

INSTALLATION



ID ISC.LRU1002

UHF Long Range Reader



Note

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Contents

| | |
|--|-----------|
| 1. Safety Instructions / Warning - Read before start-up ! | 5 |
| 2. Performance Features of Reader Family ID ISC.LRU1002 | 6 |
| 2.1. Performance features..... | 6 |
| 2.2. Available Reader types | 6 |
| 2.3. Available Accessories..... | 6 |
| 3. Installation | 7 |
| 4. Terminals | 8 |
| 4.1. Antenna Connection | 9 |
| 4.2. Power Supply..... | 10 |
| 4.2.1. Power Supply via connection X2..... | 10 |
| 4.3. Interfaces | 11 |
| 4.3.1. Ethernet Interface on connector X1..... | 11 |
| 4.3.2. USB Interface on connector X3..... | 11 |
| 4.3.3. RS232 Interface on connector X4 | 12 |
| 4.3.4. Data-Clock Interface on connector X4..... | 13 |
| 4.4. Digital Input on connector X4 | 15 |
| 4.5. Outputs on connector X4..... | 16 |
| 4.5.1. Digital outputs on connector X4 | 16 |
| 4.5.2. Relay output on connector X4 | 18 |
| 5. Operating and Display Elements | 19 |
| 5.1. Status LEDs | 19 |
| 5.2. Reset Push Buttons | 20 |
| 5.3. Reader Power adjustment..... | 21 |
| 5.3.1. EU-Reader according to EN302 208 | 21 |
| 5.3.2. FCC-Reader according to FCC 47 Part 15..... | 22 |

| | |
|---|-----------|
| 6. Technical Data | 23 |
| 7. Radio Approvals | 26 |
| 7.1. Europe (CE)..... | 26 |
| 7.2. Declaration of Conformity (Directive 1999/5/EC - R&TTE)..... | 27 |
| 7.3. USA (FCC) and Canada (IC) | 28 |
| 7.3.1. USA (FCC) and Canada (IC) warning notices | 28 |
| 7.3.2. Label Information | 29 |
| 7.3.3. Installation with FCC / IC Approval..... | 29 |
| 7.3.4. USA (FCC) and Canada (IC) approved antennas | 29 |

1. Safety Instructions / Warning - Read before start-up !

- The device may only be used for the intended purpose designed by for the manufacturer.
- The operation manual should be conveniently kept available at all times for each user.
- Unauthorized changes and the use of spare parts and additional devices which have not been sold or recommended by the manufacturer may cause fire, electric shocks or injuries. Such unauthorized measures shall exclude any liability by the manufacturer.
- The liability-prescriptions of the manufacturer in the issue valid at the time of purchase are valid for the device. The manufacturer shall not be held legally responsible for inaccuracies, errors, or omissions in the manual or automatically set parameters for a device or for an incorrect application of a device.
- Repairs may only be executed by the manufacturer.
- Installation, operation, and maintenance procedures should only be carried out by qualified personnel.
- Use of the device and its installation must be in accordance with national legal requirements and local electrical codes .
- When working on devices the valid safety regulations must be observed.
- Special advice for carriers of cardiac pacemakers:

Although this device doesn't exceed the valid limits for electromagnetic fields you should keep a minimum distance of 25 cm between the device and your cardiac pacemaker and not stay in an immediate proximity of the device respective the antenna for some time.

2. Performance Features of Reader Family ID ISC.LRU1002

2.1. Performance features

The Reader has been developed for reading passive data carriers, so-called „Smart Labels“, using an operating frequency in the UHF range. The output power is configurable in steps of 100 mWatts in the range between 100 mWatts and 2 Watts. This allows read ranges of up to 8m.

2.2. Available Reader types

The following Readers are available:


Table 1: Available Reader Types

| Reader type | Description |
|--------------------|---------------------------|
| ID ISC.LRU1002-EU | Device version for Europe |
| ID ISC.LRU1002-FCC | Device version for USA |

2.3. Available Accessories

The following optional accessories are currently available:

Table 2: Optional Reader Accessories

| Reader type | Description |
|--|---|
| ID ISC.LR.CSC-IP64 Connector Sealing Cap | <p>Protection cap for IP 64 Art.No.: 3558.000.00</p>  |
| ID ISC.LRU3x00-MS Mounting Rail Set | <p>Rail Mounting Set for ID ISC.LRU1002 and ID ISC.LRU3000/3500 Art.No.: 3831.000.00</p> |

3. Installation

The Reader is designed for wall-mount, including outdoors. Holes for mounting on a wall are provided in the housing.

It is not necessary to open the reader housing for mounting.

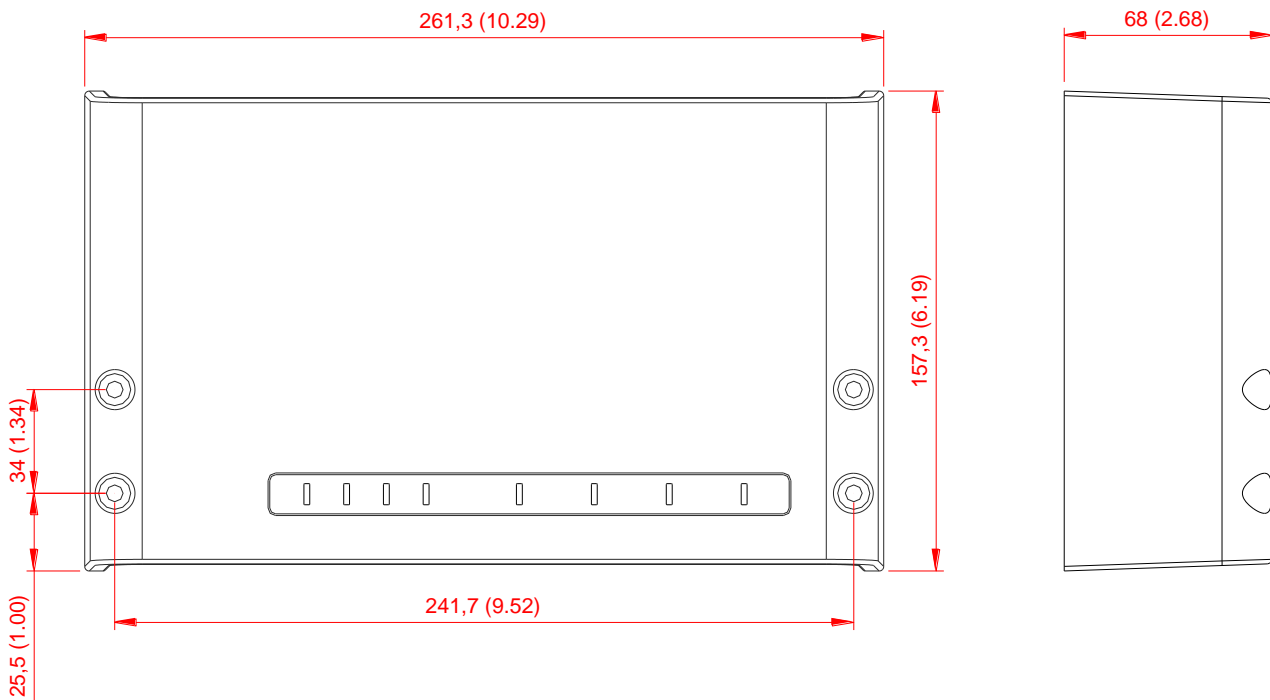


Figure 1: Installation Drawing

4. Terminals

On the lower side of the reader housing the different cable connectors are positioned. Figure 2: Connection Overview shows the arrangement of the connectors and Table 3: Connection terminals shows which connection for the different cables are used. Table 4: Push button function shows the available push buttons.

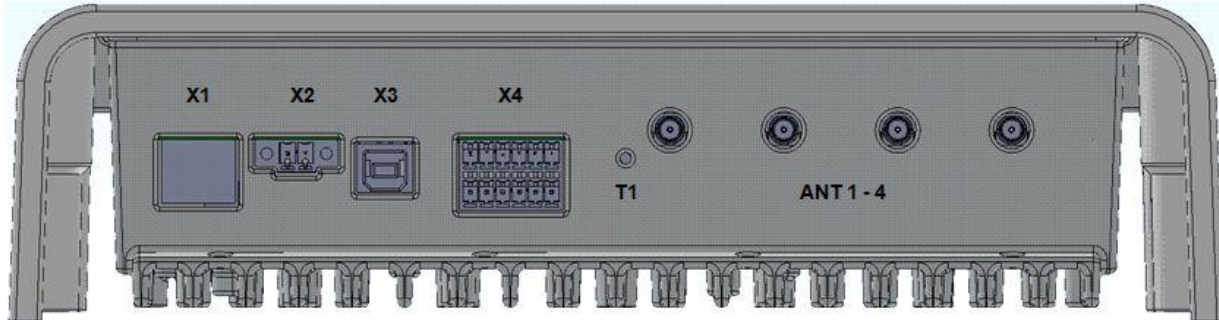


Figure 2: Connection Overview

Table 3: Connection terminals

| Connector | Description |
|-----------|---|
| ANT 1-4 | Connection of the external antennas (Impedance 50Ω) |
| X1 | 10/100Tbase network connection with RJ-45 |
| X2 | Power supply 24VDC +-5% |
| X3 | USB interface for host communication |
| X4 | Digital input, digital output, relay output and RS232 interface |

Table 4: Push button function

| Push button | Description |
|-------------|---|
| T1 | Internal push button for complete configuration reset |

4.1. Antenna Connection

The external SMA antenna connectors are positioned on the lower side of the reader.

The maximum tightening torque for the SMA sockets is 0.45 Nm (4.0 lbf in).

CAUTION:

Exceeding the tightening torque will destroy the plug.

Table 5: External antenna connection

| Terminal | Description |
|-----------|--|
| ANT 1 - 4 | Connection for external antennas (input impedance 50Ω) |

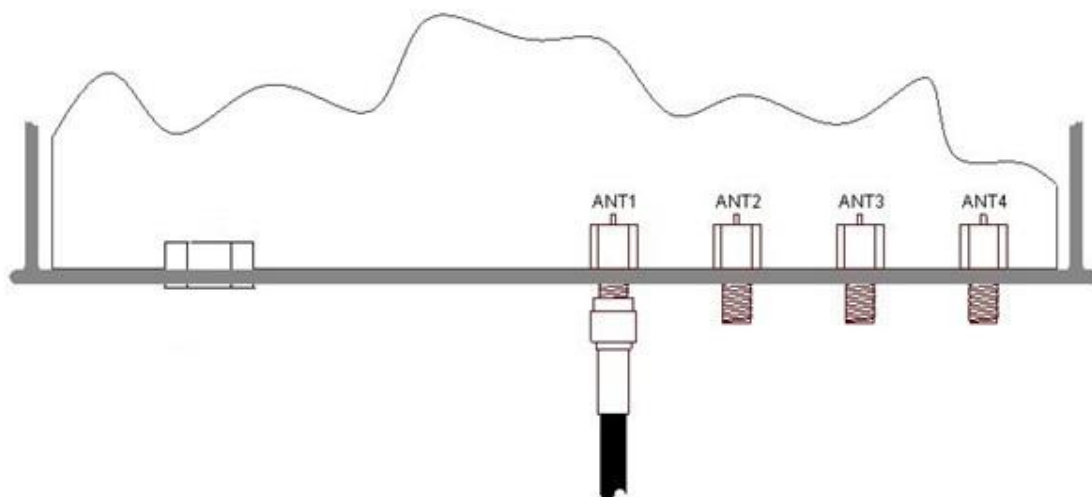


Figure 3: External antenna connection ANT1-4

4.2. Power Supply

4.2.1. Power Supply via connection X2

The supply voltage of 24 V DC has to be connected to Terminal X2.

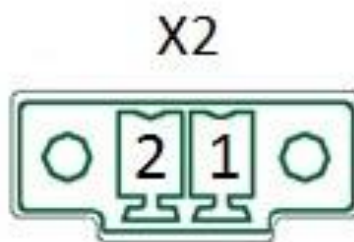


Figure 4: Connector X2 Pin Assignment

Table 6: Pin assignment for power supply

| Terminal | Abbreviation | Description |
|------------|--------------|---------------------------------------|
| X2 / Pin 1 | VDC | Vcc – supply voltage 24 V DC \pm 5% |
| X2 / Pin 2 | GND | Ground – supply voltage |

CAUTION:

The reader has to be supplied by a limited power supply (e.g. NEC Class 2/LPS power supply) according IEC EN 60950-1 chapter 2.5, only.

Reversing the polarity of the supply voltage may destroy the device.

Each reader has to be supplied by a separate external power supply.

4.3. Interfaces

4.3.1. Ethernet Interface on connector X1

The Reader has an integrated 10 / 100 base-T network port for an RJ-45. Connection is made on X1 and has an automatic “Crossover Detection” according to the 100BASE-T Standard.

With structured cabling STP CAT 5 cables should be used. This ensures a reliable operation at 10 Mbps or 100 Mbps.

The prerequisite for using TCP/IP protocol is that each device has a unique address on the network. All Readers have a factory set IP address.

Table 7: Standard factory configuration of the Ethernet connection

| Network | Address |
|-------------|---------------|
| IP-Adresse | 192.168.10.10 |
| Subnet-Mask | 255.255.0.0 |
| Port | 10001 |
| DHCP | OFF |

NOTE:

The reader is equipped with a DHCP ready Ethernet Interface.

4.3.2. USB Interface on connector X3

The USB socket on the board is terminal X3. The pinout is standardized. The data rate is reduced to 12 Mbit (USB full speed). A standard shielded USB-cable can be used.

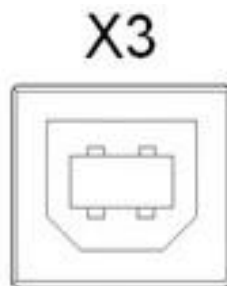


Figure 5: USB-Interface for host communication

NOTE:

The length of the USB-cable can have a max. of 5m (20 inch). It is not allowed to use longer cables.

4.3.3. RS232 Interface on connector X4

The RS232 interface is connected on X4. The transmission parameters can be configured by means of software protocol.

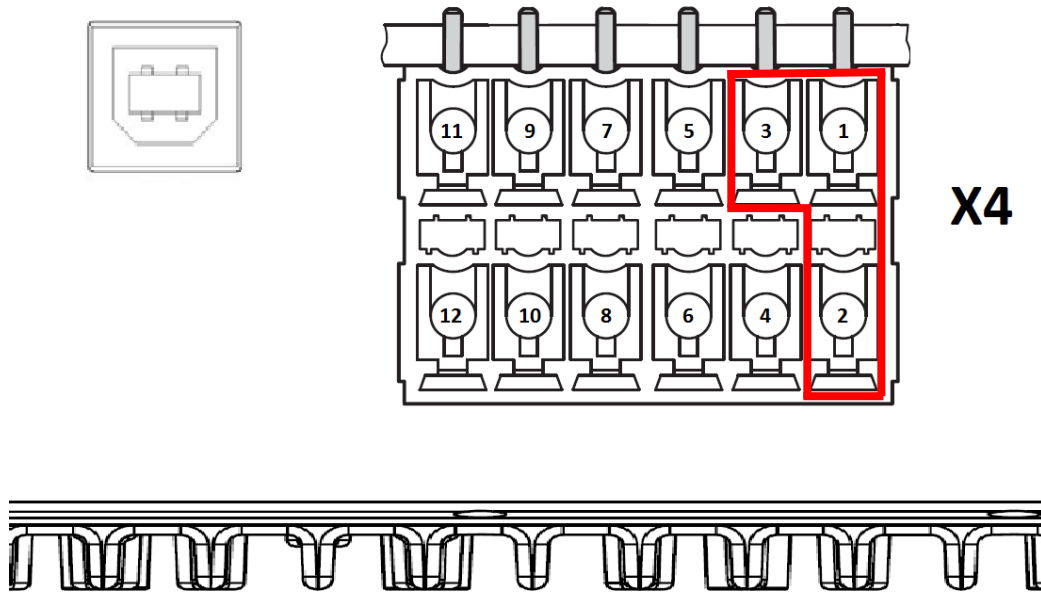


Figure 6: RS232 interface pin-outs on X4

Table 8: Pin Assignment RS232 Interface

| Pin Number at Connector X4 | Pin Assignment |
|----------------------------|----------------|
| 1 | RS232 – RxD |
| 2 | RS232 – TxD |
| 3 | GND |

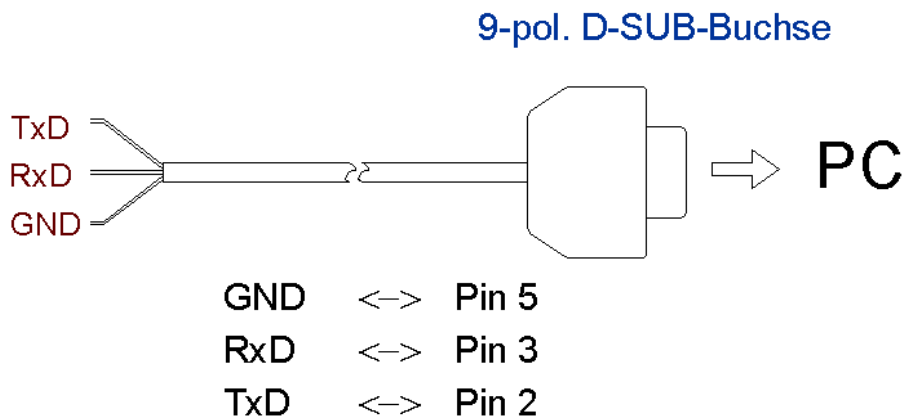


Figure 7: Wiring example for connecting the RS232 interface to a 9 pin D-SUB plug

4.3.4. Data-Clock Interface on connector X4

The connection of the data-clock interface take place via the digital Outputs OUT1 and OUT2 at connector X4. The wire for the clock needs to be connected to connector OUT1-C, the wire for the data needs to be connected to connector OUT2-C.

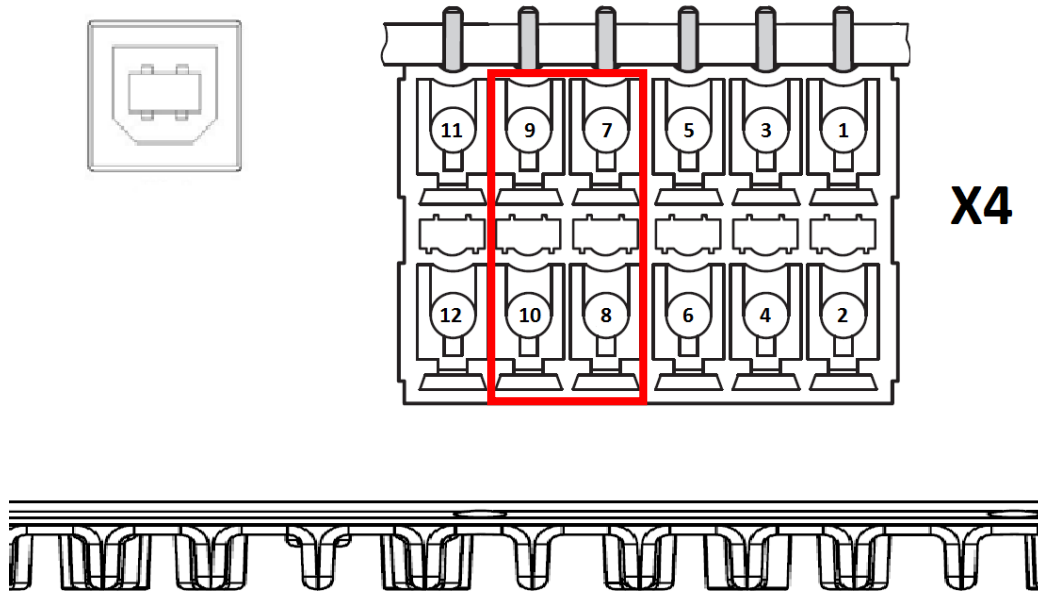


Figure 8: Data-Clock Interface on connector X4

Table 9: Pin Assignment Data/Clock Interface

| Pin Number at Connector X4 | Pin Assignment |
|----------------------------|----------------|
| 7 | Clock / Data-0 |
| 8 | Vcc |
| 9 | Data / Data-1 |
| 10 | Vcc |

NOTE:

The data-clock interface is only available in Scan-Mode.

The data-clock interface cannot be used to configure the reader.

The digital outputs OUT1 and OUT2 are not available, if the data-clock interface is activated.

The data as well as the clock need to be supplied with an external voltage. The output is configured for max. 24 V DC / 30 mA.

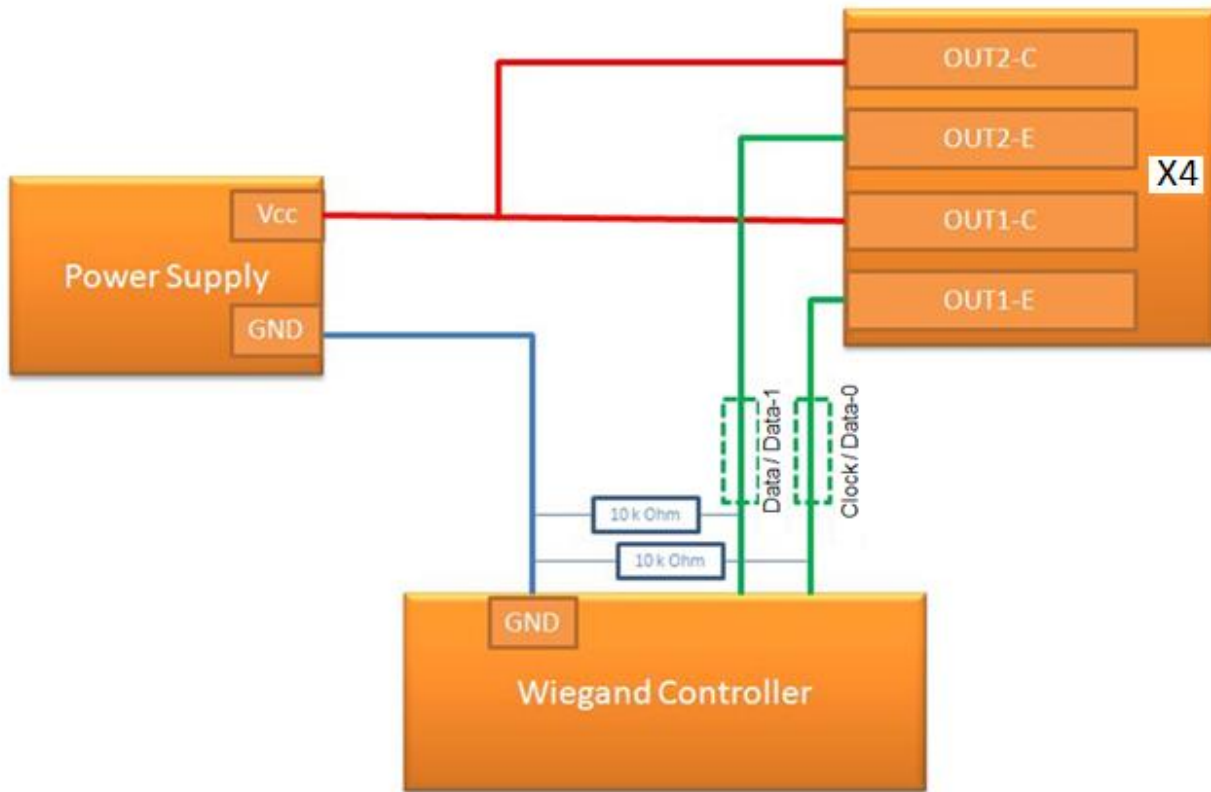


Figure 9: Wiring Example

NOTE:

Please consider possible limitations of the Wiegand Controller regarding the used supply voltage.

In dependency on the inner circuit of the used Wiegand Controller it is necessary to use external serial resistors to limit the current on the data and clock wires.

The necessity of the external pull down resistor is depending on the inner circuit of the used Wiegand Controller

4.4. Digital Input on connector X4

The optocoupler on Terminal X4 is galvanically isolated from the Reader electronics and must therefore be externally supplied.

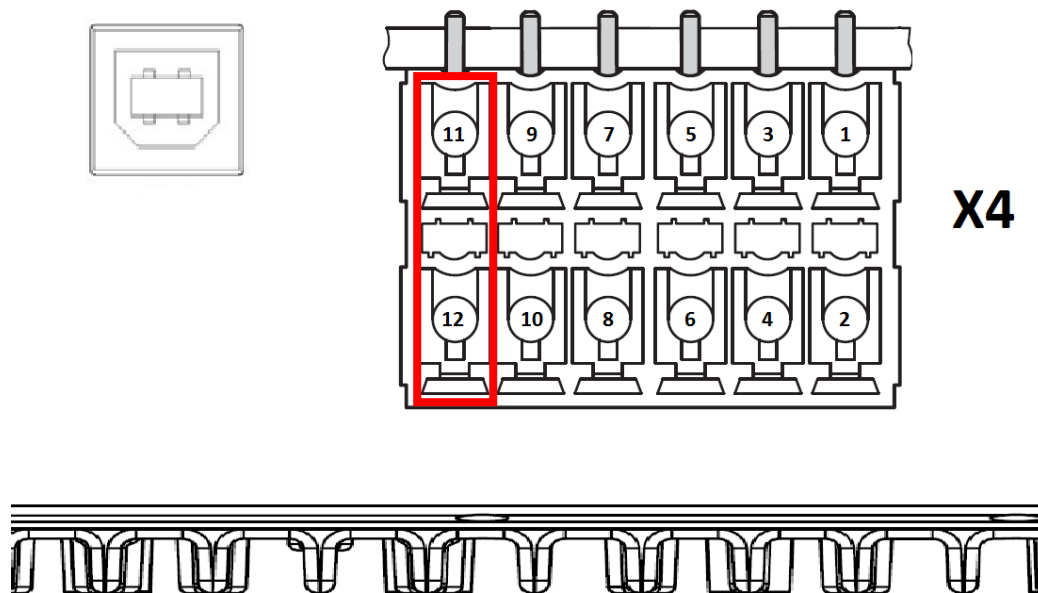


Figure 10: Optocoupler pin-outs IN1

Table 10: Pin Assignment digital Input IN1

| Pin Number at Connector X4 | Pin Assignment |
|----------------------------|----------------|
| 11 | IN1 - |
| 12 | IN1 + |

NOTE:

The input is configured for a maximum input voltage of 24 V DC and an input current of max. 20 mA.

Polarity reversal or overload on the input will destroy it.

4.5. Outputs on connector X4

4.5.1. Digital outputs on connector X4

Optocoupler output:

The transistor connections, collector and emitter, of the optocoupler output are galvanically isolated from the Reader electronics and are carried to the outside without any internal ancillary circuitry on Terminal X4. The output must therefore be powered by an external power supply.

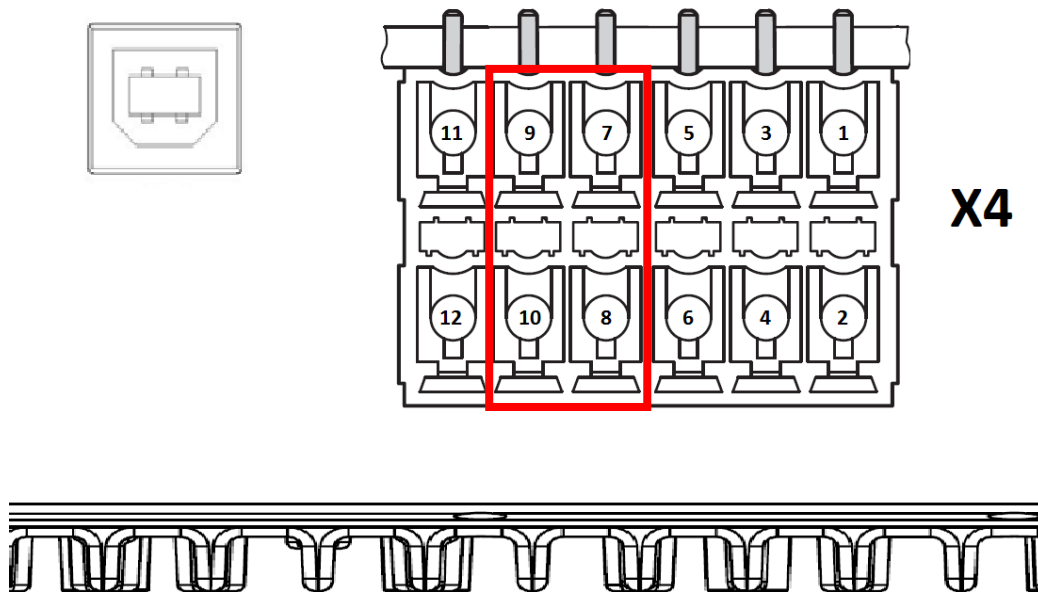


Figure 11: Optocoupler -Outputs OUT1-2

Table 11: Pin Assignment digital Output OUT1 / OUT2

| Pin Number at Connector X4 | Pinbelegung |
|----------------------------|-------------|
| 7 | OUT1-E |
| 8 | OUT1-C |
| 9 | OUT2-E |
| 10 | OUT2-C |

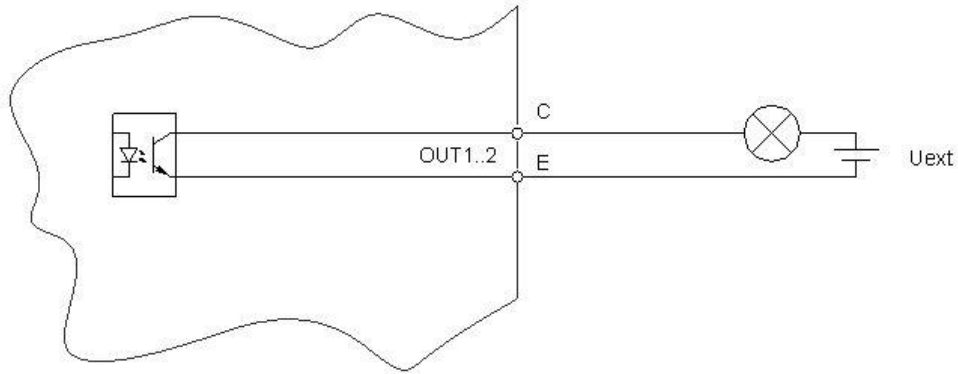


Figure 12: Internal and possible external wiring of the optocoupler-outputs OUT1-2

CAUTION:

The output is configured for max. 24 V DC / 30 mA.

Polarity reversal or overload on the output will destroy it.

The output is intended for switching resistive loads only.

4.5.2. Relay output on connector X4

There is 1 relay output available on connector X4.

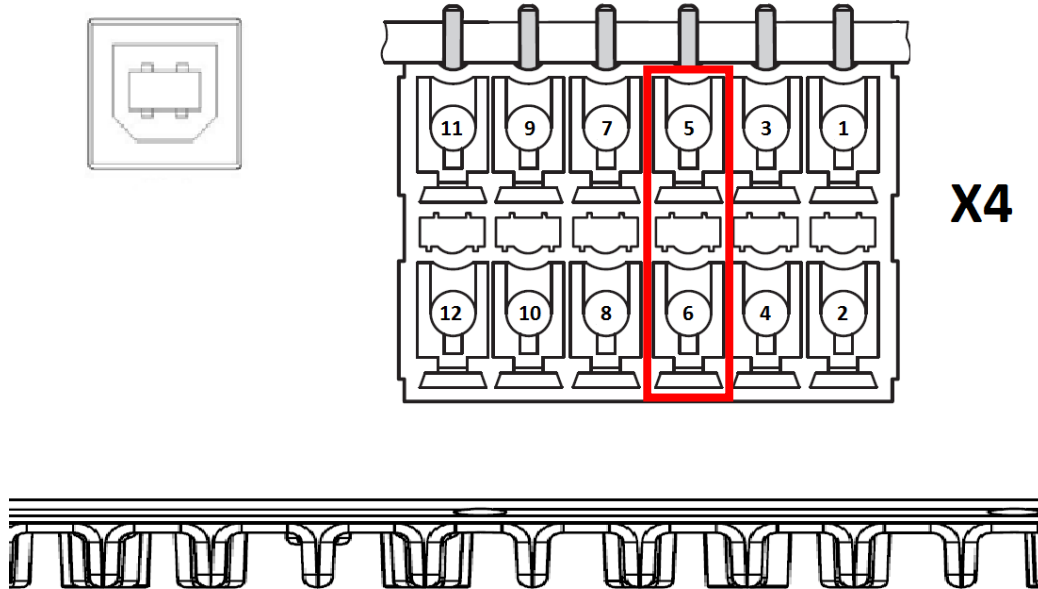


Figure 13: Relay output pin-outs REL1

Table 12: Pin Assignment Relay Output REL1

| Pin Number at Connector X4 | Pin Assignment |
|----------------------------|----------------|
| 5 | REL1-NO |
| 6 | REL1-COM |

CAUTION:

The relay output is configured for max. 24 V DC / 2 A constant load.

The switching current must not exceed 1A.

The relay output is intended for switching resistive loads only. If an inductive load is connected, the relay contacts must be protected by means of an external protection circuit.

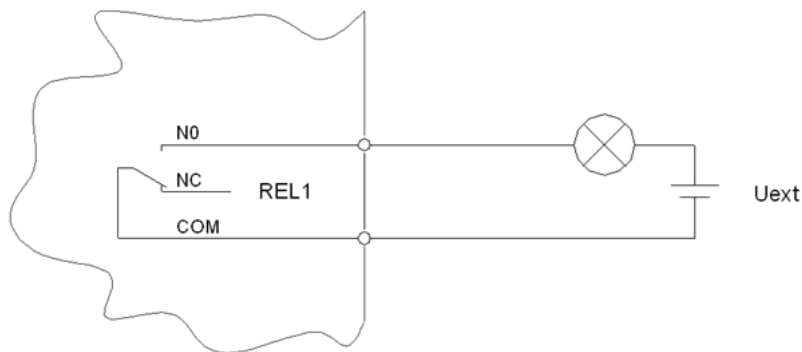
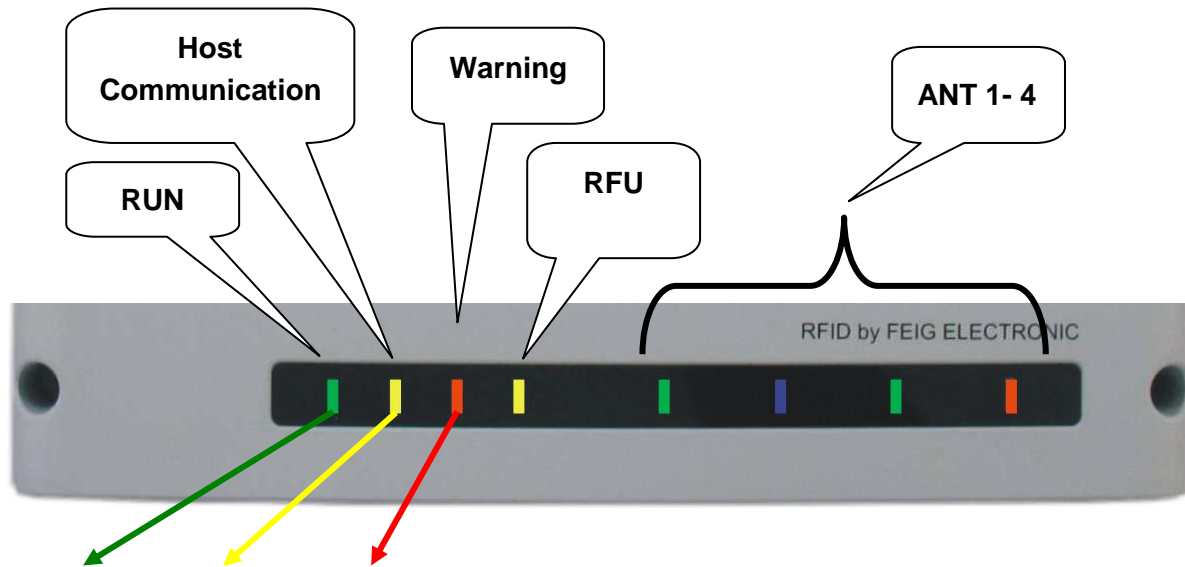


Figure 14: Internal and possible external wiring of the relay output

5. Operating and Display Elements

5.1. Status LEDs

Table 13: Configuration of the LEDs



| Green | Yellow | Red | Description |
|------------------------------|---------------------------|---------------------------|---|
| ON | OFF | ON | Boot sequence (ca.10s) after power on |
| FLASH | OFF | OFF | Normal Reader operation (without Host communication) |
| FLASH | FLASH | OFF | Reader receives a valid protocol from host |
| FLASH | OFF | ON | RF Warning [0x84] (without host communication) |
| FLASH (alternating) | OFF | FLASH (alternating) | Firmware Activation necessary [0x17] / Wrong Firmware [0x18] |
| FLASH (synchronous) | OFF | FLASH (synchronous) | RFC Hardware Error [0xF1] |
| OFF | FLASH (synchronous) | FLASH (synchronous) | Hardware Warning (EEPROM Error / RFC not detected) |
| Firmware Update: | | | |
| FLASH (light in sequence) | FLASH (light in sequence) | FLASH (light in sequence) | Firmware transfer from host to reader (Please do not switch off the reader or disconnect the interface cable) |
| Configurations-Reset: | | | |
| FLASH (light in sequence) | FLASH (light in sequence) | FLASH (light in sequence) | While T1 is pushed and hold for maximal 5s |
| ON | ON | ON | After T1 has been pushed and hold for 5s. Configuration Reset has been finished. |

| ANT 1 – 4: | |
|------------|---|
| Green | HF Power switched on |
| Blue | Tag-Detect |
| Red | Antenna impedance error (> 50Ohm or <50Ohm) |

5.2. Reset Push Buttons

Figure 15 shows the position of the reset push button T1.

At the right side of the connector X4 the push button T1 is positioned. It is located in the connector housing. With the push button T1 a complete configuration reset can be performed. As a reset you should use a paper clip and push the button T1 for at least 5 s until the blue (left side) and the red (right side) LEDs are switched on continuously, see 5.1. Status LEDs

Table 13: Configuration of the LEDs

Afterwards the green LED and the red LED are flashing alternating.

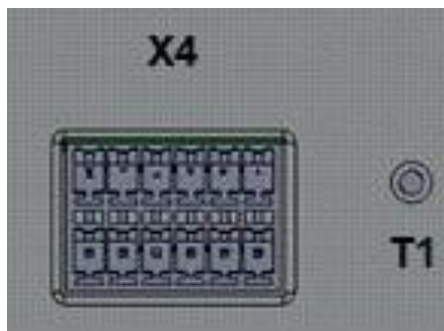


Figure 15: Position of the reset-switch T1

To finish the hardware configuration reset a reboot of the reader is mandatory. This can either be performed by plugging off the power supply or by sending the command System Reset [0x64] in Mode [0x00] RF-Controller to the reader.

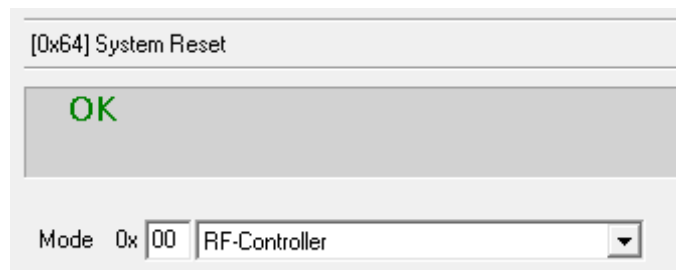


Figure 16: System Reset [0x64]

5.3. Reader Power adjustment

To achieve the optimum reading performance it is necessary to set the reader output power to the highest allowed value. This depends on the used reader type (EU / FCC) and the regulation in the country where the reader is used.

5.3.1. EU-Reader according to EN302 208

According to the standard EN302 208 the maximum radiated power is 2 W e.r.p. (Effective Radiated Power) in countries of the European Union. The in the reader configured output power P_{out} depends on the antenna gain in dBi and the attenuation of the antenna cable. If a circular polarized antenna is used the antenna gain [dBic] can be reduced by 3dB. At a linear polarized antenna the maximum linear antenna gain [dBi] must be used.

$$P_{Out} = P_{erp} - \text{Antenna Gain} + \text{Cable loss} + 2,1\text{dB}^{**}$$

** Correction Factor to convert the radiated power from e.r.p to e.i.r.p.

For the calculation of the reader output power P_{Out} an Excel file „Calc-RF-Power.xls“ can be used. Available from Feig Electronic GmbH.

Example:

| | | | | |
|---|---|------------------|----|-----------------|
| Radiated Power | | 2,0 W [e.r.p] | <> | 33,0 dBm |
| correction factor ERP-> EIRP | * | 1,64 | + | 2,1 dB |
| Radiated Power Isotrop | = | 3,28 W [e.i.r.p] | = | 35,1 dBm |
| Antenna Gain | | 11,0 dBic | - | 11,0 dBi |
| Typ of antenna ** | | 1 | 3 | + 3,0 dB |
| cable losses / 100m | | 30,7 dB | | |
| cable losses / 1m | | 0,3 dB | | |
| Length of the antenna cable | * | 6 m | | |
| | = | 1,8 dB | + | 1,8 dB |
| Radiated power in dB | | | | 29,0 dBm |
| Output power in mW | | | | 786 mW |
| Configuration in the Reader (CFG3) | | | <= | 0,8 W |

** linear antenna = „0“, circular antenna = „1“

Figure 17: Calculation of the output power

In Figure 17 the allowed antenna power is shown for the use of the FEIG standard antenna ANT.U600/270 –EU and a 6m long Belden H155 coaxial cable.

5.3.2. FCC-Reader according to FCC 47 Part 15

According to the FCC approval, Title 47, Part15 the maximum output power of the reader is limited to 1 W (30dBm). The maximum radiated power of the antenna should not increase more then 4 W e.i.r.p. Due to these facts two different cases have to be considered:

If a linear polarized antenna is used which gain is less then 6 dBi (factor 4), or if a circular polarized antenna is used which gain is less then 9dBic the reader can always be configured to an output power of 1W.

$$\text{Antenna Gain} < 6\text{dBi} \quad \rightarrow \quad P_{\text{out}} = 1 \text{ W}$$

This would be the case if the FEIG standard antennas ANT.U170/170 -FCC (4dBic) or ANT.U270/270 -FCC (8,7dBic) are used.

If an antenna is used which gain is more then 6dBi (9dBic) it is necessary to consider the antenna gain and the attenuation of the antenna cable to calculate the right output power. If a circular polarized antenna is used the antenna gain [G]=dBic can be reduced by 3dB. This is the case if the FEIG standard antenna ANT.U600/270 -FCC is used. In this configuration the maximum output power of the reader can be calculated in the following way.

$$P_{\text{out}} = 36 \text{ dBm (4 W e.i.r.p)} - \text{Antenna Gain (in dBi)} + \text{Cable Loss (in dB)}$$

$$P_{\text{out}} = 36 \text{ dBm (4 W e.i.r.p)} - \text{Antenna Gain (in dBic)} - 3 \text{ dB} + \text{Cable Loss (in dB)}$$

The antenna gain of the circular polarized standard antenna ANT.U600/270 is 10,5 dBic. This could be compared with a gain of 7,5 dBi of a linear polarized antenna (10,5 dBic – 3 dB).

Example 1:

Antenna ANT.U600/270 and 2 m Belden H155 Coaxial Cable:

$$P_{\text{out}} = 36 \text{ dBm} - 10,5 \text{ dBic} + 3 \text{ dB} + 0,6 \text{ dB}$$

$$P_{\text{out}} = 36 \text{ dBm} - 7,5 \text{ dBi} + 0,6 \text{ dB}$$

$$P_{\text{out}} = 29,1 \text{ dBm}$$

$$\text{Reader Configuration} = 0,8 \text{ Watt}$$

Example 2:

Antenna ANT.U600/270 and 6m Belden H155 Coaxial Cable:

$$P_{\text{out}} = 36 \text{ dBm} - 10,5 \text{ dBic} + 3 \text{ dB} + 1,8 \text{ dB}$$

$$P_{\text{out}} = 36 \text{ dBm} - 7,5 \text{ dBi} + 1,8 \text{ dB}$$

$$P_{\text{out}} = 30,3 \text{ dBm}$$

$$\text{Reader Configuration} = 1,0 \text{ Watt}$$

According to Example 2 it will only be necessary to adapt the output power of the reader when the antenna ANT.U600/270 is used if the length of the antenna cable is less then 6m.

6. Technical Data

MECHANICAL DATA

| | |
|-----------------------|---|
| Housing | Aluminum powder-coated |
| Dimension (W x H x D) | 261,3 mm x 157,3 mm x 68 mm 10.29 inch x 6.19 inch x 2.68 inch |
| Weight | 1,8 kg (4.0 lb) |
| Protection Class | IP 53 (with protection cap IP64) |
| Colour | RAL 9003 (Signal White) |

ELECTRICAL DATA

| | |
|---------------------|---|
| Power Supply | 24 V DC \pm 5 % (Noise Ripple: max. 150 mV) |
| Power Consumption | max. 18 W |
| Operating Frequency | |
| • EU-Reader | 865 MHz to 868 MHz (EN 302208) |
| • FCC-Reader | 902 MHz to 928 MHz (FCC47 Part15) |
| RF-Power | 100 mW to max. 2 W configurable |
| Antenna Connection | 4 x SMA female (50 Ω), internal Multiplexer |
| Outputs | |
| • 2 x Optocoupler | 24 V DC $\overline{\text{---}}$ / 30 mA (galvanically isolated) |
| • 1 x Relay | 24 V DC $\overline{\text{---}}$ / 1 A (switching current), (2A constant load) |
| Inputs | |
| • 1 x Optocoupler | max.24 V DC $\overline{\text{---}}$ / 20 mA |
| Interfaces | RS232, USB (full Speed), Ethernet, Data-Clock |

FUNCTIONAL PROPERTIES

| | |
|-----------------------------|---|
| Protocol Modes | FEIG ISO HOST Mode (Advanced Protocol Frame) |
| | Buffered Read Mode <i>Automatic Data</i> |
| | Scan Mode <i>Buffering and</i> |
| | Notification Mode <i>Filtering</i> |
| Supported Transponder Types | EPC Class 1 Generation 2 ISO 18000-6-C (Upgrade Code required) |
| Optical Indicators | 16 LEDs for operating status and diagnostics |
| Further Features | Anticollision RSSI RF-Channel monitoring Antenna SWR monitoring Temperature Monitoring* |

AMBIENT CONDITIONS

| | |
|-------------------|---|
| Temperature Range | |
| • Operation | -25 °C to +55 °C |
| • Storage | -25 °C to +85 °C |
| Humidity | 5 % to 95 % non-condensing |
| Vibration | EN 60068-2-6 10 Hz to 150 Hz: 0,075 mm / 1 g |
| Shock | EN 60068-2-27 Acceleration 30 g |

* Caution: Overheating of the device may result in performance losses. It is recommended to activate the RF of the reader only if there is a transponder in the detection range of an antenna.

APPLICABLE STANDARDS

Radio Regulation

- Europe EN 302 208
- USA FCC 47 CFR Part 15
- Canada IC RSS-Gen, RSS-210

EMC

EN 301 489

Safety

- Low Voltage EN 60950
- Human Exposure EN 50364

7. Radio Approvals

7.1. Europe (CE)

When properly used this radio equipment conforms to the essential requirements of Article 3 and the other relevant provisions of the R&TTE Directive 1999/5/EC of March 99.



Performance Classification according to ETSI EN 301 489: Class 2

7.2. Declaration of Conformity (Directive 1999/5/EC - R&TTE)

Figure 18: Declaration of Conformity

7.3. USA (FCC) and Canada (IC)

7.3.1. USA (FCC) and Canada (IC) warning notices

| | |
|--------------------------------------|---|
| Product name: | ID ISC.LRU1002-FCC ID ISC.LRU1002-FCC |
| Reader name: | ID ISC.LRU1002-FCC ID ISC.LRU1002-FCC |
| FCC ID: IC: | PJMLRU1002 6633A-LRU1002 |
| Notice for USA and Canada | <p>This device complies with Part 15 of the FCC Rules and with RSS-210 of Industry Canada.</p> <p>Operation is subject to the following two conditions.</p> <p>(1) this device may not cause harmful interference, and</p> <p>(2) this device must accept any interference received, including interference that may cause undesired operation.</p> <p>Unauthorized modifications may void the authority granted under Federal communications Commission Rules permitting the operation of this device.</p> <p>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.</p> <p>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 :</p> <p>(1) l'appareil ne doit pas produire de brouillage, et</p> <p>(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.</p> |

Warning: Changes or modification made to this equipment not expressly approved by FEIG ELECTRONIC GmbH may void the FCC authorization to operate this equipment.

7.3.2. Label Information

The following information must be placed at the outer side of the housing in which the reader is mounted.

Contains FCC ID PJMLRU1002
Contains IC: 6633A-LRU1002

7.3.3. Installation with FCC / IC Approval

FCC-/IC-NOTICE: To comply with FCC Part 15 Rules in the United States / with IC Radio Standards in Canada, the system must be professionally installed to ensure compliance with the Part 15 certification / IC certification. It is the responsibility of the operator and professional installer to ensure that only certified systems are deployed in the United States / Canada.

7.3.4. USA (FCC) and Canada (IC) approved antennas

This radio transmitter (identify the device by certification number, or model number if Category II) has been approved by Industry Canada to operate with the antenna types listed below with maximum permission gain and required antenna impedance for each antenna type indicated. Antenna types, not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

The antennas used for this transmitter must be installed to provide a separation distance of at least 23 cm from all persons and must not be located or operating in conjunction with any other antenna or transmitter, except as listed for this product's certification.

Le présent émetteur radio (identifier le dispositif par son numéro de certification ou son numéro de modèle s'il fait partie du matériel de catégorie I) a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énoncé ci-dessus et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

Les antennes utilisées pour cet émetteur doit être installé pour fournir une distance de séparation d'au moins 23 cm de toutes les personnes et ne doit pas être situé ou opérant en conjonction avec une autre antenne ou un autre émetteur, sauf dans les cas énumérés à la certification de ce produit.

Following antennas are approved by FCC according FCC Part 15 and IC Canada according RS210

- ID ISC.ANT.U170/170-FCC (4.0 dBic)
- ID ISC.ANT.U270/270-FCC (9.0 dBic)
- ID ISC.ANT.U600/270-FCC (10,5 dBic)