



# Proximity Card Reader **IR-10**

CERTIFICATE AND OPERATION MANUAL

**CE EAC**



*PERCo-Web system*

**Proximity Card Reader  
*IR-10***

**Certificate and Operation Manual**



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# 1 GENERAL INFORMATION

**IR-10** long range proximity card reader (hereinafter– *the reader*) is designed for reading and interpretation of proximity card identifier and for transferring of identifier to ACS controller. The reader is designed for the use at automotive check-point. Up to four readers can be installed for each passage direction.



**Attention!**

- The reader is designed for outdoor use only.
- People who have implanted pacemakers shall avoid continuous influence of electromagnetic radiation produced by the reader.

The reader with regard to resistance to environmental exposure complies with GOST15150, category N1 (for an outdoor application).

Operation of the turnstile housing is allowed at ambient air temperature from -40°C to +40°C and at relative air humidity of up to 100% at +25°C.

Storage of the reader is allowed in indoor facilities at the ambient air temperature from -40°C to +40°C and relative air humidity of up to 98% at +25°C.

The reader has the marking on the inner side of the housing. The marking contains the product name, the model abbreviation, the date of manufacture, the serial number; allowed power voltage, consumption current.

The reader in the original package should be transported in closed freight containers or other closed type cargo transport units.

The reader is packed in a cardboard box that protects it from being damaged during transportation and storage.

Overall dimensions of the box (L × W × H). .....425×311×174 mm  
Weight of the box..... max. 3.5 kg

After transportation or storage at temperatures below zero or at high air humidity, prior to installation the reader must be kept in the original package for no less than 24 hours indoors under normal climate conditions prior to installation.

Due to continuous improvement of products the Manufacturer reserves the right to modify, without notice, the product design not aggravating its technical specifications.

## 2 TECHNICAL SPECIFICATIONS

Rated operating voltage <sup>1</sup>	12 VDC
Operating voltage limits <sup>1</sup>	10.8–14 VDC
Consumption current	1.1 A
Power consumption	max. 14 W
Controller connection interface	RS-485, Wiegand <sup>2</sup>
Card reading distance at the rated operating voltage for different card types:	
HID ProxCard II cards	max. 60 cm
EM-Marlin IL-05ELR cards	max. 100 cm
EM-Marlin EM4100 cards	max. 70 cm
Length of cables (power and control)	3 m
Mean lifetime	8 years
Electric shock protection class	III (IEC 61140)
Ingress protection rating	IP54 (EN 60529)
Overall dimensions of reader (with a mounting arm)	408×300×266 mm
Reader weight (with a mounting arm)	max. 2.5 kg

## 3 DELIVERY SET



### Attention!

The completeness of the delivery set shall be checked upon receipt.

### Standard delivery set

Reader	1
Mounting arm	1
Jumper	3
Installation kit:	
plastic dowel	4
screw	4
Certificate and operation manual	1
Package	1

### Additional equipment

<b>BH-03</b> post	1
Power supply unit	1

<sup>1</sup> As a power supply it is recommended to use DC source with linear voltage stabilization and output pulsation amplitude max. 50 mV.

<sup>2</sup> Wiegand, Wiegand 26, Wiegand 37, Wiegand 42.

## 4 PRODUCT DESCRIPTION

### 4.1 Design

The reader consists of the unit in plastic housing, on the front side of which there are three indicators: green (top), yellow (central), red (down). The mounting arm included in the delivery set can be used for installation. Electronic components are protected from negative environmental effects by means of plastic plate with sealing gasket. Cables are connected at the back side of the reader.

The reader is equipped with integrated sound indicator. Code reading is confirmed by a short sound signal and short status change of the yellow (central) indicator (it turns on, if it was off, or it turns off, if it was on).

Reader board (see Fig. 1) contains three configurative jumpers (**XP1**, **XP2** and **XP3**) and one wire jumper **XP5** – «disconnection of EOL resistor» (the jumper is present – the EOL resistor is present, if the jumper is removed (cut) – the EOL resistor is disconnected).

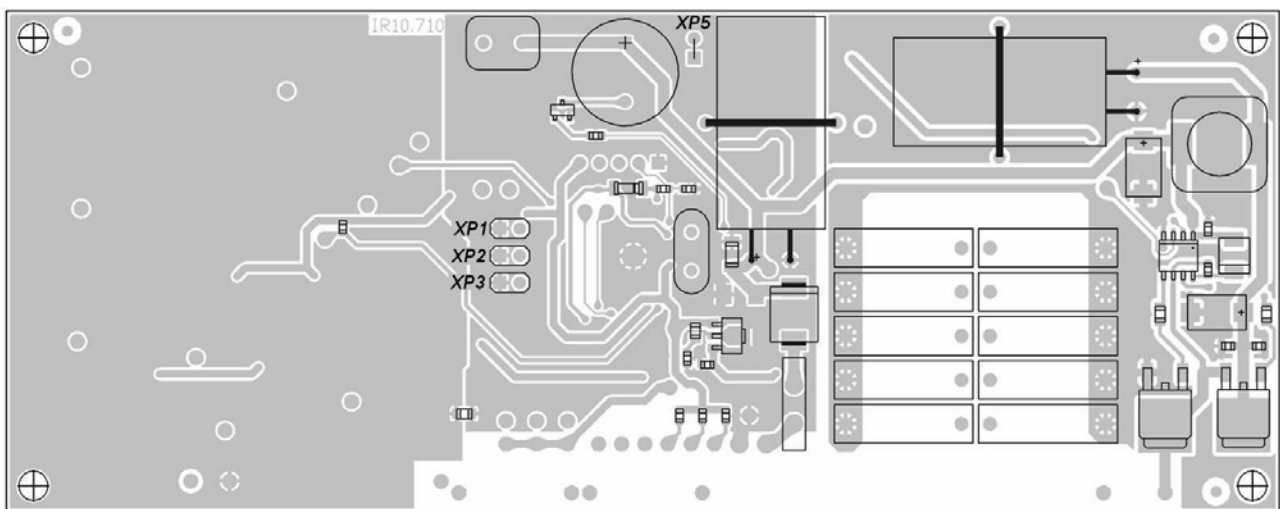
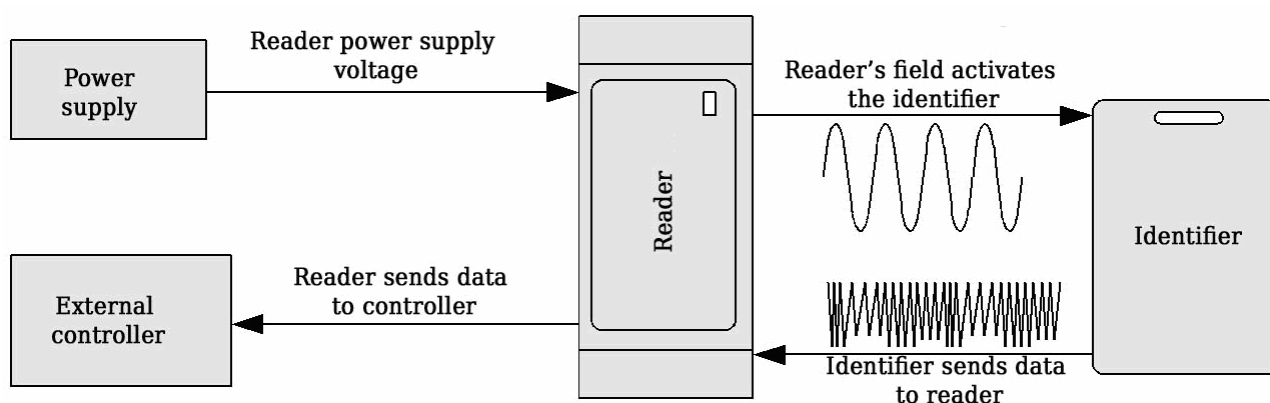


Figure 1. The board of the reader

### 4.2 Operating principle

Readers provide code reading from Proximity identifiers with operation frequency 125 kHz (hereinafter – the identifier) produced by HID Corporation, type: ProxCard II, ISOProx II (standard formats HID: 26 bit (H10301), 37 bit (H10302, H10304)), and also *IL-05ELR* and *EM4100/4102* identifiers produced by EM-Microelectronic-Marin SA.

Code reading is performed when the identifier is presented to the reader. Maximum operating distance between the identifier and the reader depends on the type of the identifier, it is in the range from 50 to 100 cm. The identifier can be placed inside pocket, wallet or any other radio transparent container (cover).



**Figure 2. Reader operation**

When the reader is switched on it radiates low frequency (125 kHz) electromagnetic field. Caught in this field the identifier is activated and starts transmitting individual encoded signal that is received by the reader.

Reader transforms the received signal in accordance with an external device interface and sends it to controller of external device via *RS-485* or *Wiegand* interfaces.

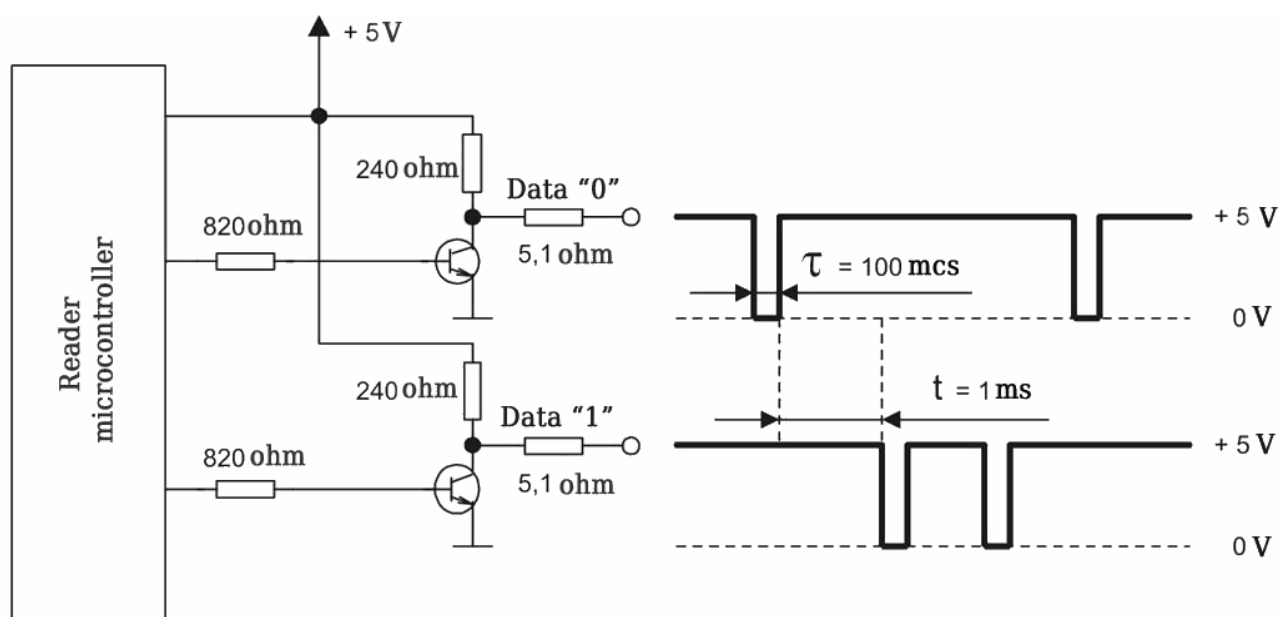
Data is transmitted to the external controller at one time at the moment of first positive signal receipt from identifier. Repeated data transfer is possible not earlier than 500 ms after identifier leaves stable reception zone.

### 4.3 Data transmitting via Wiegand interface

Two wires are used for transmission: «data 0» and «data 1». When logic level «0» occurs on one of the wires it signals the presence of bit with appropriate value in coded mark.

Time response characteristics of output data format:

Duration of data pulse .....	100 mcs
Pulse-time .....	1 ms



**Figure 3. Formation of output reader signals and their diagrams**

All bytes are transmitted with high-order bits forward.

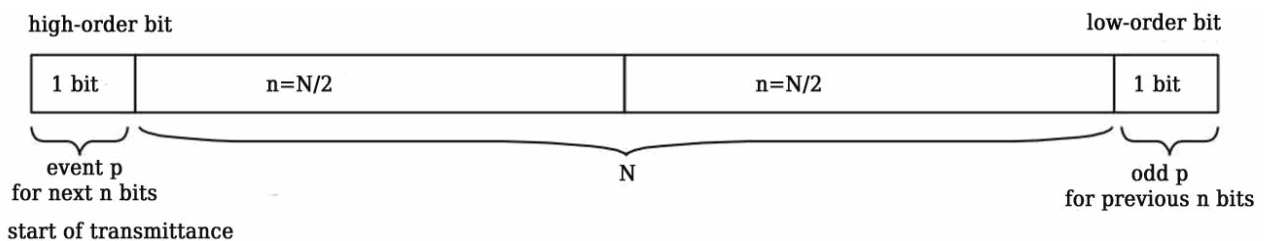
The length of the coded mark depends on the output data format set at assembly and can be either fixed or specified by data dimension received from identifier.

Following rules are applied when there is difference between coded mark received from identifier and the output coded mark:

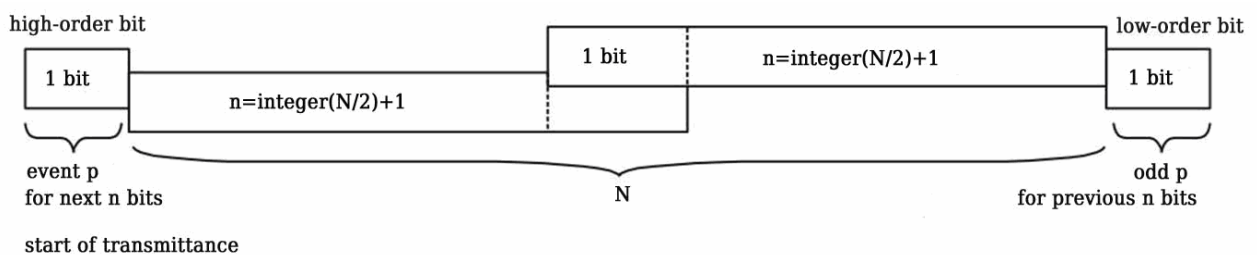
- If the input coded mark from identifier is longer than output mark the excessive high-order bits are truncated.
- If the input coded mark from identifier is shorter than output mark the missing high-order bits are padded with zeros.

The structure of coded mark and order of parities in it for fixed length formats are presented in the following Figures:

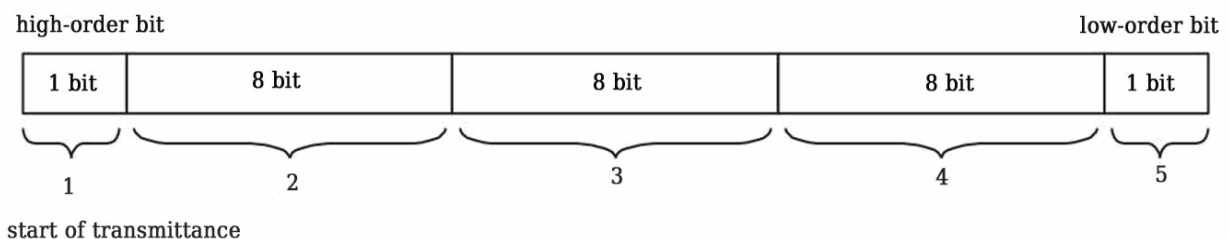
- The identifier encoded signal includes the even number of bits ( $N/2 - \text{integer}$ ):



- The identifier encoded signal includes the uneven number of bits ( $N/2 - \text{non integer}$ ):



The structure of output coded mark in Wiegand 26 (H10301) format is presented in Figure:



- 1 – Control bit (corresponds with the even parity for the next 12 bit data)
- 2 – Byte code
- 3 – High-order byte of card number
- 4 – Low-order byte of card number
- 5 – Control bit (corresponds with the odd parity for the previous 12 bit data).



## 5 CONFIGURATION

### 5.1 Selection of reader number in RS-485 interface

When connected via *RS-485* interface the reader starts operating according to reader connection protocol in **PERCo Web** system, it can be used as an external reader for controllers of the system.

Operation of reader in **PERCo Web** is similar to operation of **IR-xx** series readers. The difference is that in this case up to eight readers can be connected to one controller. All odd-numbered readers are considered by the controller to be “reader No. 1”, and all even-numbered readers are considered to be “reader No. 2”. Number of reader is bound to passage direction. Binding is made by computer software.

Number of reader from 1 to 8 is set with the use of **XP1**, **XP2**, **XP3** configurative jumpers (see Fig. 1). Numbers of readers corresponding to position of jumpers are given in Table 1.

**Table 1. Number of reader**

No.	Jumper is installed		
	XP1	XP2	XP3
1	No	No	No
2	No	No	Yes
3	No	Yes	No
4	No	Yes	Yes
5	Yes	No	No
6	Yes	No	Yes
7	Yes	Yes	No
8	Yes	Yes	Yes

### 5.2 Operation in Wiegand mode

In case there is no connection via *RS-485* interface, the reader starts operating via *Wiegand* interface and can be used as an external reader for ACS controllers.

#### 5.2.1 Indication setting

Indication mode controlled by ACS controller when connected via *Wiegand* interface depends on **XP1** jumper on the board of the controller (see Fig. 1). If the jumper is installed, “*single line*” control variant is set; if the jumper is removed, “*double line*” control variant is set. (**XP2** and **XP3** jumpers are not used in this case).

Control signals are transmitted via blue and yellow wires of the reader connection cable from the controller. Reader indication for both variants depending on received control signals is given in Table 2.

**Table 2. Reader indication**

Control signals		Indication	
Blue wire	Yellow wire	«single line»	«double line»
0	0	Green	Red and Green
0	HZ	Green	Red
HZ	0	Red	Green
HZ	HZ	Red	Yellow

Key to Table 2:

0 – control line is connected to negative terminal of power supply;

HZ – high resistance on control line (control line is not connected to negative terminal of power supply)

In order to control sound indicator externally brown wire shall be connected to negative terminal of power supply.

### 5.2.2 Changing the format of output data



#### **Attention!**

Switching over the reader into Wiegand formats does not prevent it from reading cards of other formats and delivering read code to an output of a reader in the set format.

Changing of format of *Wiegand* interface output data is defined by connection point of orange wire (WF – *Wiegand-Format* on Fig. 6) at the output of standard connection cable of the reader. Connection point is selected according to Table 3.

**Table 3. Setting of output data format**

Connection point of WF orange wire	Output data format
~ (not connected)	Wiegand 26
D0 (green)	Wiegand 37
+12B (red)	Wiegand 42
«ground» (black + shield)	Wiegand

## 6 INSTALLATION

### 6.1 Safety requirements

**Attention!**

- Study the Operation manual thoroughly before beginning the installation work.
- Reader installation must be carried out by a professional circuit installer.
- Only serviceable tools should be used.
- All work should be carried out only when the power is off and power supply is disconnected from the mains.
- Observe general safety requirements for use of electrical equipment when laying cables.

### 6.2 Installation features

It is recommended to install readers close to an operating device. Consider following factors when choosing the place for installation:

- when the reader is installed on a metal post, the cross-section of the post shall not exceed 60×60 mm;
- when the reader is installed on reinforced concrete wall, the metal framework of the wall may decrease card reading distance, that is why there should be up to 1 m distance between the reader and the wall;
- distance between two readers shall be:
  - in the same plane..... min. 0.5 m
  - facing each other ..... min. 3 m
- Close electric interference sources shorten card reading distance, therefore reader must be installed at min. 1 m whilst its cable laid at min. 30 cm distance from computer monitors, electric generators and motors, AC relays, thyristor light regulators, ac lines, computer and telephone signals;
- Metal constructions decrease card reading distance, therefore reader must be installed at min. 1 m from them;

### 6.3 Tools and equipment required for installation

**Note:**

The use of other tools is permitted on condition that they do not reduce the quality of installation.

Following tools shall be used during installation process:

- 1.2÷1.5kW hammer drill;
- Ø7 mm hard-alloy drill bits;
- Philips head screwdriver No. 2;
- hobby knife;
- level;
- 2 m measuring tape.

## 6.4 Required cables



### Note:

Maximum distance between the reader and the controller depends on the cross-section of the cable you use. In case of use of standard cables given here the flawless operation of the reader is guaranteed at the maximum distance of 40 m.

**Table 4. Cables used for installation**

No.	Connection	Max. length, m	Type
1	Power source	40	Twin wire with min. 1 mm <sup>2</sup> cross-section
2	RS-485 interface of ACS controller	40	Twisted pair cable Cat5 or higher, with min. 0.2 mm <sup>2</sup> cross-section. A and B signal lines shall be in one pair.
3	Wiegand interface of ACS controller	40	Shielded cable with 0.2-0.8 mm <sup>2</sup> cross-section (24AWG – 18AWG). Do not use cables with twisted pairs.

## 6.5 Installation sequence

Follow this sequence during installation of the reader:

1. Unpack the box with equipment, check carefully the delivery set.
2. Change the configuration of the reader if necessary.



### Attention!

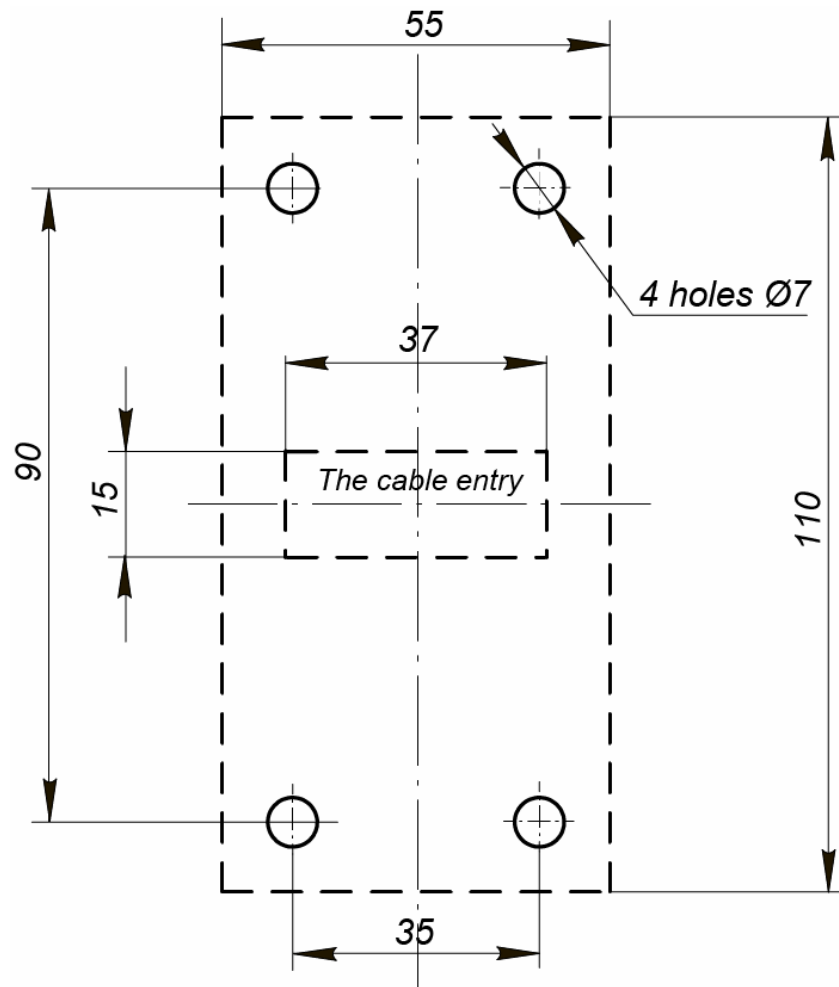
Remove the back panel of the reader housing carefully! Avoid damaging power and data transfer cables that go through the hole at the back panel and also avoid damaging the sealing gasket.

- 2.1. Unscrew four screws that fix the mounting arm to the housing and remove the mounting arm.
- 2.2. Remove the back panel with the sealing gasket.
- 2.3. When connected via *RS-485* interface set the reader number (see Table 1) by using **XP1**, **XP2**, **XP3** jumpers on the board of the reader (see Fig. 1). If this reader is not used as an end-of-line device on the communication line of *RS-485* interface, cut **XP5** wire jumper to turn off the EOL resistor. Note that in such case it is necessary to install EOL resistors on real ends of the communication line of *RS-485* interface. If there are several devices connected to the controller via *RS-485* interface the communication line is connected to all devices consistently.
- 2.4. When connected via *Wiegand* interface the “double line” variant of indication control is set on default. Install **XP1** jumper if you want to change to “single line” variant of indication control.
- 2.5. Install the back panel with the sealing gasket and the mounting arm, then fix them to the housing with four screws.
3. Choose the place for installation of the reader. Use recommendations in Section 6.2.



### Note:

It is recommended to choose the best place for installation by testing card reading distance and to install it only after that.



**Figure 4. Mounting hole pattern for installation**

4. Mark and prepare mounting holes for the mounting arm and cables in the installation surface according to Fig. 4.
5. Pull cables through required holes in the mounting arm and in the installation surface. Fix the reader on the installation surface with the use of four screws included into the delivery set.
6. Lay cables, fix them and connect them to the ACS controller in accordance with Fig. 5 and Fig. 6 or with the controller manual. Types of required cables are given in Table 4.



**Note:**

- In case of connection via *Wiegand* interface it is recommended to change the output data format directly where the standard cable is connected with the lengthening cable.
- It is recommended to use a corrugated hose to protect cables.

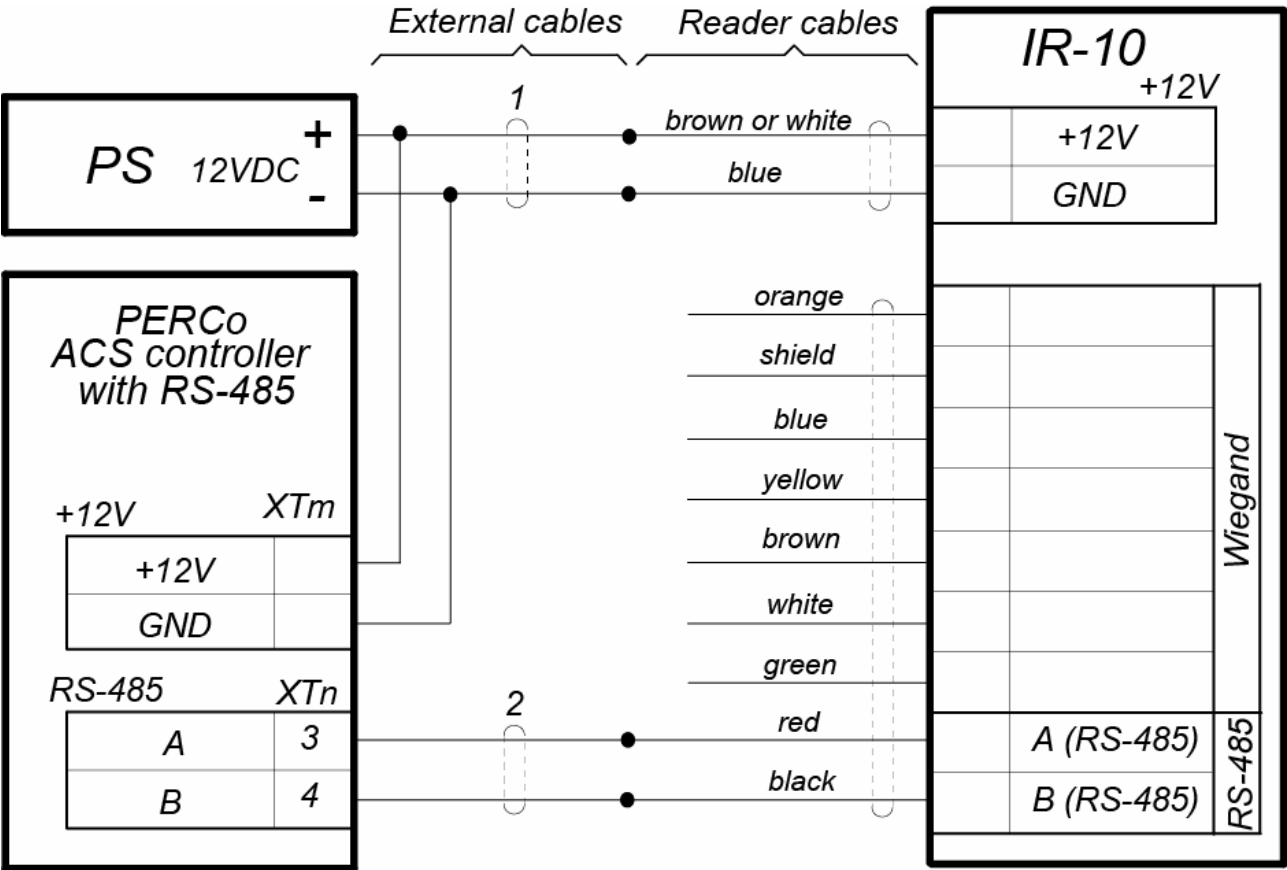


Figure 5. Connection layout for RS-485 interface of PERCo Web controller

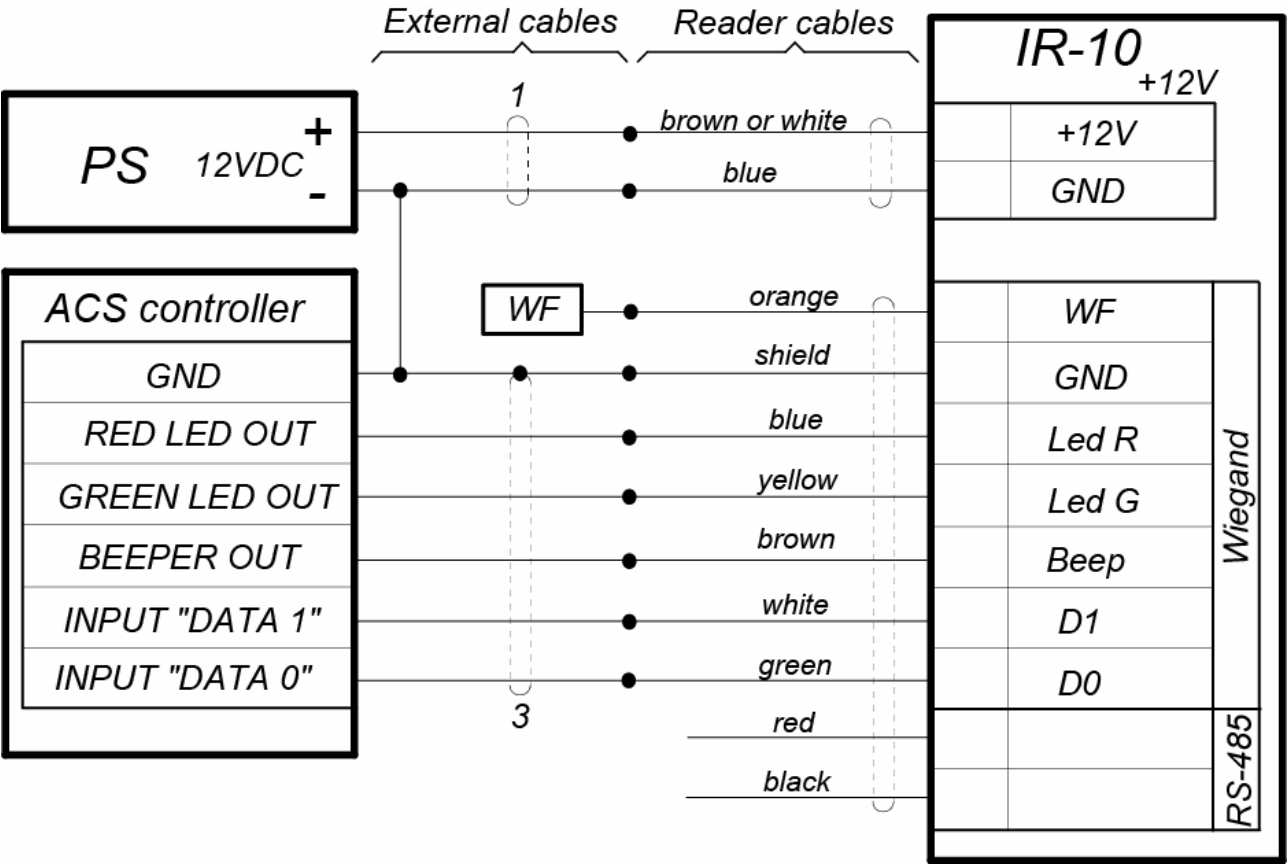


Figure 6. Connection layout for Wiegand interface of ACS

## 7 TROUBLESHOOTING

Possible faults to be corrected by the user themselves are listed in Table 5.

**Table 5. Troubleshooting guide**

Fault	Most plausible cause	Remedy
When powered-up, the reader does not respond to a presented card.	No supply voltage on the reader.	Check connection of the reader to the power source.
The reader responds to the presented card, but there are no events and indication on this reader.	No connection with the controller via <i>RS-485</i> or <i>Wiegand</i> .	Check connection and distribution of <i>RS-485</i> line or <i>Wiegand</i> line.
Card reading distance does not correspond with the one given in Section 2.	Electromagnetic interference or metal construction near the reader.	Fulfill requirements given in Section 6.2.
	Surge at output of power source unit.	Fulfill requirements given in Section 2, it may be necessary to energize the reader with a separate power source.

In an unlikely event of other faults please consult the PERCo Technical Support Department.

## 8 PERCO WARRANTY

PERCo (the Manufacturer) warrants that the **IR-10 reader post** complies with applicable statutory safety requirements and electromagnetic compatibility provided that the instructions on storage, installation and operation, given in the Certificate & Operation Manual, are observed.

The warranty period is **5 (five) years** commencing from the date of sale. Should there be no date of sale on the warranty card, the warranty period shall commence from the date of manufacture specified in the Certificate and on the Product label.

In the post-warranty period the replacement parts/components are warranted to be free from defects in material or workmanship for a period of 3 (three) months from the date of shipment of the repaired/replaced Product to the Customer.

All claims with regard to quantity, completeness and defects to appearance of the Product delivered are accepted by the Manufacturer in writing within no more than 5 (five) working days after the products are received by the Customer. In case of failure to meet the abovementioned deadline no claims are accepted.

The Warranty does not cover:

- products, parts and components with:
  - external mechanical damages resulting in the Product's fault;
  - defects resulting from Customer's improper testing, operation, installation, maintenance, modification, alteration, or adjustment;
  - damages due to force majeure circumstances (natural disasters, vandalism etc.) or defects as a result of external circumstances (power surges, electric discharge, etc);
- fuses, accumulators, galvanic elements and other components, replacement of which is performed by the Customer in accordance with the Product's in-line documentation.

To the maximum extent permitted by the acting law, the Manufacturer does not incur a liability for any direct or indirect losses of the Customer, including but not limited to loss of profit or data, losses caused by idle period, missed profit, and etc related to use or impossibility to use products and software, including possible software errors and failures.

Within the warranty period the products are repaired free of charge at the Manufacturer's site. The Manufacturer reserves the right to repair failed product or replace it with an operational one. Time of repair is specified at the moment the Product is accepted for repair. Transportation cost to and back from the place of repair shall be borne by the Customer.

In order to shorten the repair time the Customer must inform the Manufacturer's Technical Support Department (the TSD) of the problem with the Product's operation and/or about the origin of the fault by submitting a filled-in Technical Support Form by e-mail, fax or via the Manufacturer's website or communicate directly a specialist of the TSD.

The Manufacturer reserves the right not to accept the Product for repair from the Customer who failed to submit the Technical Support Form.

**The Manufacturer's warranty obligations don't cover attendance by the experts of a Customer and maintenance of any Product on site**

If in the course of the examination taken by the Manufacturer of the Product or its parts/components believed to be faulty, no faults have been detected, the Customer is responsible for compensation of the Manufacturer's expenses related to the examination.



Apart from the warranties mentioned above the Manufacturer does not provide any other warranties with regard to compatibility of a Product purchased with software or products produced by other manufacturers as well as any warranties that this Product will fit for the purposes not stipulated in the Product's in-line documentation.

The warranty does not provide for any claims with regard to the technical specifications of the Product in case they are in compliance with those stated by the Manufacturer. The Manufacturer does not guarantee that the Product purchased will meet Customer's requirements and expectations.

**PLEASE NOTE THAT PERCo PRODUCES TECHNICALLY  
SOPHISTICATED PRODUCTS THAT, IF NOT FAULTY,  
CANNOT BE RETURNED BACK IF BY SOME REASON  
THE CUSTOMER DEEMS THEM UNSATISFACTORY**

## WARRANTY CARD



IR-10 proximity card reader

Serial number	5	1	9				
---------------	---	---	---	--	--	--	--

Date of manufacture: «            » \_\_\_\_\_ 201\_\_

Quality control seal:

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Date of sale: «            » \_\_\_\_\_ 201\_\_

\_\_\_\_\_  
(signature, seal)



-----  
Cutting line

## Warranty repair coupon



IR-10 proximity card reader

Serial number	5	1	9				
---------------	---	---	---	--	--	--	--

Date of manufacture: «            » \_\_\_\_\_ 201\_\_

Quality control seal:

---

Date of sale: «            » \_\_\_\_\_ 201\_\_

\_\_\_\_\_  
(signature, seal)





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