SIGMATEK

# RFID 131

## RFID Reader
## with USB and CAN Connection

### Instruction Manual

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**Translation from German**

# RFID Reader RFID 131

The RFID reader is an installable device for reading and writing to RFID card. Communication with other bus participants is established over the CAN bus or USB interface. The reader is supplied with +24 V.

The RFID reader is installed in a cutaway of the control cabinet. The status LED in the upper left corner blinks in a 1 s cycle and indicates the readiness of the device. With a CAN message, it can also be controlled via the application.

# Contents

# 1 Technical Data

## 1.1 Performance Data

| | |
|---|---|
| Protocol | ISO 15693, ISO 14443A, ISO 14443B |
| Supported cards | Mifare Ultralight/Ultralight C<br>Mifare Classic Mini/1K/4K<br>Mifare Desfire EV1 2K, 4K 8K<br>Mifare Pro, Plus<br>ISO15693 NXP ICOD SLI, TI TagIT, standard cards |
| RF power | 100 mW EIRP |
| Operating frequency | 13.56 MHz |
| Reading distance | up to 5 cm<br>(depending on the tag, antenna and ambient conditions) |
| Write distance | approximately 70 % of the read distance |
| Interfaces | 1x USB device 2.0, (Type Mini-B)<br>1x CAN bus |
| Status LEDs | yes, blinks in 1 s frequency and indicates the readiness of the device |

## 1.2 Electrical Requirements

| | | |
|---|---|---|
| Supply voltage | typically +24 V DC | |
| | minimum +18 V DC | maximum +30 V DC |
| Current consumption<br>Power supply +24 V | minimum 45 mA | maximum 60 mA |
| Inrush current | 2 A for 2 ms | |

## 1.3 RFID Reader

| | |
|---|---|
| Dimensions | 90 x 57 x 30.8 mm (W x H x D) |
| Material | front: acrylic glass<br>back: chromated sheet steel |
| Weight | 110 g |

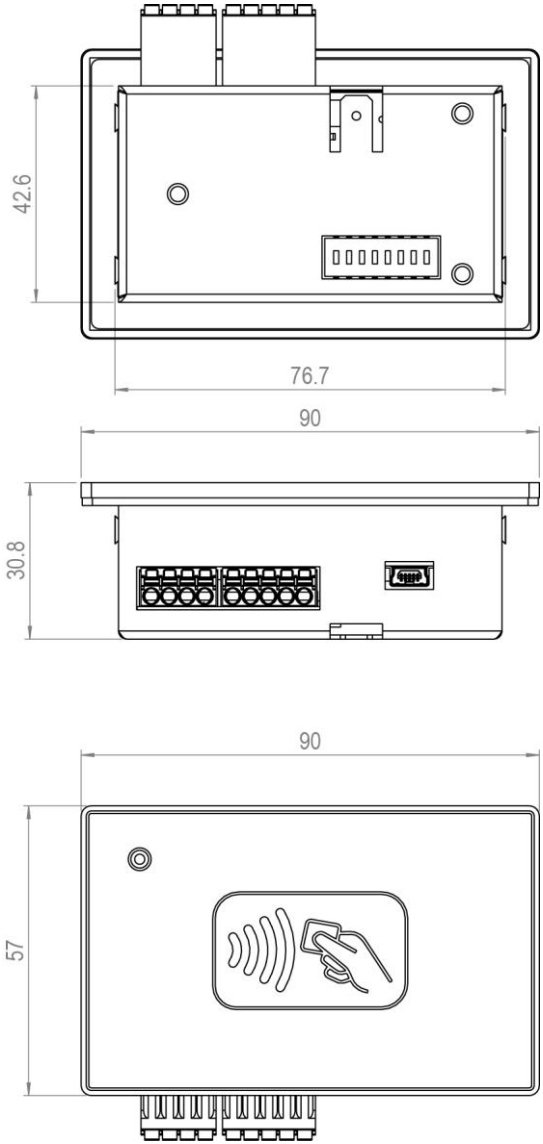
## 1.4 Environmental Conditions

| | | |
|---|---|---|
| Storage temperature | -20 ... +85 °C | |
| Environmental temperature | 0 ... +55 °C | |
| Humidity | 0-95 %, non-condensing | |
| EMC resistance | according to EN 61000-6-2 (industrial area) | |
| EMC noise generation | according to EN 61000-6-4 (industrial area) | |
| Radio Communication Conformity Europe | according to ETSI EN 300 330 (2014/53/EU, RED Directive) | |
| Radio Communication Conformity USA | FCC CFR 47 Part 15 | |
| Product safety | EN 60950-1:2006 | |
| Vibration resistance | EN 60068-2-6 | 2-9 Hz: amplitude 3.5 mm<br>9-200 Hz: 1 h (10 $m/s^2$) |
| Shock resistance | EN 60068-2-27 | duration 11 ms, 18 Shocks<br>15 g (150 $m/s^2$) |
| Protection type | EN 60529<br>protected through the housing | front: IP65<br>cover: IP20 |

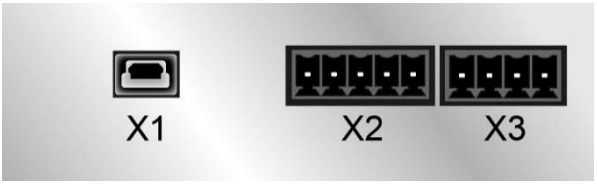
## 1.5 Miscellaneous

| | |
|---|---|
| Article number | 01-691-131 |

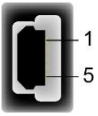
## 2 Mechanical Dimensions



# 3 Connector Layout




### X1: USB-Device 2.0 (Type Mini-B)

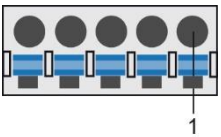



| Pin | Function |
|---|---|
| 1 | +5 V |
| 2 | D- |
| 3 | D+ |
| 4 | n.c. |
| 5 | GND |

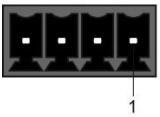
n.c. = do not use

### X2: CAN Bus (5-pin Phoenix Contact)

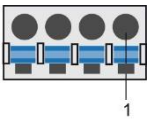

| Pin | Function |
|---|---|
| 1 | CAN A (LOW) |
| 2 | CAN B (High) |
| 3 | CAN A (CAN LOW) |
| 4 | CAN B (High) |
| 5 | CAN GND |



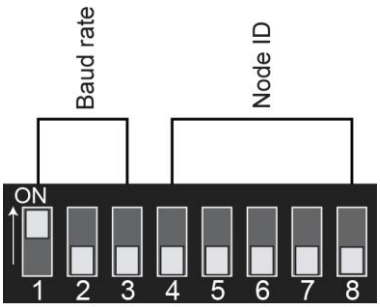

### X3: Supply (4-pin Phoenix Contact)




| Pin | Function |
|---|---|
| 1 | +24 V supply |
| 2 | +24 V supply |
| 3 | GND |
| 4 | GND |



**S1: DIP-Switch**

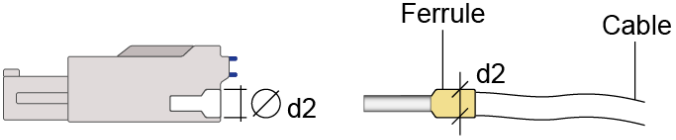



## 3.1 Applicable Connectors

**Connectors:**
**X1:** USB Type Mini-B on a USB Type A cable, max. length 3 m
(not included in delivery)
**X2:** 5-pin Phoenix plug with spring terminals FK-MCP 1.5/ 5-ST-3.5
(Included with delivery)
**X3:** 4-pin Phoenix plug with spring terminals FK-MCP 1.5/ 5-ST-3.5
(Included with delivery)

**Connections:**

| | |
|---|---|
| Stripping length: | 10 mm |
| Mating direction: | parallel to the conductor axis or circuit board |
| Conductor cross section rigid: | 0.2-1.5 $mm^2$ |
| Conductor cross section flexible: | 0.2-1.5 $mm^2$ |
| Conductor cross section AWG/kcmil: | 24-16 |
| Conductor cross section flexible with ferrule without plastic sleeve: | 0.25-1.5 $mm^2$ |
| Conductor cross section flexible with ferrule with plastic sleeve: | 0.25-0.75 $mm^2$ (reason for reduction d2 of the ferrule) |




d2 = max. 2.8 mm

# 4 Mounting Instructions

The following guidelines must be observed when installing the RFID reader:

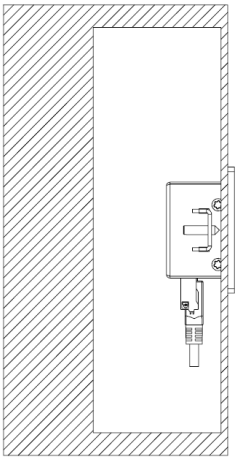
- For installation with the screw-in brackets provided, it is recommended that the installation panel have a material strength of 3 mm. Material strengths from 1 to 4 mm are also allowable. The screw-in brackets can be tightened with a **maximum torque of 0.15 Nm**. For this purpose, a **3x0.5 flat-tip screw driver** is required.

- To avoid damage to the front, it is important to ensure that during installation, the mounting surface clean (free of debris, uneven areas). Unevenness can lead to voltages on the front or contamination from dust and water.

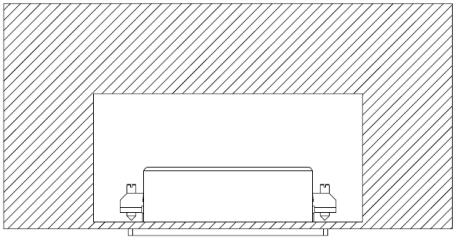
## 4.1 Mounting Position

Since very little heat is generated, no specific clearance is required.
Sufficient air circulation however, must be ensured so that no trapped heat can developed.

Section side view:



section top view



# 5 General Instructions

## 5.1 Ground

The RFID reader must be connected to ground through the assembly on the control cabinet or over the connection provided. It is important to create a low-ohm ground connection, only then can error-free operation be guaranteed. The ground connection should have a maximum cross section and the largest (electrically conductive) surface possible.

## 5.1 Shielding

To wire the USB interface, a USB 2.0 cable must be used. When using the CAN bus interface, a shielded cable must be used. Noise signals can therewith be prevented from reaching the electronics and affecting the function.

## 5.2 ESD Protection

Before any device is connected to, or disconnected from the reader, the potential should be equalized (by touching the control cabinet or ground terminal). This will allow the dissipation of electrostatic loads (caused by clothing/shoes).

## 5.3 User Guidelines

**CAUTION!**

**The RFID reader cannot always be operated with an interface (USB or CAN). Simultaneous operation is not supported and causes the reader to malfunction.**

**CAUTION!**

**The USB interface is not used to operate the device.**
**Here, as can be seen under "Electrical Requirements", an additional external voltage supply is required.**

**Technical changes to the device, as well as improper use can lead to the loss of the FCC license and generate interference, which can affect the function of nearby devices.**
**Please note the national standardization when operating the wireless device.**

Further information on the use, as well technical data can be found in the separate manual for the RFID reader series. This can be acquired through the support.

# 6 CAN Bus

This section explains how to correctly configure and use the CAN bus. The CAN bus interface is based on the CAN-Open standard according to EN50325-4. For the configuration, the device ID and the data transfer rate must be set.

## 6.1 Node ID Assignment

Each CAN bus participant in the system is assigned its own node identification number (Node ID). With this Node ID, data can be exchanged with other stations connected to the bus. In a CAN bus system however, each Node ID can only be assigned once!

### 6.1.1 Node-IDs (CAN Open SDO)

| SW 4 | SW 5 | SW 6 | SW 7 | SW 8 | Node ID |
|---|---|---|---|---|---|
| Off | Off | Off | Off | Off | **1** |
| On | Off | Off | Off | Off | **2** |
| Off | On | Off | Off | Off | **3** |
| On | On | Off | Off | Off | **4** |
| Off | Off | On | Off | Off | **5** |
| On | Off | On | Off | Off | **6** |
| Off | On | On | Off | Off | **7** |
| On | On | On | Off | Off | **8** |
| Off | Off | Off | On | Off | **9** |
| On | Off | Off | On | Off | **10** |
| Off | On | Off | On | Off | **11** |
| On | On | Off | On | Off | **12** |
| Off | Off | On | On | Off | **13** |
| On | Off | On | On | Off | **14** |
| Off | On | On | On | Off | **15** |
| On | On | On | On | Off | **16** |

| | | | | | |
|---|---|---|---|---|---|
| Off | Off | Off | Off | On | **17** |
| On | Off | Off | Off | On | **18** |
| Off | On | Off | Off | On | **19** |
| On | On | Off | Off | On | **20** |
| Off | Off | On | Off | On | **21** |
| On | Off | On | Off | On | **22** |
| Off | On | On | Off | On | **23** |
| On | On | On | Off | On | **24** |
| Off | Off | Off | On | On | **25** |
| On | Off | Off | On | On | **26** |
| Off | On | Off | On | On | **27** |
| On | On | Off | On | On | **28** |
| Off | Off | On | On | On | **29** |
| On | Off | On | On | On | **30** |
| Off | On | On | On | On | **31** |
| On | On | On | On | On | **32** |

## 6.2 Number of CAN Bus Participants

The maximum number of participants on the CAN bus depends on the cable length, termination resistance, data transfer rate and the drivers used in the participants.

With a termination resistance of 2x 20 Ω, a minimum of 100 participants are possible.

## 6.3 CAN Bus Data Transfer Rate

Various data transfer rates (baud rates) can be set on the CAN bus. The longer the bus line is, the lower the data transfer rate that must be selected.

**In delivery condition, the CAN Baud rate is set to 500 kbits/s.**

**The CAN bus transfer rate can be freely configured via DIP switch, if a device is exchanged or incorrectly configured, the DIP switch must be checked or set correctly.**

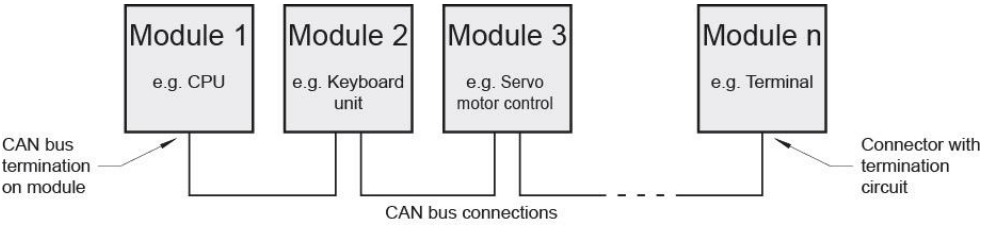
| SW 1 | SW 2 | SW 3 | Mmximum length | Baud rate (in kBaud) |
|---|---|---|---|---|
| Off | Off | Off | 60 m | 615 |
| On | Off | Off | 80 m | 500 |
| Off | On | Off | 160 m | 250 |
| On | On | Off | 320 m | 125 |
| Off | Off | On | 400 m | 100 |
| On | Off | On | 800 m | 50 |
| Off | On | On | 1200 m | 20 |
| On | On | On | 30 m | 1000 |

These values are valid for the following cable: 120 Ω, Twisted Pair.

Note: For the CAN bus protocol: 1 kbits/s = 1 kBaud

## 6.4 CAN Bus Termination

In a CAN bus system, both end modules must be terminated. This is necessary to avoid transmission errors caused by reflections in the line.




## 6.5 CAN Protocol

Each message contains up to 8 bytes. The data transfer takes place according to CiA DS301. Several CAN messages may be necessary for one frame on the RFID reader.

### 6.5.1 CAN Object Definition

| Object Number | Direction | Name | Cycle Time |
|---|---|---|---|
| **SDO** | | | |
| 0x580 + Node ID | Receive | SDO request | not cyclic |
| 0x600 + Node ID | Transmit | SDO response | not cyclic |

Direction from the point of view of the control controlling the module.

### 6.5.2 CAN – Object Dictionary

| Index (hex) | Subindex | Size (bytes) | Access | Description |
|---|---|---|---|---|
| 2000 | 0 | 256 | SEG_WO | RFID – Request |
| 2002 | 0 | 1 | EXP_RO | Number of FW information entries (here: 4) |
| 2002 | 1 | 2 | EXP_RO | FW version |
| 2002 | 2 | 4 | EXP_RO | Serial number of the product |
| 2002 | 3 | 16 | SEG_RO | Product name in ASCII |
| 2002 | 4 | 2 | EXP_RO | Bootloader version |
| 2003 | 0 | 1 | EXP_WO | Special commands<br>0xE0 … Switch to bootloader (e.g. for FW update)<br>0xF0 … Hard reset of the RFID reader<br>(This command entry in the Object Dictionary is reset in the firmware immediately after recognition) |
| 2005 | 0 | 4 | EXP_RW | LED Access:<br>Bit 0 – Bit 13: switch on time in ms (0 bis 16383)<br>Bit 14 – Bit 27: switch off time in ms (0 bis 16383)<br>Bit 28: Direct control<br>0 … LED off<br>1 … LED on<br>Bit 29: Blink-enable<br>0 … Direct control is used<br>1 … The LED flashes at the indicated times (Direct control is ignored)<br>Bit 30 – Bit 31: Reserved |
| 2200 | 0 | 256 | SEG_RO | RFID – Response (the actual length returned in the initiate segmented read packet varies with the length of the RFID reader response (max. 256 bytes)) |

Accesses from the point of view of the control that controls the module:
SEG_WO .. segmented write only access
SEG_RO .. segmented read only access
EXP_WO .. expedited write only access
EXP_RO .. expedited read only access
EXP_RW .. expedited read/write access

### 6.5.3 Serial Interface

The data from and to the RFID hardware (2000 RFID - Request, 2200 RFID - Response) are forwarded by the microcontroller from/via the serial interface. The protocol documentation of the HF-RFID Reader can be obtained separately from the support department. It describes the complete communication processes.

### 6.5.4 Example Communication - Scanning Tags

Here a short communication example is shown which CAN messages are necessary to perform a SCAN.

To read or write data from or to the RFID reader, the protocol must be transferred from the HF-RFID reader via the CanOpen protocol.

**Message to the RFID Reader:**

| Byte | Data | Description |
|---|---|---|
| 0 | 0x21 | CANOpen Header (structure see CANOpen Specification) → Command “initiate download request” |
| 1 | 0x00 | 2 Byte Index (see Object Dictionary) → 0x2000 = RFID request according to Object Dictionary |
| 2 | 0x20 | |
| 3 | 0x00 | 1 Byte Subindex (see Object Dictionary) |
| 4 | 0x06 | Data (structure see CANOpen Specification (different depending on command). |
| 5 | 0x00 | In our case the length of the “Scaan Tags" command is given here |
| 6 | 0x00 | |
| 7 | 0x00 | |

**Response from the RFID Reader:**

| Byte | Data | Description |
|---|---|---|
| 0 | 0x60 | CANOpen Header … command “initiate download response” |
| 1 | 0x00 | 2 Byte Index |
| 2 | 0x20 | |
| 3 | 0x00 | 1 Byte Subindex |
| 4 | 0x00 | Reserved (always 0) |
| 5 | 0x00 | |
| 6 | 0x00 | |
| 7 | 0x00 | |

After the reader has confirmed the message, the next message is sent.

**Message to the RFID Reader:**

| Byte | Data | Description |
|---|---|---|
| 0 | 0x03 | CANOpen Header (structure see CANOpen Specification) → Command “download segment request” |
| 1 | 0x00 | Here follows the data (in this case the Scan Tags command of the reader) |
| 2 | 0x00 | Byte 1… command “Scan Tags” |
| 3 | 0x01 | Byte 2… Status code to reader (always 0x00) |
| 4 | 0x00 | Byte 3-4 … length of the data |
| 5 | 0x02 | Byte 5 … card type |
| 6 | 0x03 | Byte 6 …CRC |
| 7 | 0x00 | Byte 7 … not used → 0x00 |

**Response from the RFID Reader:**

| Byte | Data | Description |
|---|---|---|
| 0 | 0x20 | CANOpen Header … command “download segment response” |
| 1 | 0x00 | Reserved (always 0) |
| 2 | 0x20 | |
| 3 | 0x00 | |
| 4 | 0x00 | |
| 5 | 0x00 | |
| 6 | 0x00 | |
| 7 | 0x00 | |

Now the Scan Tags command should have been successfully sent to the firmware of the RFID reader via the CanOpen protocol. To be able to read the response to the Scan Tags command we have to read the response from the module. The response of the command is provided by the firmware in the designated area (0x2200 RFID Response) in the object dictionary.

An SDO upload must be initiated to read this data.

**Message to the RFID Reader:**

| Byte | Data | Description |
|---|---|---|
| 0 | 0x40 | CANOpen Header (structure see CANOpen Specification) → Command “initiate upload request” |
| 1 | 0x00 | 2 Byte Index (see Object Dictionary) → 0x2200 = RFID response according to Object Dictionary |
| 2 | 0x22 | |
| 3 | 0x00 | 1 Byte Subindex (see Object Dictionary) |
| 4 | 0x00 | Data (structure see CANOpen Specification (different depending on command). |
| 5 | 0x00 | In this case (initiate upload request) the 4 bytes are reserved → 0x00 |
| 6 | 0x00 | |
| 7 | 0x00 | |

**Response from the Reader:**

| Byte | Data | Description |
|---|---|---|
| 0 | 0x40 | CANOpen Header … command “initiate upload Response” |
| 1 | 0x00 | 2 Byte Index |
| 2 | 0x22 | |
| 3 | 0x00 | 1 Byte Subindex |
| 4 | 0x00 | See CanOpen Specification (in this case the 4 bytes are reserved) |
| 5 | 0x00 | |
| 6 | 0x00 | |
| 7 | 0x00 | |

After successfully initiating the SDO upload, the SDO upload may now be executed.

**Message to the RFID Reader:**

| Byte | Data | Description |
|---|---|---|
| 0 | 0x60 | CANOpen Header (structure see CANOpen Specification) → Command “upload segment request” |
| 1 | 0x00 | See CanOpen Specification (in this case → reserved) |
| 2 | 0x00 | |
| 3 | 0x00 | |
| 4 | 0x00 | |
| 5 | 0x00 | |
| 6 | 0x00 | |
| 7 | 0x00 | |

**Response from the Reader:**

| Byte | Data | Description |
|---|---|---|
| 0 | 0x00 | CANOpen Header … command “upload segment response” |
| 1 | 0x00 | Segment data (in this case the response to the “Scan Tags” command |
| 2 | 0x00 | Byte 1… command “Scan Tags” |
| 3 | 0x0E | Byte 2 … Status code from reader (see HF-RFID Reader module documentation) |
| 4 | 0x00 | Byte 3-4 … length of data (in our case now 14 bytes) |
| 5 | 0x01 | Byte 5-7 … first part of the card information (next part then in the segment) Detailed breakdown of the card information → see HF RFID Reader module documentation |
| 6 | 0x0D | |
| 7 | 0x02 | |

With the CANOpen Header you can determine if there are more segments to be uploaded. More information can be found in the corresponding specifications.

In our case even more segments have to be uploaded. Therefore a message is sent again to upload the remaining segments.

**Message to the RFID Reader:**

| Byte | Data | Description |
|---|---|---|
| 0 | 0x70 | CANOpen Header (structure see CANOpen Specification) → Command “upload segment request”, toggle bit now is 1 |
| 1 | 0x00 | See CanOpen Specification (in this case → reserved) |
| 2 | 0x00 | |
| 3 | 0x00 | |
| 4 | 0x00 | |
| 5 | 0x00 | |
| 6 | 0x00 | |
| 7 | 0x00 | |

**Response from the Reader:**

| Byte | Data | Description |
|---|---|---|
| 0 | 0x10 | CANOpen Header … command “upload segment response” |
| 1 | 0x09 | Further segment data (in this case the response to the “Scan Tags” command |
| 2 | 0x00 | Byte 1-7… further card information Detailed breakdown of the card information → see HF RFID Reader module documentation |
| 3 | 0x08 | |
| 4 | 0x90 | |
| 5 | 0xDD | |
| 6 | 0x6B | |
| 7 | 0x28 | |

Since according to the CANOpen header not all segments have been uploaded yet, the remaining segments have to be uploaded.

**Message to the RFID Reader:**

| Byte | Data | Description |
|---|---|---|
| 0 | 0x60 | CANOpen Header (structure see CANOpen Specification) → Command “upload segment request”, toggle bit now is 0 again |
| 1 | 0x00 | See CanOpen Specification (in this case → reserved) |
| 2 | 0x00 | |
| 3 | 0x00 | |
| 4 | 0x00 | |
| 5 | 0x00 | |
| 6 | 0x00 | |
| 7 | 0x00 | |

**Response from the Reader:**

| Byte | Data | Description |
|---|---|---|
| 0 | 0x05 | CANOpen Header … command “upload segment response” |
| 1 | 0x00 | Further segment data (in this case the response to the “Scan Tags” command |
| 2 | 0x01 | Detailed breakdown of the card information → see HF RFID Reader module documentation |
| 3 | 0x04 | |
| 4 | 0xE0 | |
| 5 | 0xEA | |
| 6 | 0x00 | |
| 7 | 0x00 | |

Now that the corresponding bit in the CanOpen header is set, all segments have been read by the reader. So the next command can be sent.

This is an example of communication with the reader when 1 tag with the correct card type is on the reader. If there are no tags, or even several tags on the reader, the communication looks different. The basic principle ( transmitting the HF-RFID Reader protocol via CanOpen SDO) always remains the same.

The same communication scheme must be used for the other commands. First write the request to address 0x2000 in the Object Dictionary and then read the response from address 0x2200.

# 7 USB Interface Connections

The USB interface of the RFID reader is set functionally identical to the existing CAN interface.

The USB interface provides a USB CDC (virtual COM interface), which is available as a serial interface in the system.

Supported operating systems: Windows, Salamander, Gecko

**Due to noise immunity, a maximum USB cable length of 3 m must be maintained when using the USB interface.**

## 7.1 Use with Windows-based Systems

Under Windows, the reader can be used with the drivers available from SIGMATEK. For testing and evaluation purposes, a tool is provided which like the drivers, can be acquired separately from SIGMATEK via Support.

To write a user-defined application, the protocol documentation of the HF RFID reader must be acquired separately via support. This describes the complete communication processes.

The communication parameters for the virtual serial interface under Windows:

- **Baud rate**: 115200
- **Parity**: None
- **Data bits**: 8
- **Stop bit**: 1

# 8 FCC Statement

**This Device Contains FCCID: 2ACQNPHR001**

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.

Section 15.21 Information to user

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

Section 15.105 (b)

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 in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television Reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

The unit complies with the applicable CE requirements and FCC part 15.

| | |
|---|---|
| Sigmatek Product Name: | **Sigmatek RFID023** |
| Sigmatek Part number: | **01-691-023** |
| FCC ID: | **2ACQNPHR001** |

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.

# 9 Cleaning the Front

Never spot-clean the front, but always over broad surface with a moist cloth when possible. This prevents scratches that can be caused by dust, sand or other contaminants on the surface while cleaning.

Wipe the applied cleanser with a soft, clean, colorless (white) cotton cloth. When cleaning, do not apply pressure to the front. Continue wiping, until the cleanser dries evenly. If necessary, repeat the process until the staining is removed.

No alkaline cleansers or hard objects that can scratch or damage the front surface may be used.

If the RFID reader comes in contact with toxic or erosive chemicals, carefully clean the RFID Reader immediately to prevent corrosion!

**To ensure optimal function, the front should be cleaned at regular intervals!**

**Pour garantir le fonctionnement optimal du terminal, le terminal doit être nettoyé régulièrement!**

# 10 Disposal

To dispose of the product, the respective, possibly country-dependent, guidelines must be met and followed.

# Documentation Changes

| Change date | Affected page(s) | Chapter | Note |
|---|---|---|---|
| 16.03.2017 | 1 | | Text |
| | 4 | 1.3 RFID Reader | Mechanical Dimensions |
| | 5 | 1.5 Miscellaneous | Hardware version to 2.x |
| | 6 | 2 Mechanical Dimensions | new dimensions |
| | 8 | 3 Connector Layout | DIP Switch changed |
| | 12 | 6.1 Node ID Assignment | added |
| | 14 | 6.3 CAN bus Data Transfer Rate | changed |
| 10.04.2017 | 5 | 1.4 Environmental Conditions | IP65 to IP54 changed |
| 12.02.2019 | 5 | 1.4 Environmental Conditions | Radio norm assimilated |
| 19.09.2019 | | 6.5 CAN Protocol | Chapter added |
| 23.06.2020 | | 6.5.4 Example Communication | Chapter added |
| 01.07.2020 | 5 | 1.4 Environmental Conditions | IP54 to IP65 changed |
| 03.07.2025 | 23 | 7 USB Interface Connections | Supported OS expanded |