 A (per pin/wire).

## 4 UHF general

### 4.1 RFID Frequency Bands

The following diagram shows the position of the different frequency bands used for RFID. The devices described in this manual operate in the frequency range from 865 MHz ... 868 MHz, and from 902 MHz ... 928 MHz, which is highlighted.



- 100 kHz ... 135 kHz: Low frequency (LF)
- 13.56 MHz: High frequency (HF)
- 860 kHz ... 960 MHz: Ultra-high frequency (UHF)

### 4.2 The Impact of Various Materials on the Detection Range

In the UHF frequency band, the properties of the environment and surface on which the tag is mounted strongly affect the system's read/write detection range. Therefore, the UHF tags cannot be mounted on metal without adjustments. For example, glass has a negative impact on the detection range when used as a mounting surface. When a UHF tag is mounted on damp materials, the detection range is worse compared to dry material.

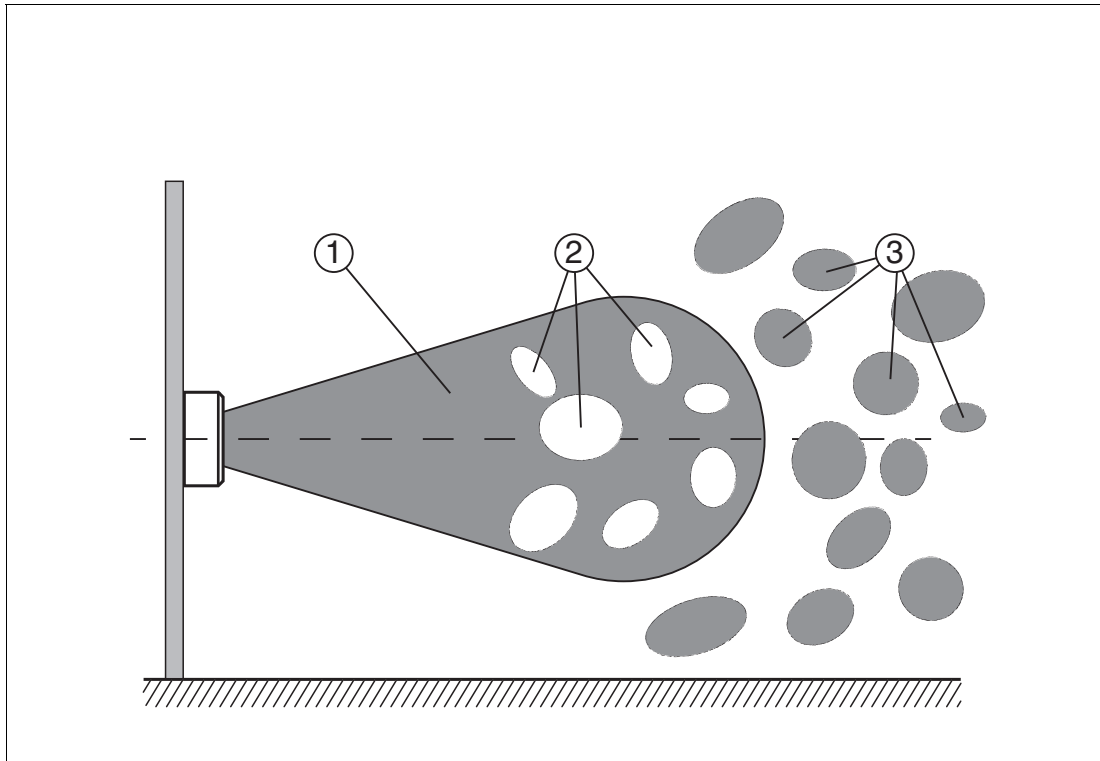
There are tags available that are optimized for mounting on metal or on an electrically conductive surface. They can be mounted on metal without an additional spacer. Check whether the tag used is suitable for the corresponding installation location. Information on this can be found on the datasheet of the tag. If these tags are mounted on plastic material or non-electrically conductive materials, the achievable sensing range can be reduced compared to mounting on metal.

Generally speaking, the sensing range always depends on the mounting surface material. It is therefore impossible to make a generalization about a tag's detection range. Only a statement with restrictions is possible. The detection range achieved with the currently set parameters must be checked at each installation point of an RFID read/write device. The transmitter radiated power can be used to affect the sensing range of the RFID read/write device. The transmitter radiated power must be set so that the read/write tag can be read securely at the lowest possible power level. An increase in the transmitter radiated power can lead to unintentional identification of nearby read/write tags. This unintentional identification of read/write tags in the vicinity of the RFID read/write device should also be checked.

### 4.3 Interference Due to Multipath Propagation

The electromagnetic waves radiated by the device do not just follow the direct route to the tag, but are reflected off objects in the environment. This means that multiple partial waves overlap.

This overlap causes interference in the form of excessive peaks or reductions of the field strength, leading to complete system degradation. Depending on the environment, several reflections may occur with differing intensity. These different reflections lead to a field strength in the sensing range that is difficult to predict. In the areas of reduction, the prevailing field strength is weaker than the minimum detection field strength of the tag. As a result, the tag cannot be activated for communication. Excessive peaks of the field strength may lead to unwanted excessive detection ranges.



1. Sensing range
2. Degradation
3. Excessive detection ranges

The reflections and the resulting spatial inhomogeneity of the field strength may depend on the frequency used. Since the tags move in the sensing range of the device, and the environment can change, it is advisable to repeat the commands at different transmission frequencies. Different transmission frequencies are advisable, since the manufacturing tolerances and the immediate environment of the tag have an effect on the tag's resonance frequency.

In the case of reduction due to interferences, the absolute value of the field strength depends on the transmitter radiated power. It may be useful to adjust the transmitter radiated power accordingly.

4.4 Polarization

The polarization of the electromagnetic wave emitted by an antenna depends on the type of antenna and is defined via the electromagnetic field component of the electromagnetic wave. Polarization can be either linear or circular. In the case of an electromagnetic wave with linear polarization, the orientation of the electric field vector is spatially constant and therefore dependent on the position of the antenna. Linear polarization can usually be either vertical or horizontal.



**Note**  
The integrated antenna of the RFID read/write device has circular polarization. The polarization of the antenna cannot be changed.

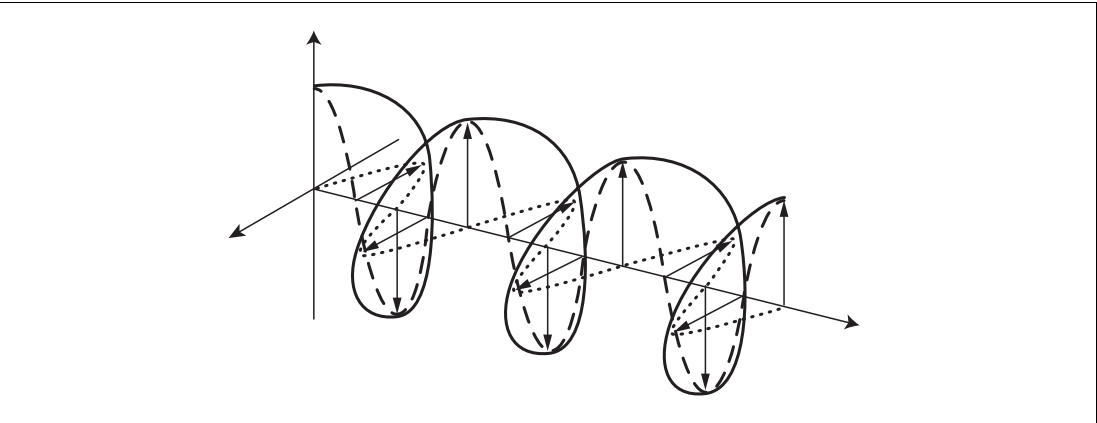


Figure 4.1

- Linear polarization**
  - Vertical -----
  - Horizontal .....
- Circular polarization**
  - Right-handed polarization ———
  - Left-handed polarization ———



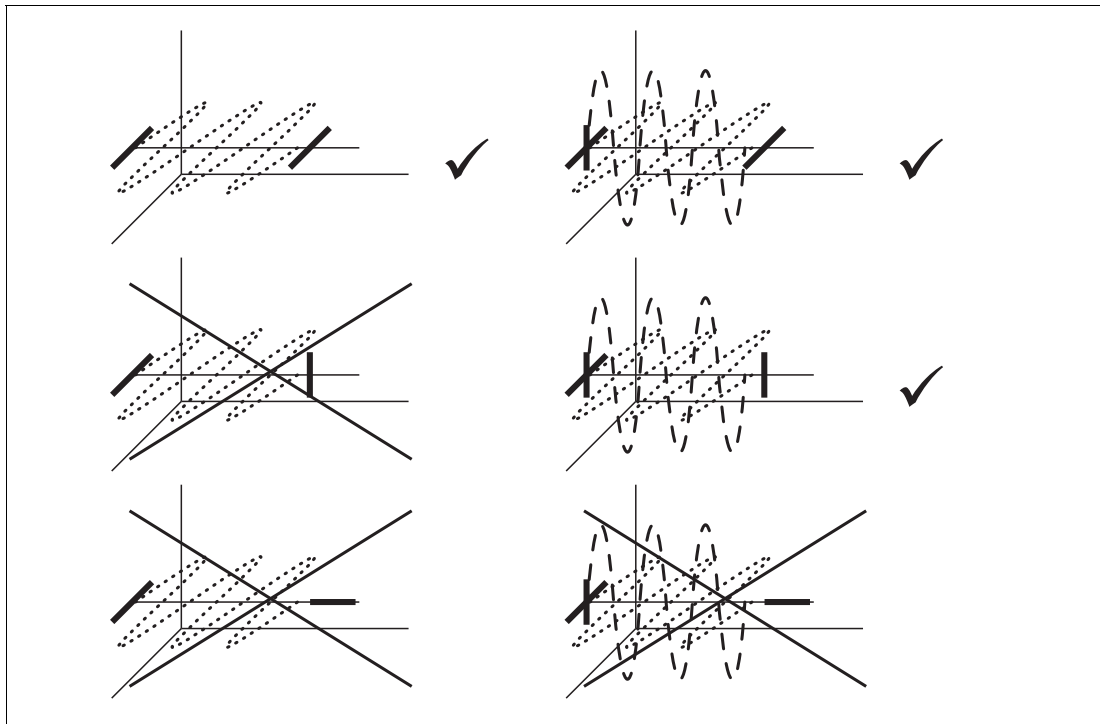
## 4.5 Spatial Orientation

The orientation of the tag in relation to the antenna of the RFID read/write device influences the detection range of the system. Make sure the antennae are oriented parallel to each other.

The following figure shows how the tags must be oriented with linear and circular polarization to enable good communication between the RFID read/write device and the tag. The tag is located on the right-hand side and the RFID read/write device is located on the left-hand side.

Linear polarization

Circular polarization

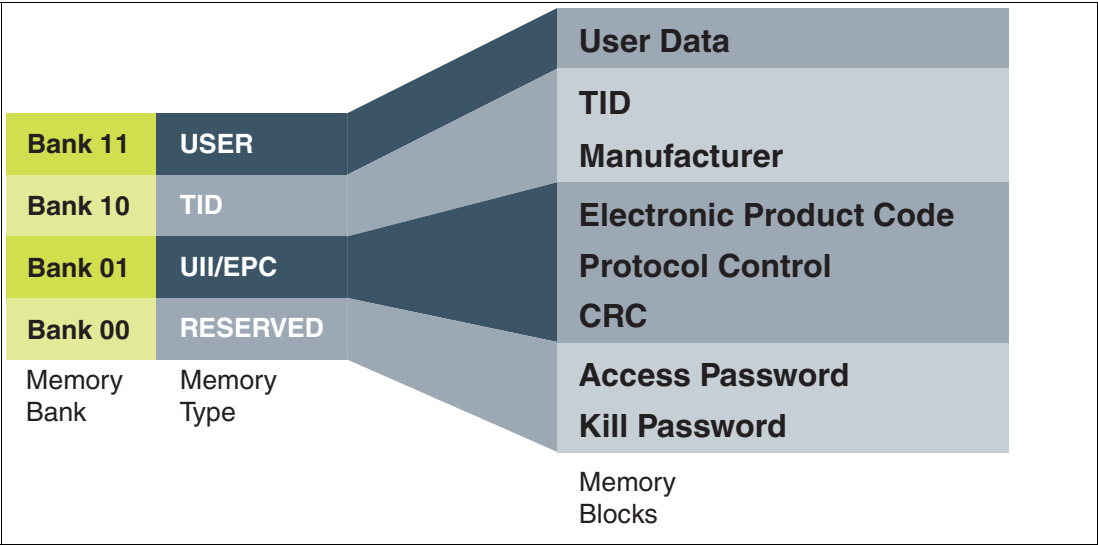


Optimal tag orientation

Poor tag orientation

- Good communication between the device and tag
- Insufficient communication between the device and tag

4.6 Memory Structure of a Tag in Accordance with EPC Gen 2 (ISO/IEC 18000-63)



The memory module of an EPC Gen 2 (ISO/IEC 18000-63) tag is split into four segments (banks). The main contents of these segments are:

| Segment | Function                                                      | Length                                             |
|---------|---------------------------------------------------------------|----------------------------------------------------|
| Bank 00 | Password management                                           | Depends on the tag type                            |
| Bank 01 | Unique Item Identifier (UII)<br>Electronic Product Code (EPC) | Depends on the tag type                            |
| Bank 10 | Tag ID (TID)                                                  | 4 bytes (MDID, TMN) + 0 bytes, 4 bytes, or 8 bytes |
| Bank 11 | User memory                                                   | Depends on the tag type                            |

Bank 00: Password Management

The **Bank 00** segment contains the password management information. It contains the access password and the kill password.

Bank 01: EPC/UII

The **Bank 01** segment contains the EPC/UII. The segment is divided into several subsections:

- CRC (Cyclic Redundancy Check; checksum) 16 bits
- PC (Protocol Control; PC word) 16 bits
- EPC (Electronic Product Code) or UII (Unique Item Identifier) Variable length

Bytes 0 and 1 of the memory bank contain a checksum (CRC). This is calculated independently by the read/write tag. This subsection can only be read.

The PC word (Protocol Control) is located in bytes 2 and 3. It contains the following information:

- Length of EPC/UII
- Application Family Identifier (AFI)
- Toggle bit to indicate whether it is an EPC or ISO standard code
- Bit to indicate whether data is stored in segment 11 (user memory)

### Electronic Product Code (EPC)

The Electronic Product Code (EPC) is a unique identifier in the form of a sequence of numbers. The number sequence has a set structure and a length of 64 bits, 80 bits, 96 bits, or longer, depending on the EPC used. This number sequence is saved to the RFID tag, offering world-wide unique identification of the tagged object.

The EPC system was defined by GS1 for use in inventory management. Tags with memories for EPCs must be programmed by the user. The memory of new tags must not contain any valid EPCs. The EPCs are managed and assigned by GS1. To obtain an EPC, please contact the GS1 subsidiary in your country ([www.gs1.com/contact](http://www.gs1.com/contact)).

The EPC is currently defined by GS1 in 13 different encoding schemes. SGTIN-96 (serialized global trade item number) is given here as an example of a frequently used encoding scheme. SGTIN-96 has a defined format and is structured as follows:

1. **Header:** The header specifies the EPC standard used and denotes the number sequence.
2. **Filter value:** Denotes the unit of the product, for example, end product, outer packaging, pallet.
3. **Partition:** Denotes the point at which the following company prefix ends and the object data begins.
4. **Company prefix:** Assigned sequence of numbers that identifies the producer.
5. **Object class:** Sequence of numbers that describes the object, e.g., item number.  
The company prefix and the object class are each of variable length, but together are always 44 bits long.
6. **Serial number:** Sequence of numbers that identifies the item, e.g., the sequential serial number of the item.

|              | Header            | Filter value     | Partition        | Company prefix         | Object class       | Serial number         |
|--------------|-------------------|------------------|------------------|------------------------|--------------------|-----------------------|
| Length [bit] | 8                 | 3                | 3                | 20 ... 40              | 4 ... 24           | 38                    |
| Value        | 48 <sub>dec</sub> | 0 <sub>dec</sub> | 5 <sub>dec</sub> | 4050143 <sub>dec</sub> | 124 <sub>dec</sub> | 203886 <sub>dec</sub> |

Table 4.1

### Bank 10: TID

The **Bank 10** segment contains the tag identifier (TID). The TID always consists of a "Short Tag Identification" (short TID) and optionally consists of an "Extended Tag Identification" (XTID). The short TID has a length of 4 bytes (32 bits) and is structured as follows:

- Class identifier (tag class; 16#E2) 8 bits
- Extended Tag Identification Indicator 1 bit
- Security Indicator and File Indicator 1 bit each
- Mask Designer Identifier (MDID) 9 bits
- Tag Model Number (TMN) 12 bits

If the bit for the extended tag identification indicator is set within the short TID, the short TID is followed by additional bytes containing extra information about the properties of the read/write tag. The XTID has a length of 8 bytes (64 bits) and the following structure:

- XTID 16 bits
- Serial number 48 bits

Bank 11: User memory

The **Bank 11** segment contains memory to which the user has free access. The size of this memory depends on the chip type, or this memory may not be present.

The tag's payload is located in the user memory. This memory is used when application-specific data must be stored on the tag. When using chips based on EEPROM technology, the number of write accesses may be limited. An almost unlimited number of write accesses is possible when using read/write tags with FRAM memory.

4.7 Dense Reader Mode (DRM)

A special operating mode for read/write tags in accordance with the specification EPC Gen 2 (ISO/IEC 18000-63) allows several RFID read/write devices to be operated close to each other simultaneously without interference.

It is used in Europe, among other locations. In accordance with EN 302208, the RFID read/write device uses only channels 4, 7, 10, and 13 in this mode for transmission (communication path: RFID read/write device → read/write tag). The transmitter radiated power is a maximum of 2 W<sub>ERP</sub> in accordance with EN 302208.

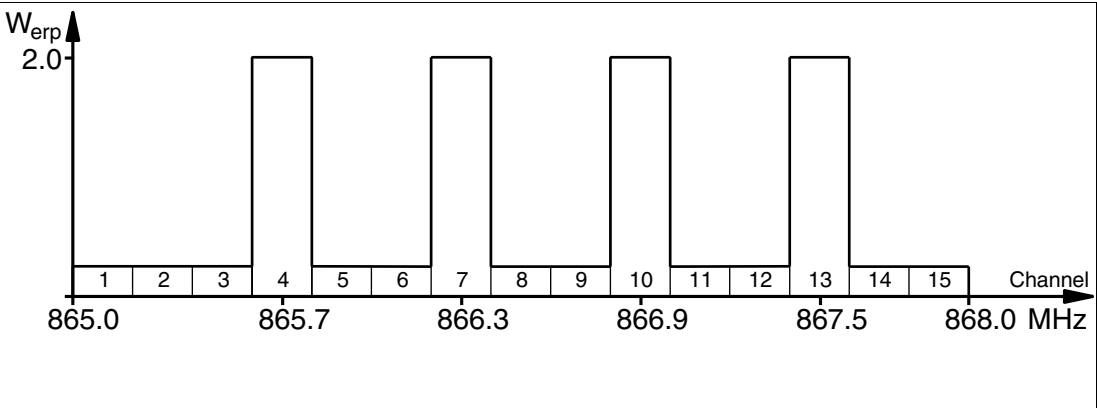


Figure 4.2



**Note**

In the diagram, dense reader mode (DRM) is shown using Europe as an example, but it is also used in other regions.



**Note**

Only the ETSI lower band is supported.

The response from the read/write tag appears via the frequency offset, which is achieved by the modulation used in this mode on the adjacent channels. Due to the high level difference between the transmission channels and the response channels, this technology offers major benefits for reusing frequencies.

4.8 Frequency Hopping Spread Spectrum

With FHSS (Frequency Hopping Spread Spectrum), the information to be transmitted is distributed successively through multiple channels. Only one frequency channel is used at any one time.

## 4.9 Countries of Use



### Note

#### Transmission License and Country Code

Operation of this device is subject to country-specific regulations. Make sure that the device used is suitable and approved for the country of use. Information about countries of use can be found in the datasheet for the relevant device at [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com). The devices comply with the respective regulatory requirements of the regions. Country-specific settings cannot be changed by the user.

The respective country-specific settings are shown in the table below.

#### Country-Specific Settings

| Operating location     | Region code | UHF band                   | Channel width | Channel spacing |
|------------------------|-------------|----------------------------|---------------|-----------------|
| European Union         | 01          | 865 MHz ...<br>868 MHz     | 200 kHz       | 600 kHz         |
| USA, Canada,<br>Mexico | 02          | 902 MHz ...<br>928 MHz     | 500 kHz       | 500 kHz         |
| China                  | 03          | 920 MHz ...<br>925 MHz     | 250 kHz       | 250 kHz         |
| India                  | 04          | 865 MHz ...<br>867 MHz     | 200 kHz       | 200 kHz         |
| Brazil,<br>Colombia    | 07          | 915 MHz ...<br>928 MHz     | 250 kHz       | 250 kHz         |
| Japan                  | 08          | 916.7 MHz ...<br>920.5 MHz | 200 kHz       | 1200 kHz        |
| South Korea            | 09          | 917.2 MHz ...<br>920.4 MHz | 200 kHz       | 600 kHz         |
| Australia              | 10          | 920 MHz ...<br>926 MHz     | 500 kHz       | 500 kHz         |
| New Zealand            | 11          | 921.5 MHz ...<br>928 MHz   | 500 kHz       | 500 kHz         |
| Hong Kong,<br>Thailand | 12          | 920 MHz ...<br>925 MHz     | 500 kHz       | 500 kHz         |
| Malaysia               | 13          | 919 MHz ...<br>923 MHz     | 500 kHz       | 500 kHz         |
| Singapore              | 14          | 920 MHz ...<br>925 MHz     | 500 kHz       | 500 kHz         |
| Morocco                | 15          | 867.6 MHz ...<br>868 MHz   | 200 kHz       | 200 kHz         |
| Indonesia              | 16          | 920 MHz ...<br>923 MHz     | 500 kHz       | 500 kHz         |
| Taiwan                 | 17          | 920 MHz ...<br>928 MHz     | 500 kHz       | 500 kHz         |

Table 4.2

| Operating location  | Frequency hopping spread spectrum | Number of channels | Channels used (M)             | Center frequencies           |
|---------------------|-----------------------------------|--------------------|-------------------------------|------------------------------|
| European Union      | Parameterizable frequency list    | 4                  | 4, 7, 10, 13 (adjustable)     | 864.9 MHz + (M x 0.2) MHz    |
| USA, Canada, Mexico | Frequency hopping (FHSS)          | 50                 | 1 ... 50 (all)                | 902.25 MHz + (M x 0.5) MHz   |
| China               | Frequency hopping (FHSS)          | 16                 | 2 ... 17 (all)                | 920.125 MHz + (M x 0.25) MHz |
| India               | Parameterizable frequency list    | 10                 | 1 ... 10 (adjustable)         | 864.9 MHz + (M x 0.2) MHz    |
| Singapore           | Parameterizable frequency list    | 10                 | 1 ... 10 (adjustable up to 4) | 865.9 MHz + (M x 0.2) MHz    |
| Brazil, Colombia    | Frequency hopping (FHSS)          | 52                 | 1 ... 52 (all)                | 914.875 MHz + (M x 0.25) MHz |
| Japan               | Parameterizable frequency list    | 4                  | 5, 11, 17, 23 (adjustable)    | 915.8 MHz + (M x 0.2) MHz    |
| South Korea         | Frequency hopping (FHSS)          | 6                  | 1, 4, 7, 10, 13, 16 (all)     | 917.1 MHz + (M x 0.2) MHz    |
| Australia           | Frequency hopping (FHSS)          | 12                 | 1 ... 12 (all)                | 919.75 MHz + (M x 0.5) MHz   |
| New Zealand         | Frequency hopping (FHSS)          | 13                 | 1 ... 13 (all)                | 921.5 MHz + (M x 0.5) MHz    |
| Hong Kong, Thailand | Frequency hopping (FHSS)          | 10                 | 1 ... 10 (all)                | 919.75 MHz + (M x 0.5) MHz   |
| Malaysia            | Frequency hopping (FHSS)          | 8                  | 1 ... 8 (all)                 | 918.75 MHz + (M x 0.5) MHz   |
| Singapore           | Frequency hopping (FHSS)          | 10                 | 1 ... 10 (all)                |                              |
| Morocco             | Parameterizable frequency list    | 2                  | 1, 2 (adjustable)             | 867.5 MHz + (M x 0.2 MHz)    |
| Indonesia           | Frequency hopping (FHSS)          | 6                  | 1 ... 6 (all)                 | 919.75 MHz + (M x 0.5 MHz)   |
| Taiwan              | Frequency hopping (FHSS)          | 14                 | 1 ... 14 (all)                | 920.25 MHz + (M x 0.5) MHz   |

Table 4.3

**Note**

For information on the maximum radiated power, see datasheet.

## 5 Product Description

### 5.1 General

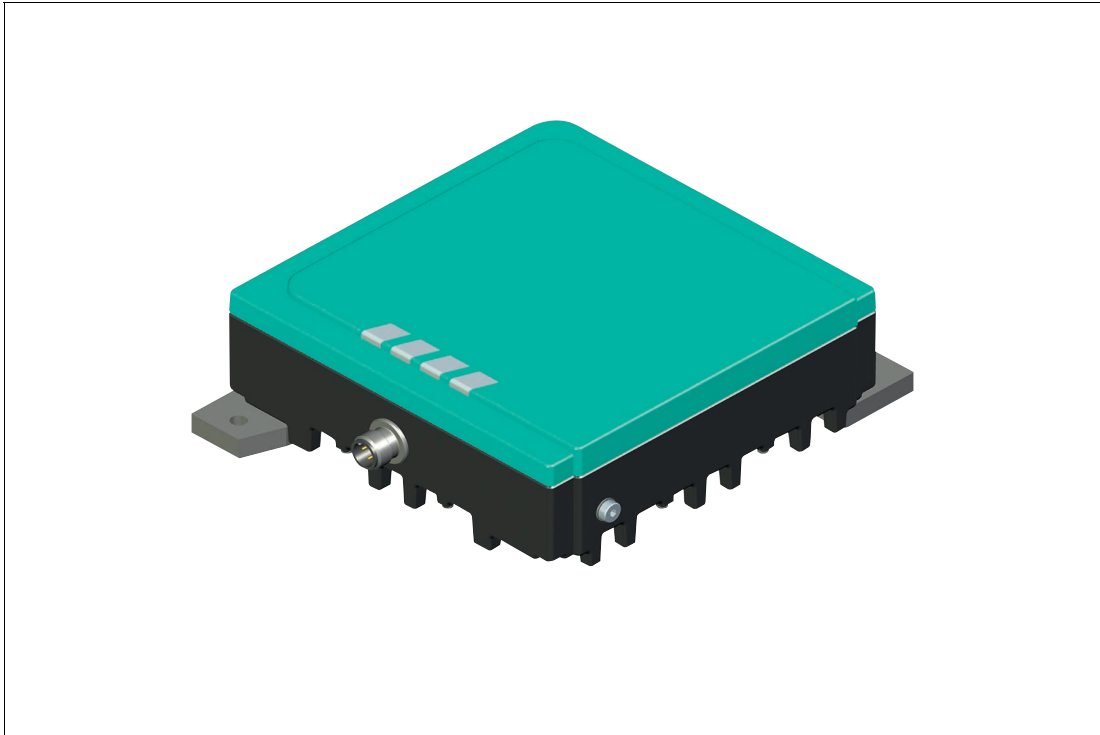


Figure 5.1

#### Functions

The devices from the IUH1-F7xx-V1-FR\* series have been developed for reading and writing passive read/write tags with a UHF operating frequency.

The RFID read/write devices are connected to an IDENTControl evaluation unit using an integrated M12 plug.

Tags that comply with EPC Class 1 Gen 2 (ISO/IEC 18000-63) are supported.

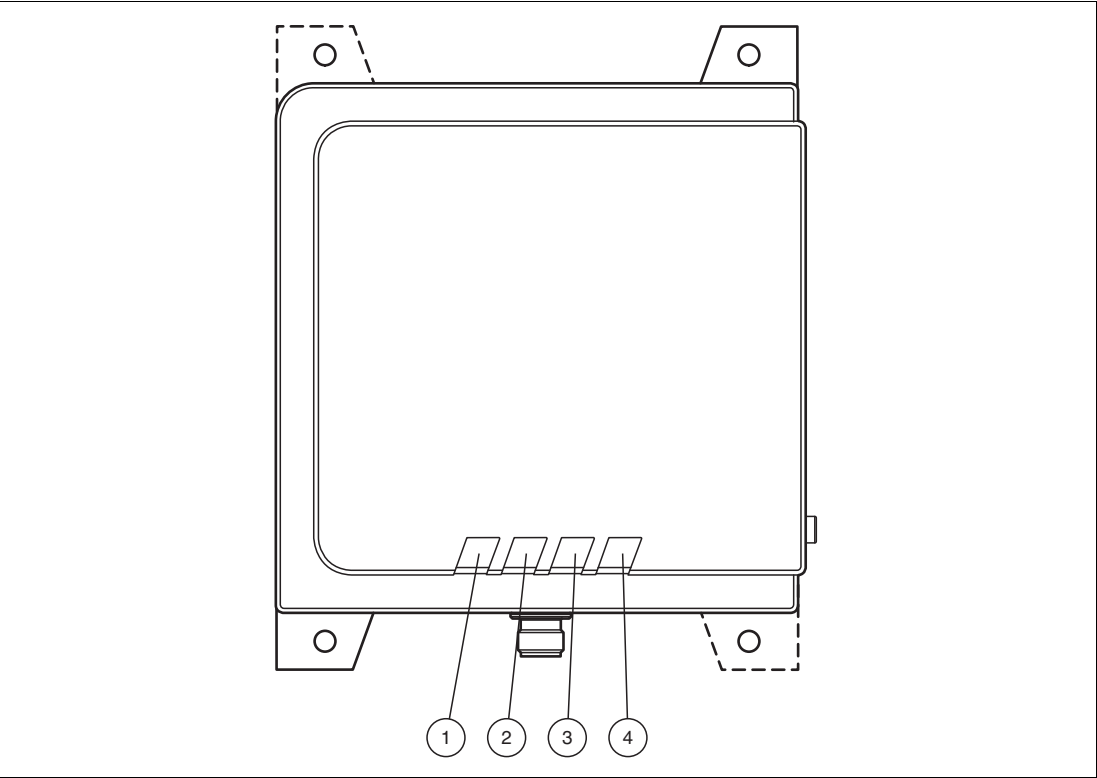
#### Integrated Antenna

The RFID read/write devices have a circular polarized antenna. As a result, the alignment of a linearly polarized tag (e.g., horizontal or vertical) is generally not relevant for communication.

5.2 Indicators and Operating Elements

LEDs

There are four LEDs on the front of the device. The LEDs indicate the device health and the activity on the air interface.



|   | LED               | Description                                                                                                                                                                                                                                                        |
|---|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Operation LED     | <ul style="list-style-type: none"><li>Off: No voltage supply or not ready for operation</li><li>Green: Ready for operation</li><li>Flashing orange (10 Hz): Firmware update is in progress</li><li>Magenta: Supply voltage out of permissible range</li></ul>      |
| 2 | Communication LED | <ul style="list-style-type: none"><li>Green: Connection to the host</li><li>Green flashing: Communication via the interface</li><li>Red: No connection to the host</li></ul>                                                                                       |
| 3 | RFID LED          | <ul style="list-style-type: none"><li>Blue: RFID switched on</li><li>Orange: Tag detected</li><li>Red: RF error</li><li>Magenta: Status A (several tags detected) or status 4 (memory area not available)</li><li>White: Tag outside the set RSSI filter</li></ul> |
| 4 | User-defined LED  | <ul style="list-style-type: none"><li>This LED can have various functions, depending on the selected device settings</li></ul>                                                                                                                                     |

Table 5.1

## 6 Installation

### 6.1 Storage and Transportation

Keep the original packaging. Always store and transport the device in the original packaging. Store the device in a clean and dry environment. The permitted ambient conditions must be considered, see datasheet.

### 6.2 Mounting



#### Warning!

Malfunctions with pacemakers

This device does **not** exceed the permissible limit values for electromagnetic fields. Maintain the minimum distance between the device and your pacemaker. The minimum distances of the respective devices are listed in the table below.

Inadequate distance from the RFID read/write device can result in inhibitions, reprogramming, or incorrect stimulation pulses.

**Minimum Distances Between Device and Pacemaker**

| Device           | Minimum distance |
|------------------|------------------|
| IUH1-F720-V1-FR* | 25 cm            |

Table 6.1

The RFID read/write device is intended for wall mounting or mounting on brackets. Please only install the device using the existing mounting holes in the housing. The preferred mounting direction is with the cable connection facing vertically downward.



#### Note

Do not route the connection cable within the sensing range of the antenna.

To mount the RFID read/write device, use at least two screws with a diameter of 4 mm, together with flat washers and fastening material suitable for the type of mounting surface. The tightening torque of the screws depends on the type of mounting and the surface. Use a suitable tightening torque to prevent damage.



#### Caution!

Mounting the RFID read/write device

Only use the appropriate mounting aids for your device.



#### Caution!

Mounting the RFID read/write device

Make sure that the RFID read/write device is firmly attached to the surface.



#### Note

The installation recommendations provided in this document assume the most favorable ambient conditions. Pepperl+Fuchs does not guarantee fault-free operation in environments outside the system.

## Mounting the RFID read/write device

### IUH-F720-V1-FR\*

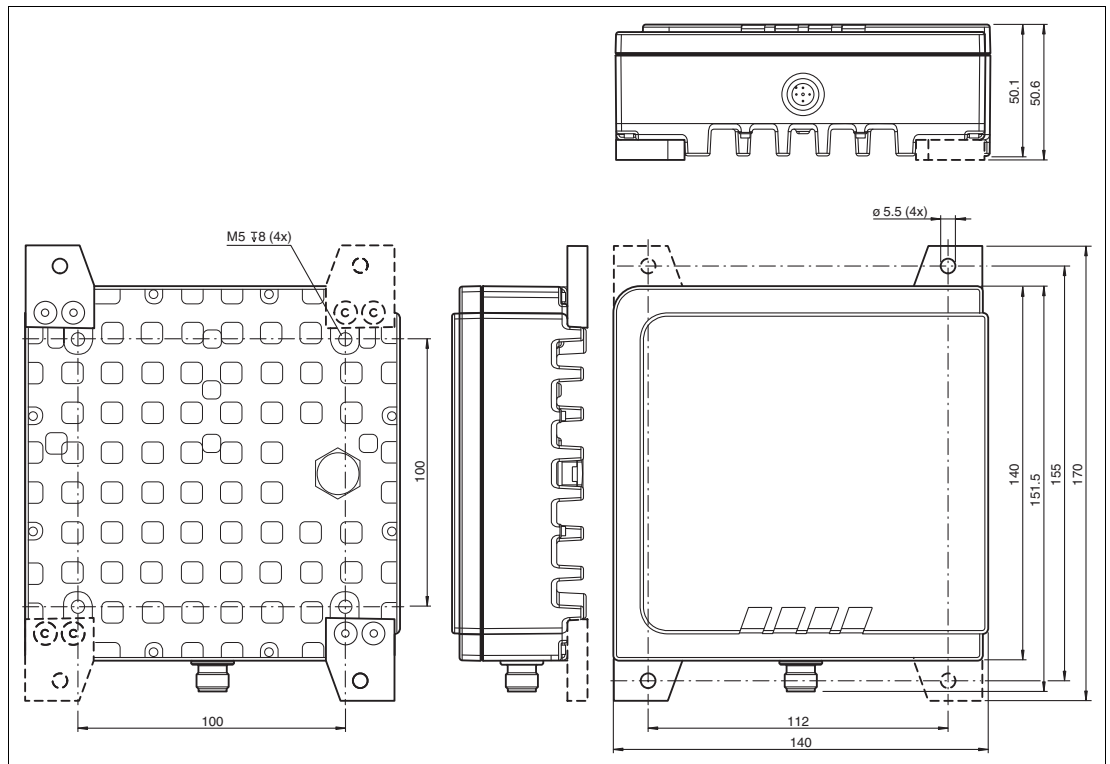


Figure 6.1



#### Note

It is possible to mount the RFID read/write device using a VESA 100x100 bracket.



#### Note

The RFID read/write device is supplied with two retaining tabs including screws.

The retaining tabs can be used to mount the RFID read/write device if required and fit in all the provided mounting positions.

To ensure the most compact design possible, the retaining tabs are not pre-assembled at the factory.

Tighten the fixing screws to a tightening torque of 2 Nm.



#### Note

The cooling structure of the RFID read/write device must not be covered nor its air circulation impaired, since this can lead to impermissible heating of the device.

To ensure reliable heat dissipation and trouble-free operation, the cooling structure should be regularly checked for dirt and cleaned if necessary.

### 6.2.1 Minimum Distances

When positioning the RFID read/write device, please observe the minimum distances. The lateral distance between the RFID read/write device and metals or liquids should be at least **(50 cm)**. The distance between the RFID read/write device and the ground should be at least **(50 cm)**.

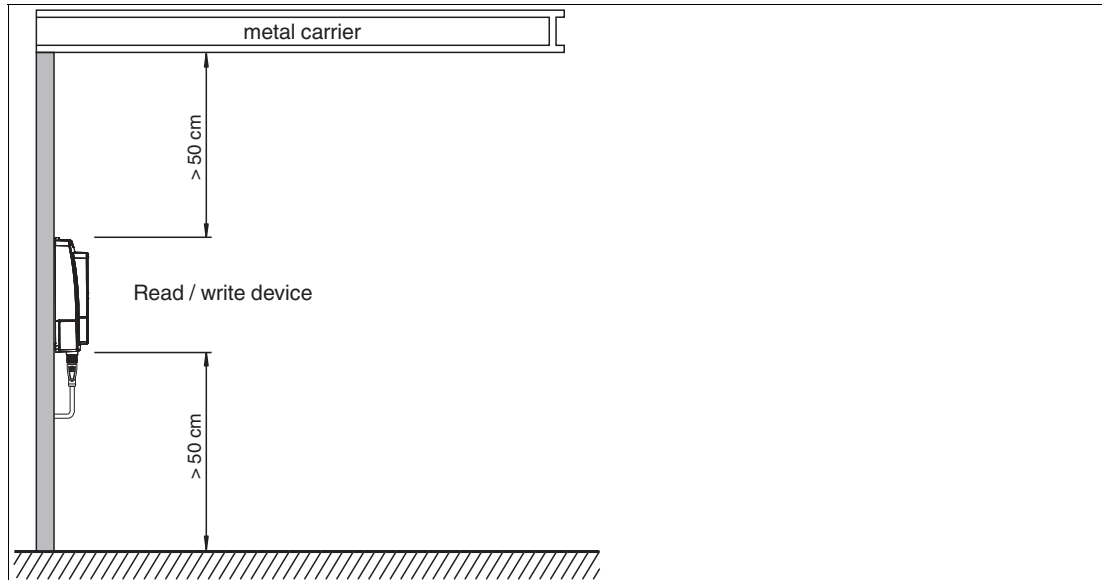


Figure 6.2

During simultaneous operation of several RFID read/write devices, only one RFID read/write device may ever communicate with a tag at any given time. When arranging the RFID read/write devices, make sure that the sensing ranges do not overlap if possible. You can change the transmitter radiated power to enlarge or reduce the size of the sensing range. Determine the sensing range of each RFID read/write device at the mounting location.



#### Note

During mounting, take into account how the RFID read/write devices may cause interference with each other. The further the RFID read/write devices or the used transmission channels are from each other, the lower the risk of interference.

## 6.3

## Connection

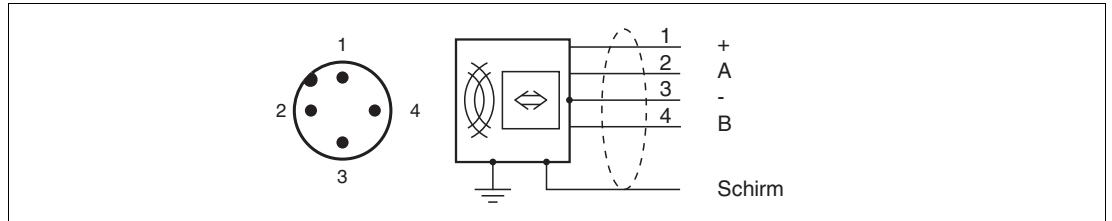
**Warning!**

Incorrect electrical connection

Damage to the device or plant caused by incorrect electrical connection.

Check all connections in the plant before commissioning the device.

The RFID read/write device is connected to the IDENTControl evaluation unit with an M12 x 1 connector. Further technical details can be found in the datasheet for the relevant device.



## 7 Commissioning and Operation

### 7.1 General Protocol Structure

### 7.2 Overview of Parameters

| Parameter | Parameter abbreviation | Description | Value range | Default settings |
|-----------|------------------------|-------------|-------------|------------------|
|           |                        |             |             |                  |
|           |                        |             |             |                  |
|           |                        |             |             |                  |
|           |                        |             |             |                  |
|           |                        |             |             |                  |
|           |                        |             |             |                  |
|           |                        |             |             |                  |

Table 7.1

### 7.3 Overview of Commands

| Command name        | Command abbreviation | Hex code | Description                                |
|---------------------|----------------------|----------|--------------------------------------------|
| Single Read Fixcode | SF                   | 16#01    | One-time read command to the TID (Bank 10) |
|                     |                      |          |                                            |
|                     |                      |          |                                            |
|                     |                      |          |                                            |
|                     |                      |          |                                            |
|                     |                      |          |                                            |
|                     |                      |          |                                            |

Table 7.2



## 7.4 Operation via Web Interface

## 7.5 REST API

## 7.6 Operation on a Control Panel

## 7.6.1 Siemens (TIA Portal) with B40

## 7.6.2 Rockwell (???) with B40

## 8 Service and Maintenance

The device is designed and constructed to function stable over long periods of time. For this reason, regular cleaning or maintenance is unnecessary.

Regularly check the connections and connection cables.

The device is maintenance-free. If the device is defective

- disassemble the device
- send it to Pepperl+Fuchs for repair or
- replace the device.

Any unauthorised tampering or modification is dangerous and will void any warranty and manufacturer's liability.

9 Troubleshooting

| Problem                                                  | Solution                                                                                                                                                                                                                                                                                                                                                     |
|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Interference from several devices in the direct vicinity | <ul style="list-style-type: none"><li>• Check the distance from other devices.</li><li>• Change the setting of the transmission channels.</li><li>• Reduce the transmitter radiated power.</li></ul>                                                                                                                                                         |
| Status A message                                         | <ul style="list-style-type: none"><li>• Check whether there are too many tags in the sensing range:<br/>Remove the tag from the sensing range by placing the tag in a sealed metal container, for example.<br/>Repeat the read or write operation.</li><li>• Use filter commands.</li><li>• Determine whether multiple tags have the same UII/EPC.</li></ul> |

Table 9.1



## 10 Decommissioning and Disposal

### Decommissioning

For safe decommissioning, see chapter 2.

### Disposal

The device, built-in components, packaging, and any batteries contained within must be disposed in compliance with the applicable laws and guidelines of the respective country.

11 Appendix

11.1 ASCII table

| hex | dec | ASCII | hex | dec | ASCII | hex | dec | ASCII | hex | dec | ASCII |
|-----|-----|-------|-----|-----|-------|-----|-----|-------|-----|-----|-------|
| 00  | 0   | NUL   | 20  | 32  | Space | 40  | 64  | @     | 60  | 96  | '     |
| 01  | 1   | SOH   | 21  | 33  | !     | 41  | 65  | A     | 61  | 97  | a     |
| 02  | 2   | STX   | 22  | 34  | "     | 42  | 66  | B     | 62  | 98  | b     |
| 03  | 3   | ETX   | 23  | 35  | #     | 43  | 67  | C     | 63  | 99  | c     |
| 04  | 4   | EOT   | 24  | 36  | \$    | 44  | 68  | D     | 64  | 100 | d     |
| 05  | 5   | ENQ   | 25  | 37  | %     | 45  | 69  | E     | 65  | 101 | e     |
| 06  | 6   | ACK   | 26  | 38  | &     | 46  | 70  | F     | 66  | 102 | f     |
| 07  | 7   | BEL   | 27  | 39  | '     | 47  | 71  | G     | 67  | 103 | g     |
| 08  | 8   | BS    | 28  | 40  | (     | 48  | 72  | H     | 68  | 104 | h     |
| 09  | 9   | HT    | 29  | 41  | )     | 49  | 73  | I     | 69  | 105 | i     |
| 0A  | 10  | LF    | 2A  | 42  | *     | 4A  | 74  | J     | 6A  | 106 | j     |
| 0B  | 11  | VT    | 2B  | 43  | +     | 4B  | 75  | K     | 6B  | 107 | k     |
| 0C  | 12  | FF    | 2C  | 44  | ,     | 4C  | 76  | L     | 6C  | 108 | l     |
| 0D  | 13  | CR    | 2D  | 45  | -     | 4D  | 77  | M     | 6D  | 109 | m     |
| 0E  | 14  | SO    | 2E  | 46  | .     | 4E  | 78  | N     | 6E  | 110 | n     |
| 0F  | 15  | SI    | 2F  | 47  | /     | 4F  | 79  | O     | 6F  | 111 | o     |
| 10  | 16  | DLE   | 30  | 48  | 0     | 50  | 80  | P     | 70  | 112 | p     |
| 11  | 17  | DC1   | 31  | 49  | 1     | 51  | 81  | Q     | 71  | 113 | q     |
| 12  | 18  | DC2   | 32  | 50  | 2     | 52  | 82  | R     | 72  | 114 | r     |
| 13  | 19  | DC3   | 33  | 51  | 3     | 53  | 83  | S     | 73  | 115 | s     |
| 14  | 20  | DC4   | 34  | 52  | 4     | 54  | 84  | T     | 74  | 116 | t     |
| 15  | 21  | NAK   | 35  | 53  | 5     | 55  | 85  | U     | 75  | 117 | u     |
| 16  | 22  | SYN   | 36  | 54  | 6     | 56  | 86  | V     | 76  | 118 | v     |
| 17  | 23  | ETB   | 37  | 55  | 7     | 57  | 87  | W     | 77  | 119 | w     |
| 18  | 24  | CAN   | 38  | 56  | 8     | 58  | 88  | X     | 78  | 120 | x     |
| 19  | 25  | EM    | 39  | 57  | 9     | 59  | 89  | Y     | 79  | 121 | y     |
| 1A  | 26  | SUB   | 3A  | 58  | :     | 5A  | 90  | Z     | 7A  | 122 | z     |
| 1B  | 27  | ESC   | 3B  | 59  | ;     | 5B  | 91  | [     | 7B  | 123 | {     |
| 1C  | 28  | FS    | 3C  | 60  | <     | 5C  | 92  | \     | 7C  | 124 |       |
| 1D  | 29  | GS    | 3D  | 61  | =     | 5D  | 93  | ]     | 7D  | 125 | }     |
| 1E  | 30  | RS    | 3E  | 62  | >     | 5E  | 94  | ^     | 7E  | 126 | ~     |
| 1F  | 31  | US    | 3F  | 63  | ?     | 5F  | 95  | _     | 7F  | 127 | DEL   |



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