OBID®
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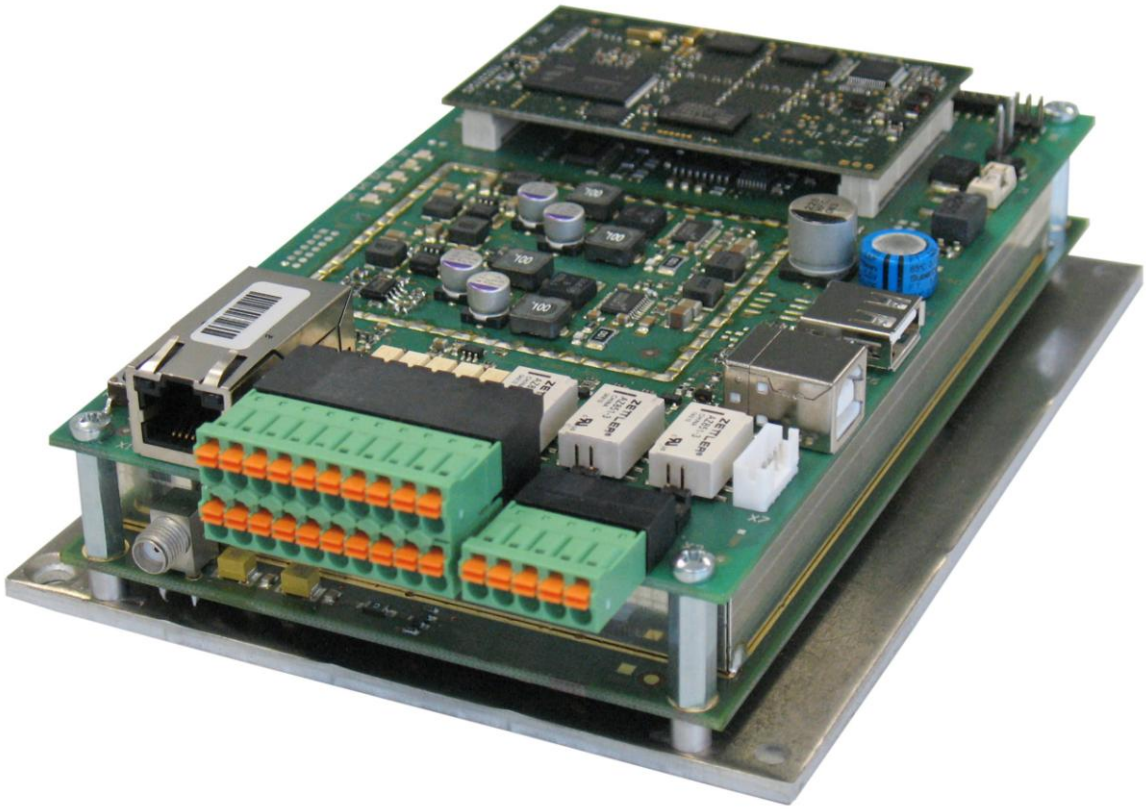
INSTALLATION

ID ISC.LRM2500-B

Long Range Reader



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FEIG ELECTRONIC

Note

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FEIG call explicit attention that devices which are subject of this document are not designed with components and testing methods for a level of reliability suitable for use in or in connection with surgical implants or as critical components in any life support systems whose failure to perform can reasonably be expected to cause significant injury to a human. To avoid damage, injury, or death, the user or application designer must take reasonably prudent steps to protect against system failures.

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Content

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

- The device may only be used for the purpose intended by the manufacturer.
- The operation manual should be kept readily 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 the manufacturer from any liability.
- 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 undertaken 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.
- Before touching the device, the power supply must always be interrupted. Make sure that the device is without voltage by measuring. The fading of an operation control (LED) is no indicator for an interrupted power supply or the device being out of voltage!
- Special advice for wearers 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 the immediate proximity of the device’s antenna for any length of time.

2 Performance Features of Reader Family ID ISC.LRM2500

2.1 Performance Features

The Reader has been developed for reading passive data carriers, so-called „Smart Labels“, using an operating frequency of 13.56 MHz. For the operation it is necessary to connect a appropriate external antenna to the connector ANT1.

2.2 Available Reader Types

The following Reader type’s are currently available:

Reader type	Description
ID ISC.LRM2500-A	Module version with RS232/485- / USB- / LAN-Interface, USB-Host und Embedded Linux
ID ISC.LR2500-A	Housing version with RS232/485- / USB- / LAN-Interface, USB-Host und Embedded Linux
ID ISC.LRM2500-B	Module version with RS232/485- / USB- / LAN-Interface

Table 1: Available Reader types

3 Installation and mounting

3.1 Mounting

The Reader Module is designed for installation on a heat sink. Mounting is accomplished using the ∅ 4.5 mm holes located in each corner of the base plate (see: Figure 1).

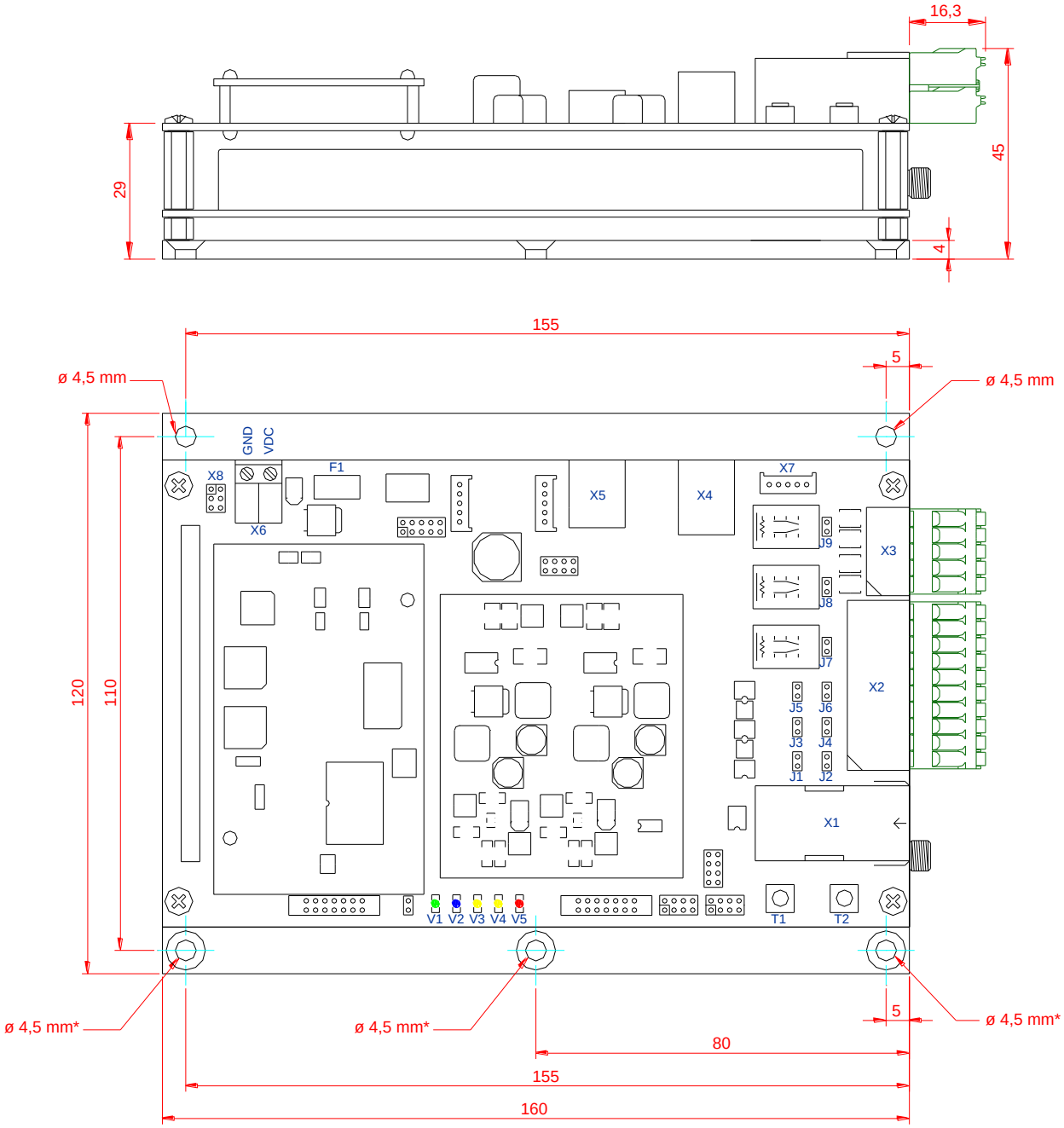


Figure 1: Scale drawing of the Reader module with mounting plate

To fully exploit the performance of the Reader Module, the heat sink should have a thermal resistance R_{ThK} of max. 1 K/W. When attaching the Reader Module to the heat sink you should strive for a little heat transfer resistance between the base plate and the heat sink as possible. The use of heat sink compound is recommended.

If the antenna is properly tuned and there is sufficient air convection along the mounting plate, the ID ISC.LRM2500 can be operated without an additional heat sink at up to 2W of power. Note here however that detuning of the antenna can result in additional heating of the Reader. In such cases the Reader regulates its output power down until the upper temperature limit of its final stage fallen down again.

3.2 Terminals

Figure 2 shows the terminals and control elements of the ID ISC.LRM2500-B

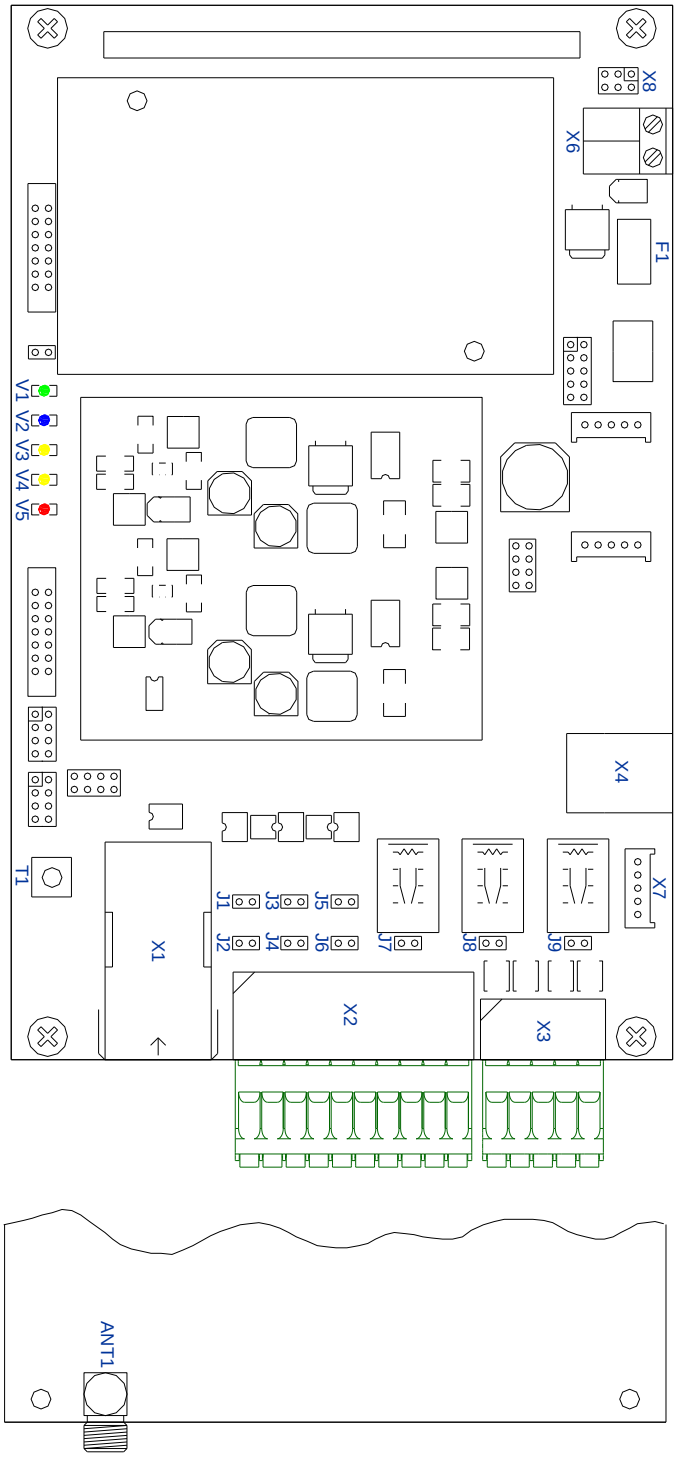


Figure 2: Reader terminals

3.3 Antenna connection

The SMA socket „ANT1“ is located on the lower circuit board for connecting the antenna to the ID ISC.LRM2500.

Active external function units (e.g. ID ISC.DAT) can also be supplied with 8 V ⎓ through the antenna terminal. The maximum current draw is then not allowed to exceed 150mA. This additional power consumption must be considered for the total reader power consumption.

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

Attention:
Exceeding the tightening torque will destroy the socket.

Terminal	Description
ANT1	For connecting the antenna (Input Impedance 50Ω)

Table 2: Antenna jack

- **The standing wave ratio VSWR for the antenna should not exceed a value of 1,3.**
- **For reaching optimal read ranges the coaxial cables between readers and antenna must have defined lengths. For all antennas of the company FEIG ELECTRONICS GmbH and for all antennas which with the tuning boards (e.g. ID ISC.DAT, ID ISC.MAT b and ID ISC.MAT s) of FEIG ELECTRONICS GmbH is made the optimal length of the coaxial cable is 1.35 m (Article No. 1654.004.00.00, Name ID ISC.ANT.C-B). See also Mounting Manual Power Splitter ID ISC.ANT.PS-B and ID ISC.ANT.MUX.**
- **The optimum operating Q factor of the antenna should be in a range of Q_{oper} = 10...30. To determine the operating Q the antenna must be supplied with a 50 Ohm source such as a network analyzer or frequency generator.**
- **To prevent external coupled noise, the antenna cable must be fitted with the included EMC ferrite ring core ∅ 28 mm x 20 mm. The antenna line must be wound around the ring core for at least 4 turns. The distance between the Reader termination and the ring core should be maximum 10 cm (see** Figure 3**).**
- **When connecting an antenna, ensure that it does not exceed the permissible limits prescribed by the national regulations for radio frequency devices.**

Figure 3: Antenna line with EMC ring cores

3.4 Supply voltage

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

The supply voltage of 24 V⎓ is connected to Terminal X6.

Terminal	Abbreviation	Description
X6 / Pin 1	VDC	Vcc – supply voltage + 24 V ⎓
X6 / Pin 2	GND	Ground – supply voltage

Table 3: Pin-outs for supply voltage on X6

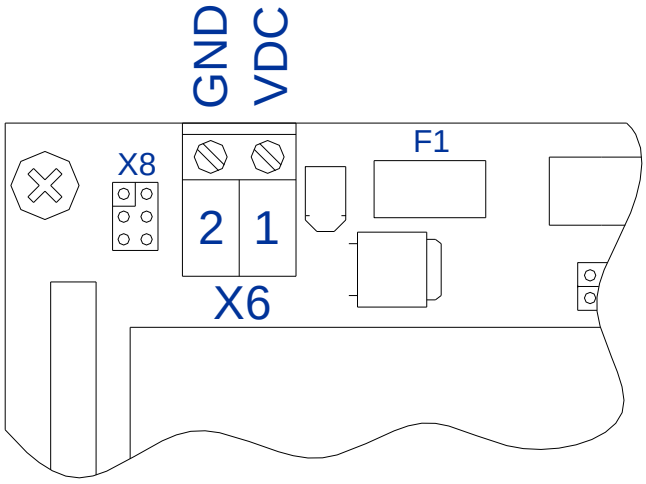


Figure 4: Position of the connector X6 for the power supply

Note:

- **Reversing the supply voltage polarity may destroy the device.**
- **To meet national requirements for radio frequency devices the power supply line must be fitted with one of the supplied EMC ring cores ∅ 28 mm x 20 mm. The power supply line must be wound around the ring core for at least 5 turns. The distance between the Reader termination and the ring core should be maximum 10 cm.**

3.5 Fuse F1

The reader have been protected with a SMD fuse 2,5A (time-lag).

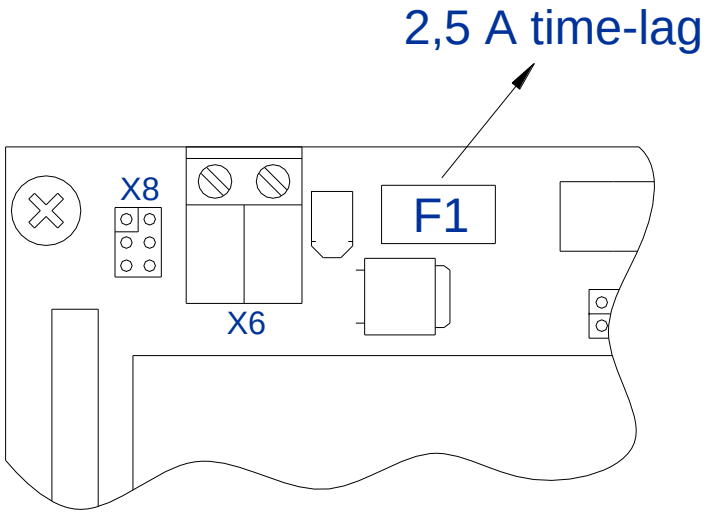


Figure 5: Position of the fuse F1

Attention!:

- **The 24V ⎓ voltage for supplying the internal and external DC voltage on X2 for the digital inputs and outputs is not protected by the fuse F1.**

3.6 X2: Optocoupler Inputs (X2 / IN1, IN2, IN3)

The three optocouplers inputs are available on Terminal X2.

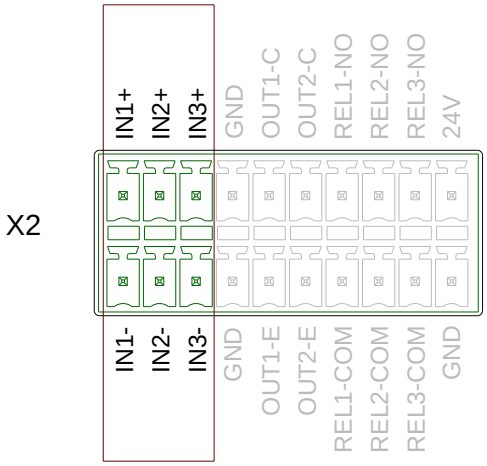


Figure 6: Optocoupler pin-outs on terminal X2

The optocoupler on terminal strips X2 are galvanically isolated from the Reader electronics and must therefore be powered externally, see Figure 7. The external VCC voltage may however be provided by the reader, see Figure 8.
All 3 inputs are identical and may therefore be configured individually.

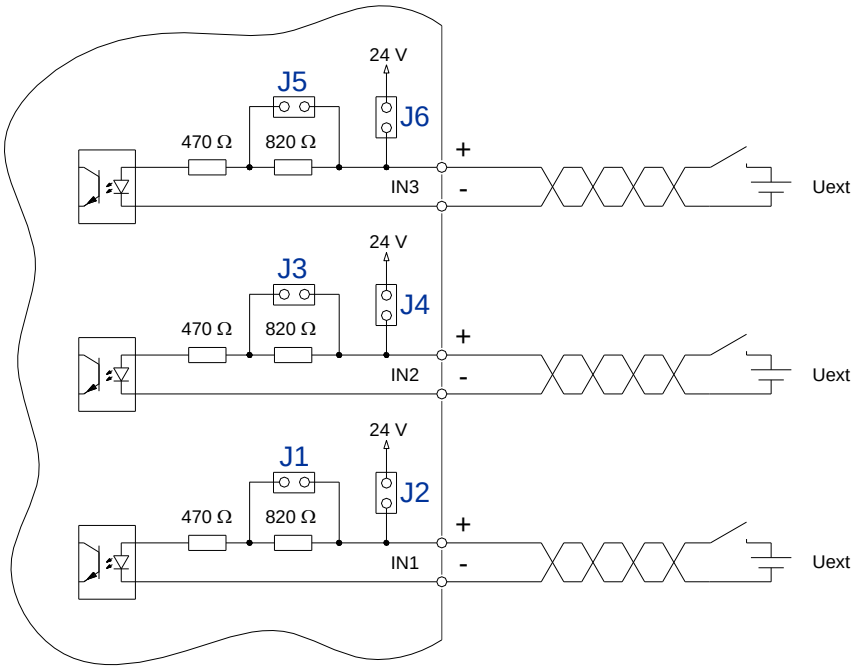


Figure 7: External power supply for the optocouplers on X2

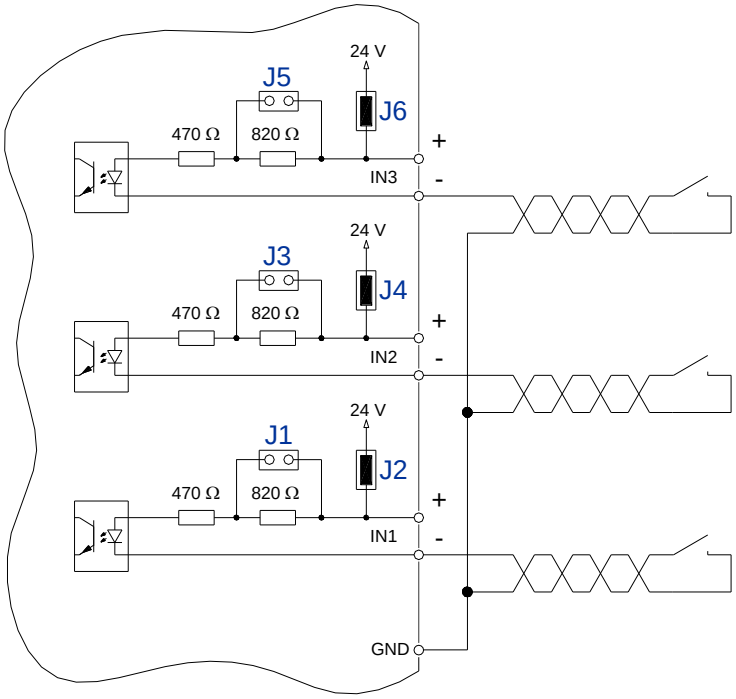


Figure 8: Possible internal power supply for the optocouplers

The input LED for the optocouplers are internally connected to a series resistor of 1290 Ω and are limited to an input current of max. 20mA. For voltages of less than 10V a part of the series resistance must be jumpered (J1, J3, J5) accordingly.

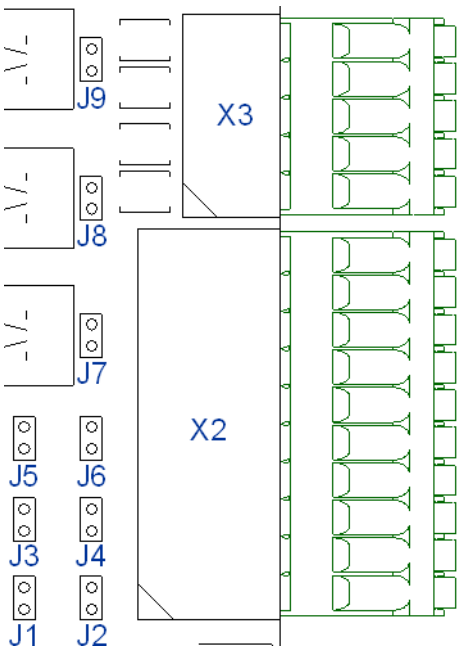


Figure 9: Position of the Jumper J1- J9

Note:

- ***The input is configured for a maximum input voltage of 24 V ⎓ and an input current of maximum 20mA.***
- ***Reversing the polarity or overloading the input will destroy it.***

Jumper	Description
J1	Series resistance IN1 (X2)
J2	VCC IN1 (X2)
J3	Series resistance IN2 (X2)
J4	VCC IN2 (X2)
J5	Series resistance IN3 (X2)
J6	VCC IN3 (X2)

Table 4: Jumpers for inputs IN1,IN2 and IN3

Table 5 shows the required external series resistances for the various external voltages

External voltage U_{ext}	Jumper J1/J3/J5
5 V ... 10 V	ON
10 V ... 24 V	OFF

Table 5: Required external series resistance

Table 6 shows the jumper setting for external or internal supply voltage

Jumper	Jumper J2/J4/J6
external voltage	OFF
internal VCC voltage	ON

Table 6: Internal / External supply voltage

Note:

- **The internal 24V ⎓ voltage for supplying the DC voltage on the digital inputs is not protected by the fuse F1.**
- **Using internal and external voltage at the same time can destroy the reader.**

3.7 Optocoupler outputs (X2 / OUT1, OUT2)

The transistor connections, collector and emitter, of the optocoupler outputs are galvanically isolated from the Reader electronics and are carried to the outside without any internal ancillary circuitry on Terminal X2. The output must therefore be powered by an external power supply. The digital outputs OUT1 and OUT2 can be used for the data clock interface. OUT1 => „Clock“, OUT2 => „Data“

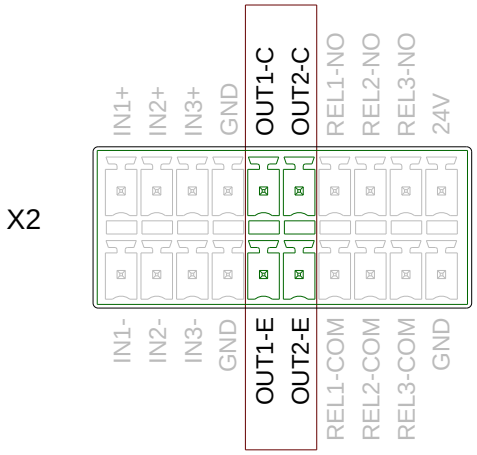


Figure 10: Digital Output’s on terminal X2

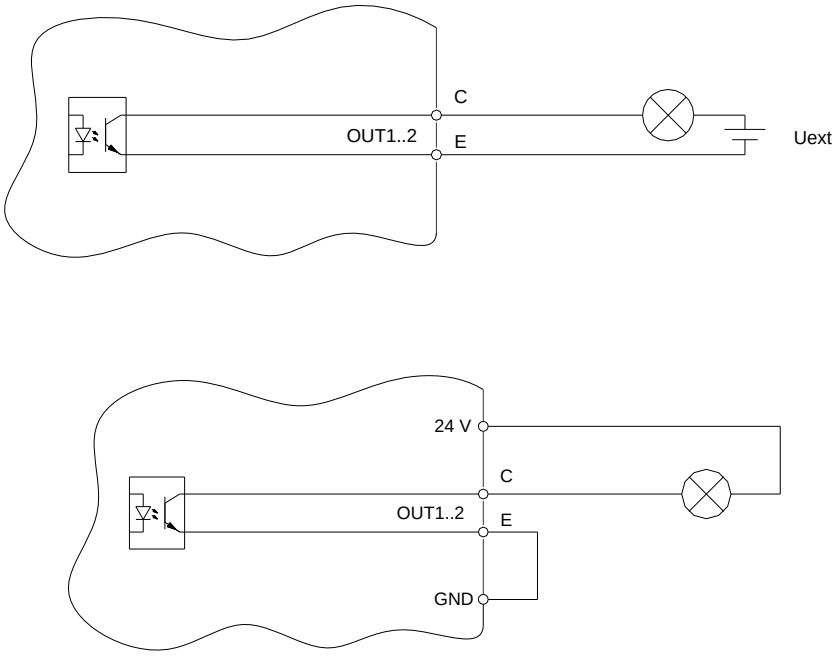


Figure 11: Internal and possible external wiring of the digital output OUT1-2

Note:

- **The output is configured for max. 24 V ⎓ / 30 mA.**
- **Polarity reversal or overload on the output will destroy it.**
- **The output is intended for switching resistive loads only.**

3.8 Relay (X2 / REL1, REL2, REL3)

The relay outputs are all a normally open contact. These outputs, which are located on terminals X2, are galvanically isolated from the Reader electronics and must therefore be externally supplied. The external voltage may however be provided by the card using jumper J7; J8; J9. All 3 outputs are identical and may be configured individually.

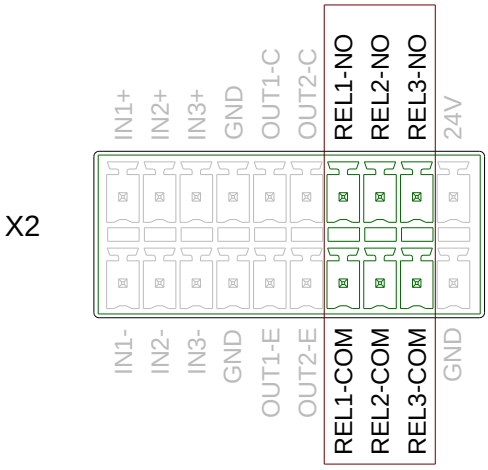


Figure 12: Relay Outputs on terminal X2

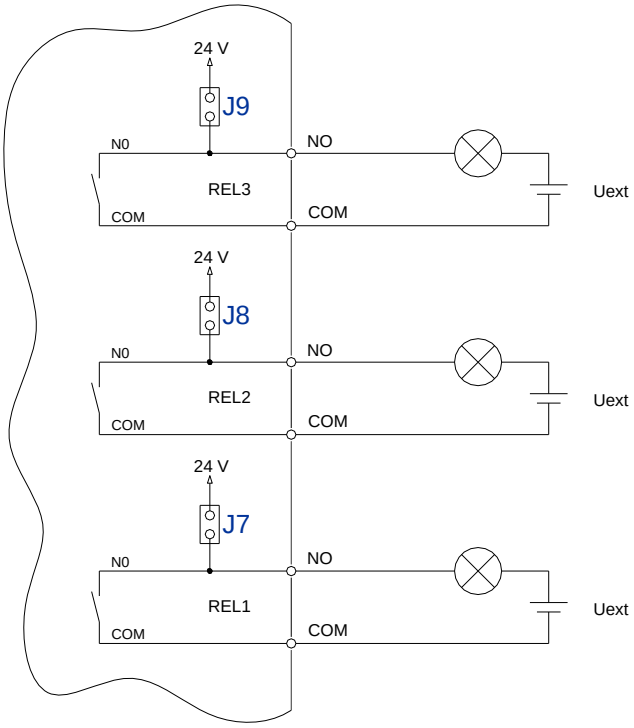


Figure 13: Internal and possible external wiring of the relay output's with external voltage

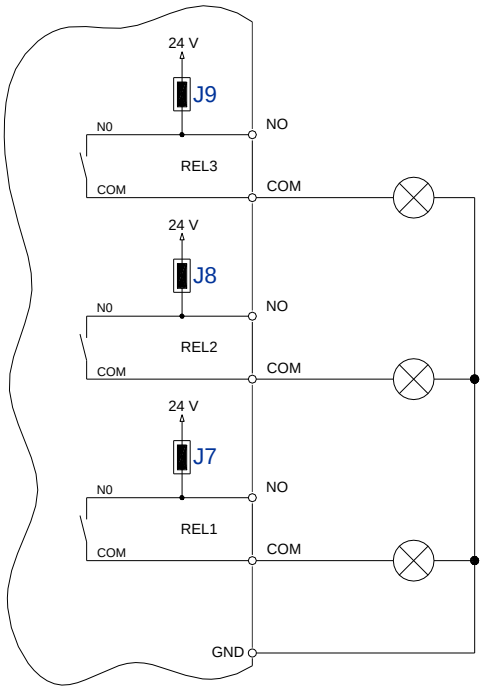


Figure 14: Internal and possible external wiring of the relay output's with internal voltage

Jumper	Description
J7	VCC - REL 1 (X2)
J8	VCC - REL 2 (X2)
J9	VCC - REL 3 (X2)

Table 7: Assignment of the jumpers to the relay output

Table 8 shows the jumper setting for the external voltage or internal VCC voltage

Jumper	Jumper J7/J8/J9
external voltage	open
Internal VCC voltage	closed

Table 8: Internal- / External voltage supply

Notes:

- **The relay output is configured for max. 24 V ⎓ / 1 A.**
- **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.**
- **The internal 24V ⎓ voltage for supplying the DC voltage on the relays is not protected by the fuse F1.**
- **Using internal and external voltage at the same time can destroy the reader.**

3.9 Output 24V ⎓ (X2 / 24V, GND)

The output 24V/GND can be used to power the optional external circuitry of the digital inputs , outputs or relays. The maximum current consumption must not exceed 500mA. A possible current consumption via J2, J4, J6 or J7, J8, J9 must be factored in.

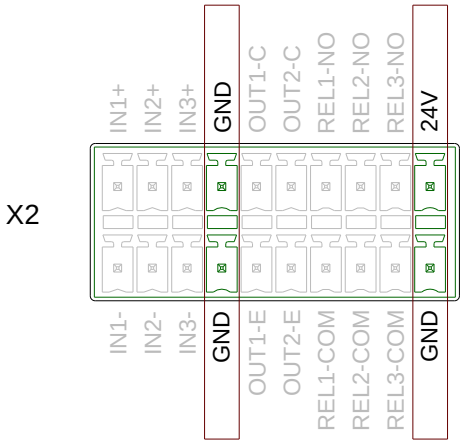


Figure 15: Optional 24V ⎓ external voltage supply

Note:

- ***For the dimensioning of the power supply the power consumption for the external output circuitry must be additional considered to the typical reader power consumption.***
- **The internal 24V ⎓ voltage on X2 is not protected by the fuse F1.**

3.10 X8: External diagnostic LED connections

X8 allows for connection of additional external LEDs in parallel with the internal diagnostic LEDs.

The external LEDs are connected as shown in Figure 16

Terminal	Abbreviation	Description
X8 / Pin 1	V1 Anode ext.	Function same as internal LED V1
X8 / Pin 2	V2 Anode ext.	Function same as internal LED V2
X8 / Pin 3	V3 Anode ext.	Function same as internal LED V3
X8 / Pin 4	V4 Anode ext.	Function same as internal LED V4
X8 / Pin 5	V5 Anode ext.	Function same as internal LED V5
X8 / Pin 6	GND	Common GND

Table 9: External LEDs pin-outs

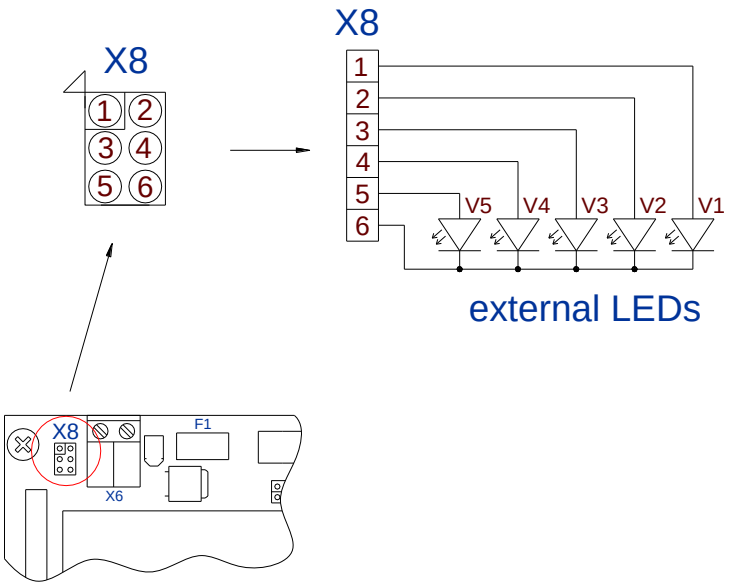


Figure 16: Connecting external LEDs to X8

Note:

- **The outputs on X8 are intended for switching an external LED only. Overloading the outputs with other loads may destroy them.**
- **If only one output is used the maximum current consumption is Imax=15mA. The total current consumption of all 5 outputs together should not increase 25mA. The off-load output voltage is 3,3V and is supplied via a 220Ohm series resistor.**

3.11 Interfaces

3.11.1 RS232-Interface X3

The RS232 interface is connected on X3.

The transmission parameters can be configured by means of software protocol.

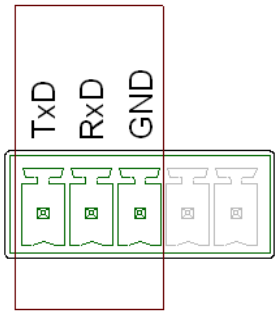


Figure 17: RS232 interface pin-outs on X3

Kurzzeichen	Description
TxD	RS232 – (Transmit)
RxD	RS232 – (Receive)
GND	RS232 – (Ground)

Table 10: Pin assignment of the RS232-Interface

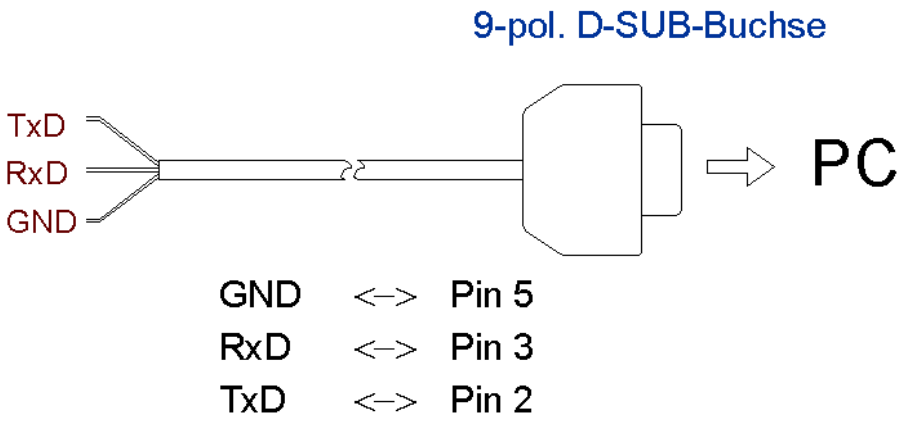


Figure 18: Wiring example for connecting the RS232 interface

3.11.2 RS485-Interface X3

The connection of the RS485 interface take place via the X3 connector as well.

The interface parameter can be configured via software protocols.

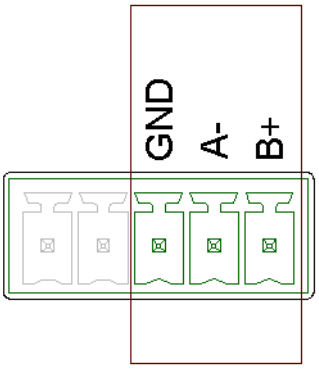


Figure 19: RS485 interface pin-outs on X3 (RS485-Interface)

Abbreviation	Description
GND	RS485 – GND
A-	RS485 – (A -)
B+	RS485 – (B +)

Table 11: RS485 interface pin-outs

With the Jumper J10 and J11 the „Pull up“ and „Pull down“ resistors can be activated if needed.

Jumper	Closed	Open
J10	Pull-Down on RS4xx - A	**without** Pull-Down on RS4xx - A
J11	Pull-Up on RS4xx - B	**without** Pull-Up on RS4xx - B

Table 12: Jumper of the RS485-interface

Note:

The Termination can be activated via software in the reader configuration.

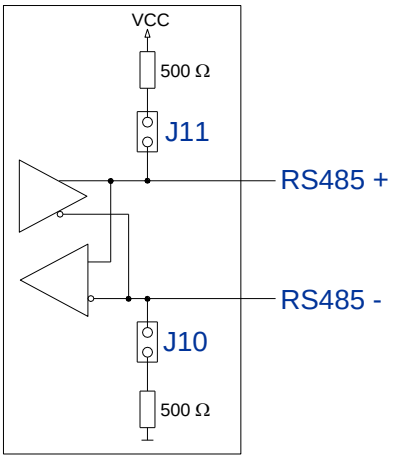


Figure 20: Jumper of the RS485-interface

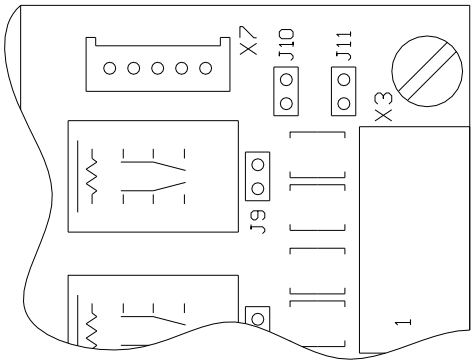


Figure 21: Position of the Jumper J10, J11

Note:

If the Gate People Counter is connected with the RS485 interface the RS485 interface can be not used for host communication.

3.11.2.1 Address assignment of RS485 for bus operation

For bus operation the Reader can be assigned the required bus address via software.

The address is assigned by the host computer. The software is used to assign addresses “0” through “254” to the Reader.

The termination of the RS485 Bus can be configured via software. See system manual.

Note:
Since all Readers are factory set with address „0“, they must be connected and configured one after the other.

3.11.3 USB – Interface X4 (Host Communication, HID)

The USB socket on the board is terminal X4. The pinout is standardized. The data rate is reduced to 12 Mbit (USB full speed). A standard USB-cable can be used.

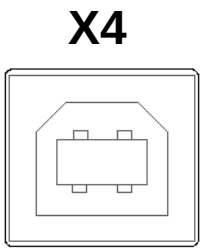


Figure 22: USB-Interface for host communication

Note:

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

3.11.4 Ethernet-Interface on X1 (10/100 Base-T)

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 1000 Base-T Standard.

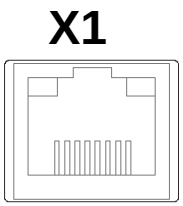


Figure 23: LAN interface for host communication

With structured cabling 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.

Network	Address
IP-Address	192.168.10.10
Subnet-Mask	255.255.255.0
Port	10001
DHCP	OFF
Hostname	LR2500B

Table 13 Standard factory configuration of the Ethernet connection

Note:

- ***The Reader TCP/IP interface has a DHCP option.***
- ***It is recommended to use a shielded twisted pair STP CAT5 cable.***

3.11.5 Data-Clock Interface on connector X2

The connection of the data-clock interface take place via the digital Outputs OUT1 and OUT2 at connector X2. 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. See also: ***Optocoupler outputs (X2 / OUT1, OUT2)***

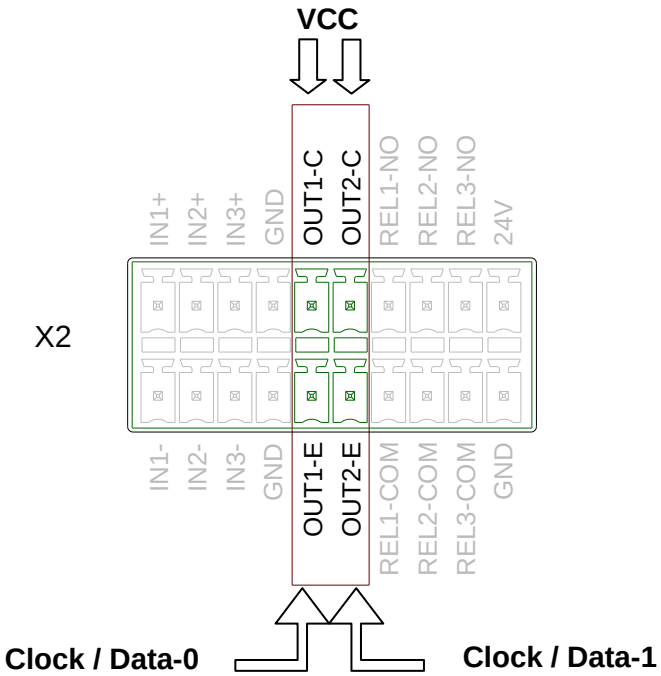


Figure 24: Data-Clock Interface on connector X2

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.**

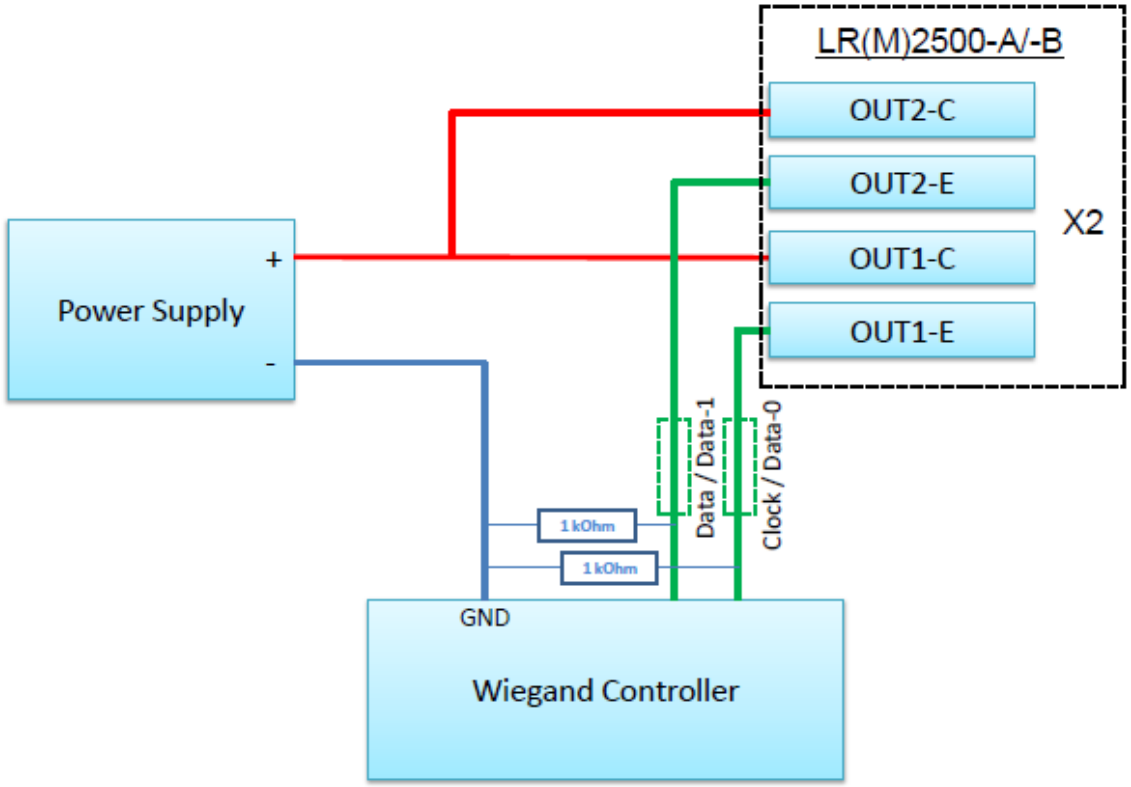


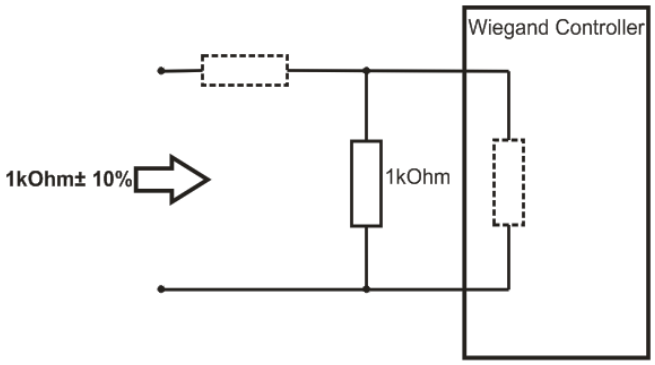
Figure 25: Wiring Example

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
The total resistance incl. the input resistance of the Wiegand Controller should be 1kOhm ± 10% .



4 Operating and Display Elements

4.1 LEDs

Table 14 shows the LED configuration.

Abbreviation	Description
LED V1 (green)	"RUN-LED 1" - Indicates proper running of the internal Reader software (DSP) - Comes on during Reader initialization after power-on or after a reset.
LED V2 (blue)	Diagnostic 1: RF communication / EEPROM status - Short flashing indicates errorless communication with a transponder on the RF interface - Flashes alternately with V1 after a reset following a software update - Flashes alternately with V1 in case of a data error when reading the parameters after a reset
LED V3 (yellow)	Diagnostic 2: Host communication - Short flashing indicates sending of a protocol to the host on the RS232 / RS485 / USB and LAN-Interface
LED V4 (yellow)	Reserved
LED V5 (red)	Diagnostic 4: RF warning - Comes on when there is an error in the RF section of the Reader. The error type can be read out via software over the RS232 / RS485 / USB and LAN-Interface

Table 14: LED configuration

4.2 Button T1

Abbreviation	Description
T1	Reader reset button

Table 15: Reset Button

- Pressing T1 resets the reader controller

5 Radio Approvals

5.1 Europe (CE)

When used according to regulation, this radio equipment conforms with the basic requirements of Article 3 and the other relevant provisions of the R&TTE Guideline 1999/E6 dated March 99.

CE

Equipment Classification according ETSI EN 300 440 and ETSI EN 301 489: Class 2

Declaration of Conformity

FEIG ELECTRONIC

in accordance with the
Directive 1999/5/EC (R&TTE Directive)
&
Directive 2011/65/EU (RoHS Directive)

Product Manufacturer	:	**FEIG ELECTRONIC GmbH** Lange Strasse 4 D-35781 Weilburg Germany Phone: +49 6471 3109 0
Product Designation	:	**ID ISC.LR2500** **ID ISC.LRM2500**
Product Description	:	RFID Reader
Radio equipment, Equipment class (R&TTE)	:	Class 1

FEIG ELECTRONIC GmbH declares that the radio equipment complies with the RoHS Directive 2011/65/EU and the essential requirements of Article 3 of the R&TTE Directive 1999/5/EC, when used for its intended purpose.

Standards applied :

Health and safety requirements pursuant to R&TTE Article 3(1)(a)	EN 60950-1:2006 / AC:2011 EN 50364:2010
Protection requirements concerning electromagnetic compatibility R&TTE Article 3(1)(b)	ETSI EN 301 489-1 V1.9.2 ETSI EN 301 489-3 V1.6.1
Measures for the efficient use of the radio frequency spectrum pursuant to R&TTE Article 3(2)	ETSI EN 300 330-2 V1.5.1

Weilburg, 30.04.2014 — Place & date of issue

Markus Desch — Name and signature

This declaration attests to conformity with the named Directives but does not represent assurance of properties. The safety guidelines in the accompanying product documentation must be observed.

5.2 USA (FCC) and Canada (IC)

Product name:	**ID ISC.LRM2500-B**
Reader name:	**ID ISC.LRM2500-B**
FCC ID: **IC:**	**PJMLRM2500** **6633A-LRM2500**
Notice for USA and Canada	This device complies with Part 15 of the FCC Rules and with RSS-210 of Industry Canada. 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. Unauthorized modifications may void the authority granted under Federal communications Commission Rules permitting the operation of this device. 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. Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

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

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.

6 Technical Data

	ID ISC.LRM2500-B
Mechanical Data	
• **Dimensions (W x H x D)**	160 mm x 120 mm x 46 mm (6.29 inch x 4.72 inch x 1.81 inch)
• **Weight**	approx.. 0,6 kg (1.32 lb)
Electrical Data	
• **Supply Voltage**	24 V ⎓ ± 15 % Noise Ripple : max. 150 mV
• **Power Consumption**	Typical 35 VA / maximum 47VA *(depending on ext.* output circuitry*)*
• **Operating Frequency**	13,56 MHz
• **Transmit Power**	2W – 12 W (250 mW Step - Software)
• **Modulation**	10% - 30% (Software configurable)
• **Antenna Connection**	SMA Jack (50Ω)
• **DC Supply at Antenna Connector**	8 V ⎓ (max. 150mA)
• **Diagnostic Options**	internal VSWR-Meter internal temperature monitoring
• **Outputs** **– 2 Optocoupler** **– 3 Relay (3 x NO)**	 24 V ⎓ / 30 mA (optional usable as Data Clock IF) 24 V ⎓ / 1 A
• **Inputs** **– 3 Optocoupler**	 5- 24 V ⎓ / 20 mA *(See chapter: 3.6)*
• **Interfaces**	• RS232 • RS485 • USB – Interface (HID) • Ethernet (TCP/IP) • Data Clock

• **Protocol Modes**	• FEIG ISO HOST • BRM (Data Filtering and Data Buffering • Scan Mode • Notification Mode
• **Supported Transponder**	• ISO15693, ISO18000-3 MODE 1 (EM HF ISO Chips, Fujitsu HF ISO Chips, KSW Sensor Chips, IDS Sensor Chips, Infineon my-d, NXP I-Code, STM ISO Chips, TI Tag-it) • NXP I CODE1
• **Optical Indicators**	5 LEDs for Operating Status Diagnostics

Ambient

• **Temperature Range**	
– Operating	-20°C to +55°C (-4°F to +131°F)
– Storage	-25°C to +85°C (-13°F to +185°F)
• **Humidity**	5% - 80%, no condensation
• **Vibration**	EN 60068-2-6 10 Hz to 150 Hz : 0,075 mm / 1 g
• **Shock**	EN 60068-2-27 Acceleration : 30 g

Applicable Standards

• **RF Approval**	
– Europe	EN 300 330
– USA	FCC 47 CFR Part 15
- Canada	RSS-210
• **EMC**	EN 301 489
• **Safety**	
– Low Voltage Directive	EN 60950
– Human Exposure	EN 50364