

# AIJGO-32

PERSONAL GROUNDING TESTER WITH DUAL FOOT  
ELECTRODE AND RFID READER

## HARDWARE SPECIFICATION



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## ABOUT THE PRODUCT

- Tester for checking personal grounding before entering an ESD protected area (EPA)
- Testing footwear system and wrist strap/groundable ESD smock system at the same time
- Can be used to test a groundable ESD smock system
- Test result indication with LED light and sound
- It is not possible to configure it so that a test can be carried out without touching the touch button
- With a built-in RFID reader
- For indoor use only
- An unlimited number of AIJGO-32 products can be connected in a single system

The AIJGO-32 is a tester for checking personal grounding before entering an ESD protected area (EPA). It may be a good choice if you want to identify persons entering the site and link the tester to some kind of enterprise management system, time-tracking software or other program. The hardware of the device itself allows connection to any system via a serial port, but the software operation of the connection requires a driver, which need to be developed separately according to the customer's needs. Such software is not provided with the device, but we can help you to develop it by providing product descriptions and information on interface programming. Based on this, the necessary additional driver can be created to ensure proper communication between the AIJGO product and the system.

The AIJGO-32 tester, with a properly functioning system and driver software programmed for it, can also allow you to apply more specific custom settings, such as how many times per day an employee is required to test, how many times per day he/she is allowed to enter without testing.

The AIJGO-32 product does not include management software. It is a tester with LIGHT BAR system – such AIJGO products have a steel touch button, the measured results are indicated by LED lights. COMFORT system product – such AIJGO devices have touch button and RFID reader, an RFID card is required for use.

The tester is supplied with manufacturer's certificate, dual foot electrode, mounting plate and universal holder.

### CE declaration

We declare that the AIJGO-32 product complies with the requirements of IEC 61340-5-1, ANSI/ESD S20.20 and Directive 2001/95/EC (General product safety).

## TECHNICAL INFORMATION

<b>Test voltage</b>	100 V DC
<b>Wrist strap/groundable ESD smock system connection</b>	With a combined 10 mm snap, 4 mm banana plug socket
<b>Power supply</b>	12 V DC
<b>Relay outputs</b>	0,5 A/60 V <i>Pass relay (Normally Open) with green wire</i> <i>Fail relay (Normally Open) with red wire</i>
D-SUB = RS232 serial port connection, made possible by a four-wire cable with a connector, TX, RX, GND (ground) and power (12 V) wires. The use of the power cable is not required.	
<b>Sizes</b>	<p>215 x 195 x 55 mm (tester)  500 x 630 x 970 mm (tester+stand with dual foot electrode, assembled), the touch button and the RFID reader emerges from it beyond this, the tester extends 14 cm backwards beyond the platform. The size of the platform itself in case of a tester version with stand: 500 x 490 x 20 mm.  Tilt angle of the stand: 5 degrees</p> <p>Size of the platform itself:  - in case of a tester version with stand:  500 x 490 x 20 mm  - in case of a tester version which is to be mounted on wall/table/entrance gate:  500 x 395 x 8 mm</p>

## RFID reader

**FF reader (full frequency), it reads cards operating at low (125/134 kHz) and high (13,56 MHz) frequencies.**

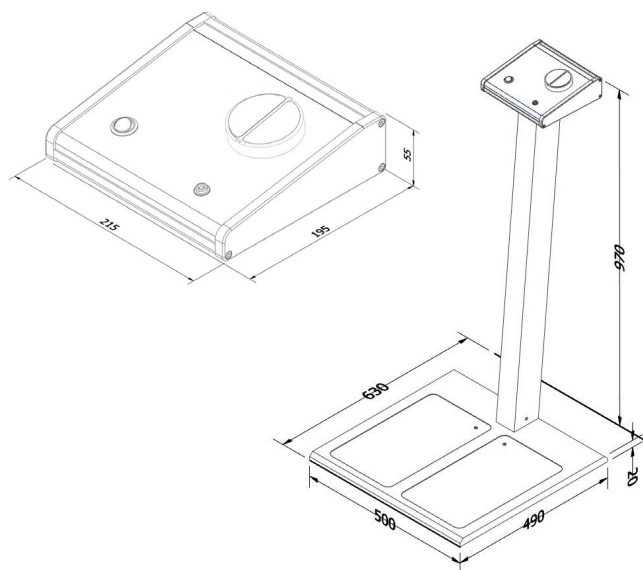
**It is prepared for the following types of cards, transmitters and communication:** Emarine (pl. EM4100,4102,4200), Casi Rusco, FDX Animal, HiTag1, HiTag2, Indala Type1, Indala Type2, Indala KSF (Kantech Secure Format), IoProx XSF (Kantech Extended Secure Format), ProxCARD II, ProxCARD II C1000, ProxCARD II H10301, ProxCARD II H10302, ProxCARD II H10304, TIRIS, T5557, ATA5567, ATA5577

**Transmitters type ISO-14443A:** Mifare Classic 1K, 4K, Mifare Ultralight, Mifare Desfire, Mifare Plus, Mifare Plus X, Mifare ProX, Mifare SmartMX, SLE66R35, NTAG213, NTAG215, NTAG216

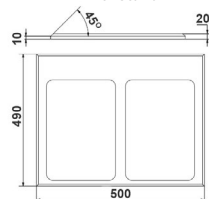
**Transmitters type ISO-15693:** Texas Instruments TagIt Plus, Texas Instruments TagIt Plus 3P, Texas Instruments TagIt Standard, Texas Instruments TagIt Pro, Legic Advant, Picopass, HID iClass, ICode SLI, ICode 2

**Transmitters type ISO-14443B:** SR1XXX, pl. SR1512, SRT512, SR14K, SR1X4k, ISO-14443B típusú kártya emuláció, Felica

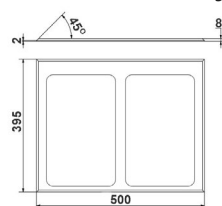
**ISO-18092/NFC type communication:** P2P active communication according to NFCIP-1, NFC card emulation (passive), NFC-enabled mobile phone (Android, iOS, Windows Mobile) in the previously listed modes



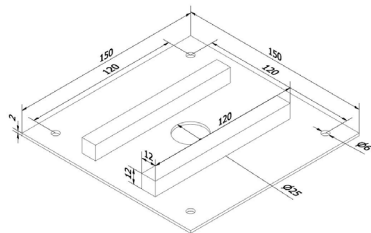
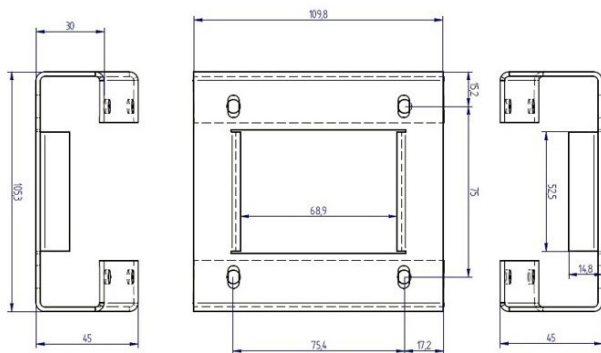
Platform in case of a tester version with stand



in case of a tester version which is to be mounted on wall/table/entrance gate



## Mounting plate sizes



## Order codes

<b>AIJGO-32</b>	Personal grounding tester with dual foot electrode, RFID reader, mounting plate and universal holder
<b>AIJGO-STA</b>	Stand for AIJGO tester

## 1. BASIC DESCRIPTION (BLOCK DIAGRAM OF THE TESTER)

The AIJGO-32 hardware is a microcontroller based measuring instrument, which is capable to measure the personal ESD equipment system in one shoot. The system has 3 measurement channels, all working at the same time. One for left, one for right footwear system, and one for wrist strap/groundable ESD smock system.

The measurement data processed by a risk microcontroller, which is capable to communicate with a host hardware via RS232 bus. Additionally the system has another RS232 or RS485 (with optional extender board) port to read personal identification device, for example RFID cards.

Above the RS232 ports there are many inputs and outputs to drive and detect the tester.

### Outputs:

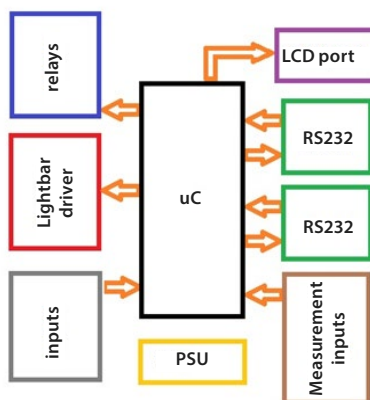
- 3 low power relay, activated for pass or fail result and to step out EPA.
- 3 segmented RGB light bridge to display system status and test result
- Alphanumeric LCD display to show all information. (Optional)

### Inputs:

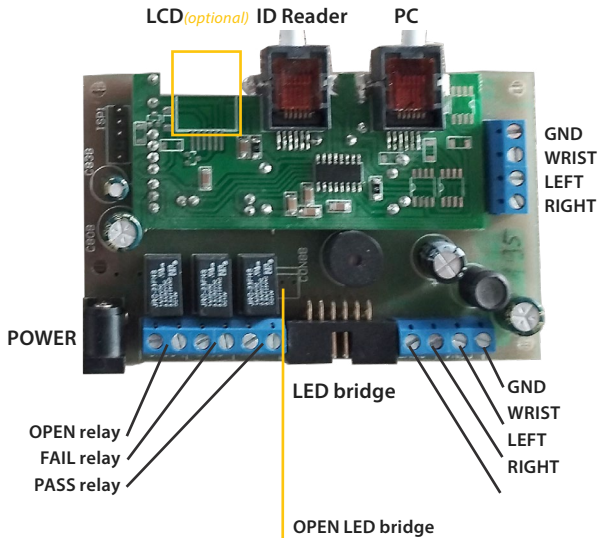
- Touch sensitive input to start the test process.
- Touch sensitive input to step out from EPA function.
- Input for test type selector switch

Power input is a conventional DC input connector 2.1 / 5.5 mm size. Central pin is positive. Voltage 12 V / 200 mA

### Block diagram:



## 2. CONNECTION DIAGRAM



**Attention: However, “LCD”, “ID reader” and “PC” marked connectors are the same, but do not mix them. Misconnection can cause damage on the hardware.**

## 3. POWER REQUIREMENTS, CONSIDERATIONS

The hardware requires DC 12 V power. If no other hardware is connected, only the PCBA above, the current consumption is nearly 100 mA.

To supply the peripherals, the board forwards DC power to them. As more and more peripherals are connected, the current supply increases.

The highest power consumers are:	
LightBar	30-80 mA
LCD with backlight (optional)	50 mA
ID reader, depends on model	20-70 mA

Before connecting any piece of hardware to the board, check the power consumption. More than 250 mA current flow can cause damage on the components.

## 4. DETAILS OF INPUTS

### 4.1 START input

Normally, this input is used for starting the test process. In some cases it can have different function as this input is configurable by software.

The circuits behind are designed to detect human skin touch. Normally the START input is connected to one of the half circle pieces, the other is connected to the GND. Touching both half circles by hand, the skin connects the input to the GND. It causes slight voltage drop, which is detected by the uC.

The non load voltage of the input is 40 V +- 5%. The impedance is 1 Mohm.

### 4.2 OPEN input

Normally, this input is used for opening a step out gate. In some cases it can have different function as this input is configurable by software.

The circuits behind are designed to detect human skin touch. Normally the OPEN input is connected to one of the half circle pieces, the other is connected to the GND. Touching both half circles by hand, the skin connects the input to the GND. It causes slight voltage drop, which is detected by the uC.

### 4.3 TYPE input

TYPE input is used for selecting the test type to run. In case of the AIJGO-32 tester, test type selection is manageable with software, this input is not in operation.

The non load voltage of input is 3.3 V +-5%. The impedance is 1 kohm.

### 4.4 Measuring inputs (wrist, left, right)

This 3 inputs measure the ESD equipment system's status used by the person who attempts to step in to EPA. All 3 inputs' hardware are identical. For the measurement, constant voltage is connected to the inputs via a resistor. The system measures the current flow through the resistor. The measured resistance is calculated from the current flow.

The non load voltage of the inputs are 103 V. The impedance is 2420 kohm.

**Attention!!! Do not connect any additional electric component to the inputs, it can cause electric shock to the user, or damage the tester's hardware.**

6.

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## 5. DETAILS OF OUTPUTS

### 5.1 RELAY OUTPUTS

There are 3 (normally open) relays on all cases. Each one has an own activation event, they are always the same.

#### Activation events:

- PASS test result
- FAIL test result
- OPEN gate event (it is used to step out from the EPA)

The activation times are configurable, default value is 2.5 sec.

The maximum voltage on the NO relay is 60 V, the maximum current flow is 0.5 A. Above the specified values the relay may damage.

**Attention!!! There is no any over voltage or over current protection on the relays.**

The life expectancy, if no electrical load is applied is about 1 million cycle, on nominal load, it goes down to 100.000.

If you want to switch higher current, it is recommend to use additional relays or SSR.

### 5.2 LightBridge output

This output is more complicated, and used to show for the user the actual status of the tester. It has 12 pins, and they are connected to the 3 segment lightbar hardware.

#### Lights color description

- At normal status when the tester is ready to test, the lightbar is slowly dimming up and down with blue color in all segments.
- When a test is started, each segment flashes according to the actual measured value. Red means: resistance is not OK, green means: resistance is OK.
- At the end of the test the flashing stops and indicates the last result.

**The lightbridge outputs voltages switched by semiconductors, they are very sensitive for overload. Do not connect anything else to this output, only the genuine lightbar.**

### 5.3 OPEN LightBridge output

It is a single channel output, designed for single color light bridge. It is used to drive the OPEN gate input lightbridge. Usually blue colored LED strip is connected.

## 5.4 LCD OUTPUT (OPTIONAL)

This output is located on the auxiliary communication PCB. It is TWI based communication to drive an alphanumeric LCD display which has 4 lines, 16 characters each line.

**This is the most sensitive port of the tester, do not connect anything else here, only genuine LCD.**

## 6. COMMUNICATION WITH THE TESTER

The AIJGO-32 has 2 RS232 ports. Each of them complies with the RS232C standard, but without „handshaking“. The plug is not standard to have a good fit in size in the PCB. The primary port can be used for communication with the host device, which controls the behavior of the tester. (Except case of A22 type when the tester works in stand alone mode). The communication speed is 9600 BAUD. Other settings of the port: 8 data bits, 1 stop bit, no parity.

The secondary port can be used to communicate with the identification reader, usually it is an RFID reader. Every person who steps in to the EPA has his/her own unique RFID tag. (The tag numbers are registered in the database. Based on this database the tester knows how to handle the actual person's step in.) The read tag number is forwarded through the primary port to the host, to get information about. The communication speed is also 9600 BAUD. Other settings of the port: 8 data bits, 1 stop bit, no parity.

### 6.1 Primary RS232 port to the host device

The host communicates with the tester with short messages. The message structure is constructed to be able to work with a simple terminal if required. But of course it is more efficient to use a specialized software. The messages always start with a 3 character command code, followed by a hash (#) character. After this come the parameters of the command, if there are any. To close the command an ENTER (13) character must be sent at the end.

For example: to get the serial number of the tester, type into the terminal <SER#> and send it with an enter.

The result could be like this: <SER#220921234>

Here the serial number is: 220921234

The first 5 characters of the serial number identify the tester type and the hardware version, the rest 4 characters is a running serial number, in decimal.

**For other commands, see the details below:**

### 6.1.1 Get serial number

Command: <SER#>

Parameters: NA

Result: <SER#220921234>

Result description: The characters after the hash are the serial number.

### 6.1.2 Get firmware version

Command: <VER#>

Parameters: NA

Result: <VER#9.0.2>

Result description: The characters after the hash are the version number.

### 6.1.3 Reload default settings

Command: <RLL#>

Parameters: NA

Command explanation: after power up, the tester loads in the configuration from a non-volatile memory to use. If anything is changed in this non-volatile memory, the device needs to be restarted or the user needs to use „Reload default settings“ command for the changes to take effect.

Result: NA

### 6.1.4. Single measure

Command: <MAD#X>

Command parameters: X

- If it is “0” the ADC raw data is retrieved in HEX format.
- If it is “1” the ADC raw data is retrieved in decimal format
- if it is “2” the calculated resistance result is retrieved in HEX format

Result: 3 lines of data, started with wrist, than left, finally right value. The value is always after the hash character.

### 6.1.5 ReSet default limits

Command: <SDL#>

Parameters: NA

Command explanation: The acceptance limits are saved into non-volatile memory low page, which is changeable. It is possible to setup improper limits (for example, lower limit can be higher than the high limit). It can cause the tester to stop working. By this command the original (standard) limits are loaded back.

## 6.1.6 Get last measured value

Command: <MVA#XX>

Parameters: XX

- If "00" the value is retrieved in HEX format.
- If "01" the result is retrieved in decimal format.

Result: 3 lines of data, started with wrist, than left, finally right value. The value is always after the hash character.

## 6.1.7 Open out gate

Command: <OGO#>

Command explanation: This command will start the step out process. The OPEN gate relay is active for the set time.

Parameters: NA

Result: NA

## 6.1.8 Start test by command

Command: <STR#>

Command explanation: This command is able to start the test immediately or prepare the type of the next test (independently from the type input).

Parameters: There are 2 parameters, one is for the selection between the prepared or the immediate test, the other one is for the selection of the test's type.

1st parameter: 'P' - prepared test, 'T' - immediate test

2nd parameter: '0' - Gate open - no test, just step in

'1' - Test wrist

'2' - Test feet

'3' - Test all

Result: 4 lines of data contain the test result, and the measured values

## SAMPLES

Name	Command	Parameter	Full Command	Result	Result description
Get serial number	SER#	-	SER#	SER#220921234	The serial number is after „#“
Get firmware version	VER#	-	VER#	VER#9.1.9	The firmware is after „#“
Start test after Command touch	STR#P	0 - Gate open 1 - Test Wrist 2 - Test Feet 3 - Test All	STR#P0 STR#P1 STR#P2 STR#P3	TST#W#F WR:FFFFFF68C LF:FFFFFF68C RG:FFFFFF68C	TST#[WRIST]#[FAIL] #[FEET]#[PASS] #[ALL]#[ ]
Start test immediately	STR#T	0 - Gate open 1 - Test Wrist 2 - Test Feet 3 - Test All	STR#T0 STR#T1 STR#T2 STR#T3	TST#W#F WR:FFFFFF68C LF:FFFFFF68C RG:FFFFFF68C	TST#[WRIST]#[FAIL] #[FEET]#[PASS] #[ALL]#[ ]

### 6.1.9 Display text on LCD

Command: <DTX#>

Command explanation: This command is able to display any text on the LCD display.

Parameters: Two parameters must follow the hash sign. First is the number of line on the LCD display. And the following characters are displayed from the beginning of the given line.

**Attention!! Please do not overwrite anything on the display!**

Example: <DTX#3AIJGO> will display text 'AIJGO' on the bottom line

### 6.2 Secondary RS232 port to the ID reader

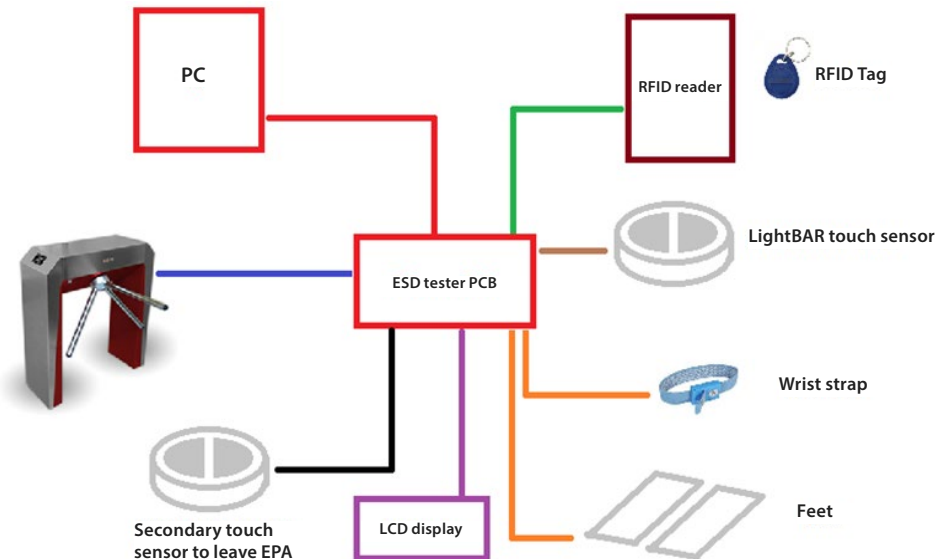
Secondary port is used to connect the personal identification device. Most of the time it is an RFID reader. The personal identification data received on this port goes to the host with an RID# prefix.

The host should watch this message and react with a reply message to the tester, which prepares or starts the person specific ESD test, or opens the gate...

The port wiring consists of 4 wires which are sufficient to power up and communicate with a general RFID reader.

### 6.3 Recommended test process

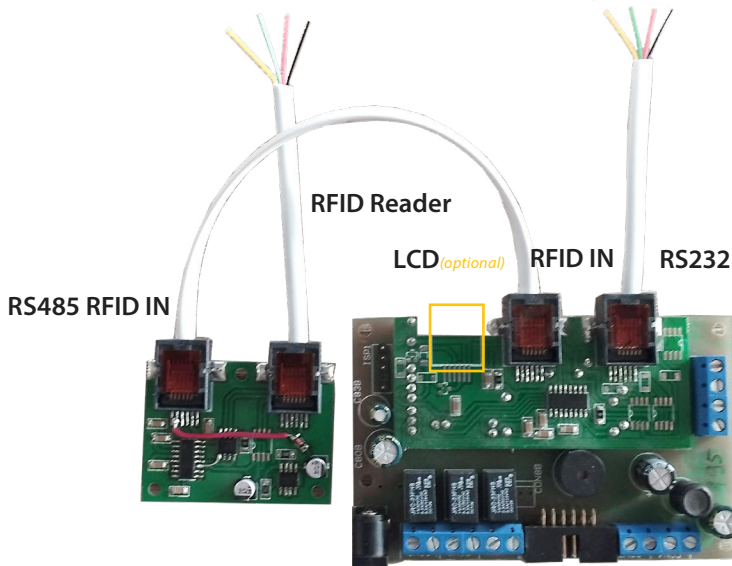
In a default setup the tester is connected to a host device (PC, most of the time), and to an RFID reader above the normal wiring. See the block diagram below.



## Process description:

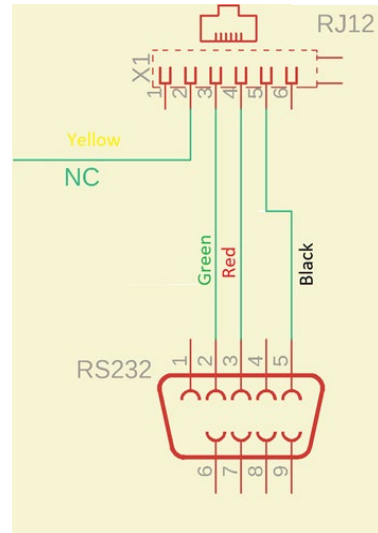
Step	Description	Who
1.	The person steps on the plates, and shows the RFID tag to the reader	Person
2.	The RFID reader sends the ID to the ESD tester via RS232 line (green line)	RFID reader
3.	The ESD tester receives the ID, extends it with "RID#" prefix and sends it to the host	ESD tester
4.	The host receives the ID, and decides what to do with it.	Host PC
5.	<p>The host sends next action to the ESD tester. Available possibilities: Send information to the person via LCD display</p> <ul style="list-style-type: none"> <li>➤ Start ESD test immediately</li> <li>➤ Prepare ESD test, tester wait for touch sensor</li> <li>➤ Open gate (for VIP entrance)</li> </ul> <p><i>For details see chapter 6.1.7, 6.1.8 and 6.1.9</i></p>	Host PC
6.	<p>The ESD tester receives the command and acts according to it:</p> <ul style="list-style-type: none"> <li>➤ Run ESD test</li> <li>➤ Prepare ESD test</li> <li>➤ Open gate</li> </ul>	ESD tester
7.	At the end of the test, tester sends the measurement result to the host, then returns to the default state.	ESD tester
8.	Host receives and processes it.	Host

## 7. WIRING / CONNECTIONS



## RS232

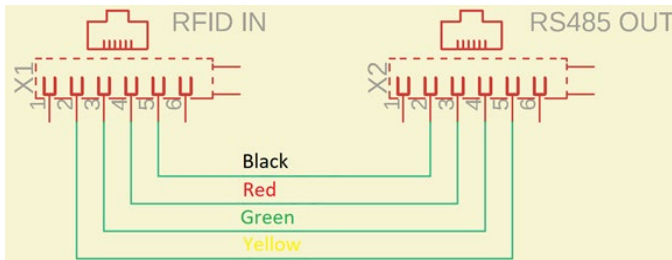
- Yellow - 12V DC
- Green - TX
- Red - RX
- Black: GND



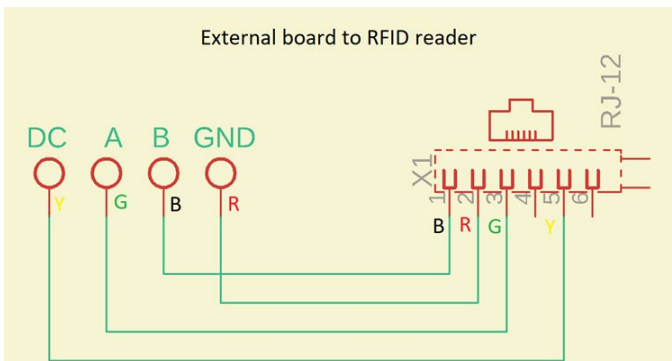
## RFID IN

(RS232 without extender board):

The pin assignment is the same as the RS232 connector.



RFID in with external (RS485-RS232) board wiring:





**D és Tsa Bt.**

2600 Vác, Dr. Csányi László Krt. 83.  
Hungary

**Tel. / Fax:** +36 27 502 555  
+36 27 200 835

**E-mail:** [sales@destsa.hu](mailto:sales@destsa.hu)

**Web:** [www.destsa.hu](http://www.destsa.hu)  
[www.dlb.hu](http://www.dlb.hu)

**AIJGO products support:**

[aijgoservice@destsa.hu](mailto:aijgoservice@destsa.hu)  
+36-20-386-7572

