

# User Manual

## ADA-4010A

### RS-485/RS-422 to RS-232 Addressable Converter



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## 1. GENERAL INFORMATION

### 1.1. GUARANTEE INFORMATION

**ADA-4010A** converter is covered by a two year warranty from date of sale. The guarantee isn't covering damage to that come from improper using, the wear and tear or unauthorized changes. If the product doesn't work according to the instruction, he will be repaired or replaced on described below principles.

All guarantee and not guarantee repairs must be returned with the payed transport and with insuring to the **Company CEL-MAR**.

**CEL-MAR Company** under no circumstances won't be responsible for ensuing damage from improper using the product or as a result of random causes: the lightning discharge, the flood, the fire and the like

**CEL-MAR Company** isn't suffering no responsibility for ensuing damage and the loss in it: loss of profits, loss of data, pecuniary losses ensuing from using or the impossibility of using this product.

**CEL-MAR Company** in peculiar cases will withdraw all guarantees, at the lack of warning the operating manual and not of accepting conditions of the guarantee by the user.

### 1.2. GENERAL CONDITIONS FOR SAFE USE

The device should install in the safe and stable place (e.g. switchbox unit), the powering cable should be arranged this way isn't exposed to treading, catching or tear out from power circuit.

Do not put device on the wet surface.

Do not connect devices for nondescript powering sources,

Do not damage or crush powering wires.

Do not make connection with wet hands.

Do not adapt, open or make holes in casings of the device!

Do not immerse device in water or no other liquid.

Do not put the fire opened on device sources: candles, an oil lamps and the like.

Complete leaving out of the powering network is coming only after disconnecting voltage in the powering circuit.

Do not take the installation or device disassembly if it is turn on. It can lead to the electric short circuit and damaging the device.

### 1.3. CE LABEL



CE symbol on organizing the company CEL-MAR a conformity of the device to the directive of the electromagnetic EMC 89/336/EEG compatibility means (Electromagnetic Compatibility Directive). The declaration of the agreement is accessible through the contact with the technical service at the address e-mail: [serwis@cel-mar.pl](mailto:serwis@cel-mar.pl) or on the phone at the +48 41 362-12-46.

### 1.4. ENVIRONMENTAL PRESERVATION



This sign on the device inform about putting expended device with other waste materials. Device should send to the recycling. (In accordance with the act about the Electronic Appliance Expended from day 29 of July 2005)

### 1.5. SERVICE AND CONSERVATION

The ADA-4010A converter doesn't require the periodic conservation.

Technical support at the number: +48 41 362-12-46 in 8.00-16.00, from Monday to Friday.

## 2. PRODUCT INFORMATION

Thank you for your purchase of CEL-MAR Company product. This product has been thoroughly inspected and tested and is warranted for an indefinite period for parts and operation under condition of delivering device to CEL-MAR Company on the customer costs. If any questions or problems arise during installation or use of this product, please do not hesitate to contact Technical Support at +48 41 362-12-46.

### 2.1. PROPERTIES

- Possibility for adding the address to not addressable device connected to RS232 interface,
- Conversion data format and baud rate on RS485 / RS422 and RS232 converter ports,
- Operating on 2 or 4 wire network in point-to-point or multi-point mode,
- Operating up to 32 devices on RS485 network,
- Conversion of TX, RX signals to RS485/RS422 standard,
- Possibility of connection up to 32 devices on RS485 network,
- Baud rate up to 230,4 kbps,
- Automatic data flow control on RS485 network,
- Transparent for all protocols: MODBUS, DNP and other,
- Any format of byte defined with the specification of RS232 interface,
- Power supply 10 - 30 VDC stable min. 2W,
- 5kV= optoisolation in signal channel between RS232 and RS485/RS422 interface,
- 1kV= or 3kV= galvanic isolation between RS485/RS422 interface and power suppl,
- Implemented short circuit protection and over-voltage protection on RS-485/RS-422 network,
- Connection RS485/RS422 and RS232 network and power supply via screw terminal block,
- Casing compatible with DIN 43880 standard– mounting in typical electro-installation unit,
- Casing adapt to rail mounting according to DIN35 / TS35 standard,
- Casing dimensions (W x D x H) 53mm x 58mm x 90mm.

**2.2. DESCRIPTION**

ADA-4010A addressable converter is device solving the problem of connecting no addressable devices equipped with the RS232 interface to multi-point RS485 bus by adding the address to RS232 device.

At the same time converter turns RS485/422 standard to RS232 standard with possibility of interference with the format of transmitted data. It can be set baud rate, number of data bites, control parity and number of stop bits depend on configuration. The setting can be different for RS232 port and RS485/422 port.

It is not required for operating, power supply form RS232 port, converter supports asynchronous baud rate up to 230,4 kbps through one or two pair of twisted cable of RS485/422 interface. ADA-4010A is equipped with screw terminal block for connection of RS232, RS485/422 and power supply. Converter uses RX, TX, GND signals and RTS signal is looped with CTS and DTR with DSR inside converter. Other signals are not connected. If it is not need to looped this signals, do not connect RTS or DTR to terminal block. Surge protection on each RS485/422 line been based on diode suppressors and fuses.

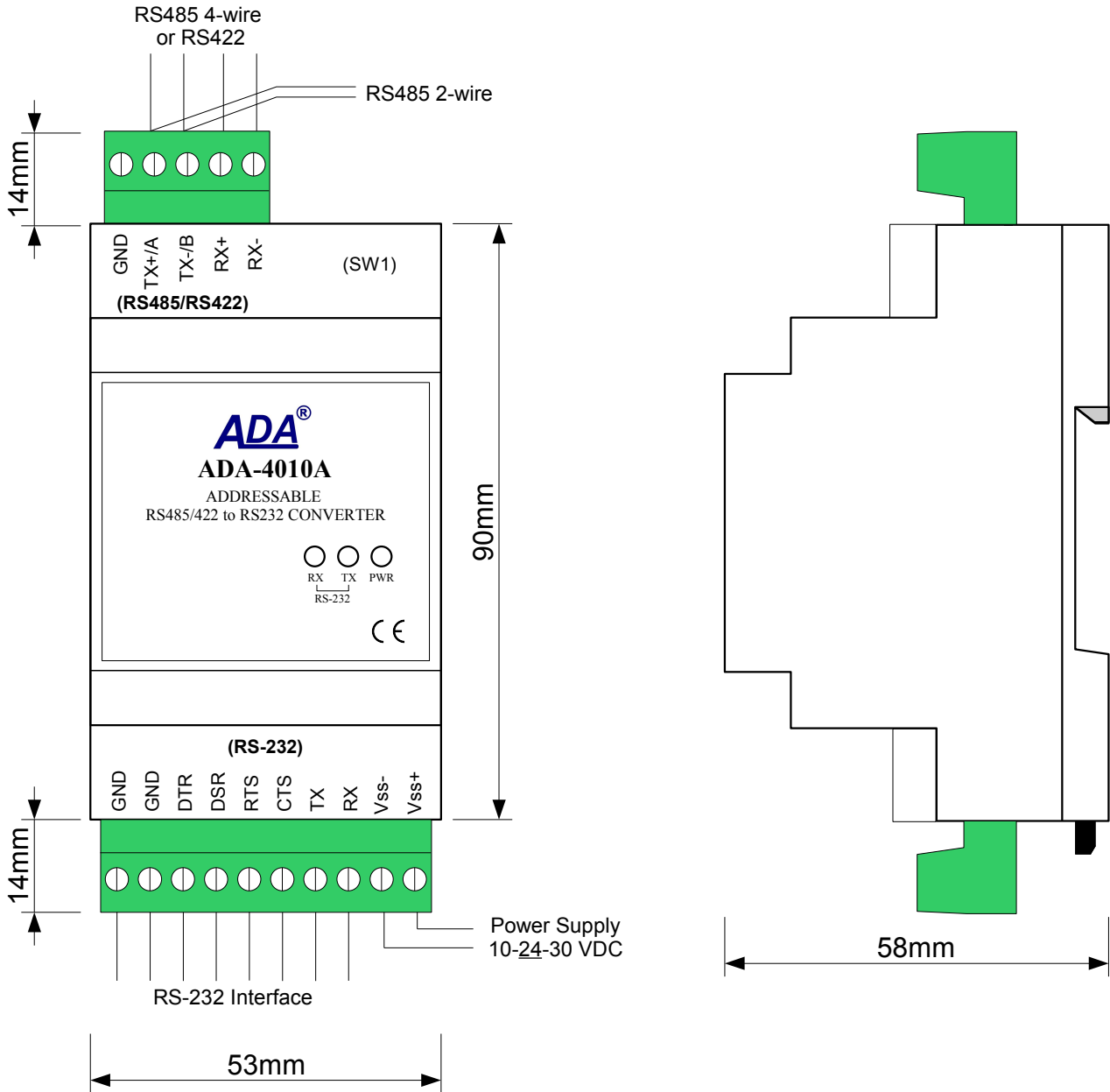


Fig 1. View of ADA-4010A and SW1 location

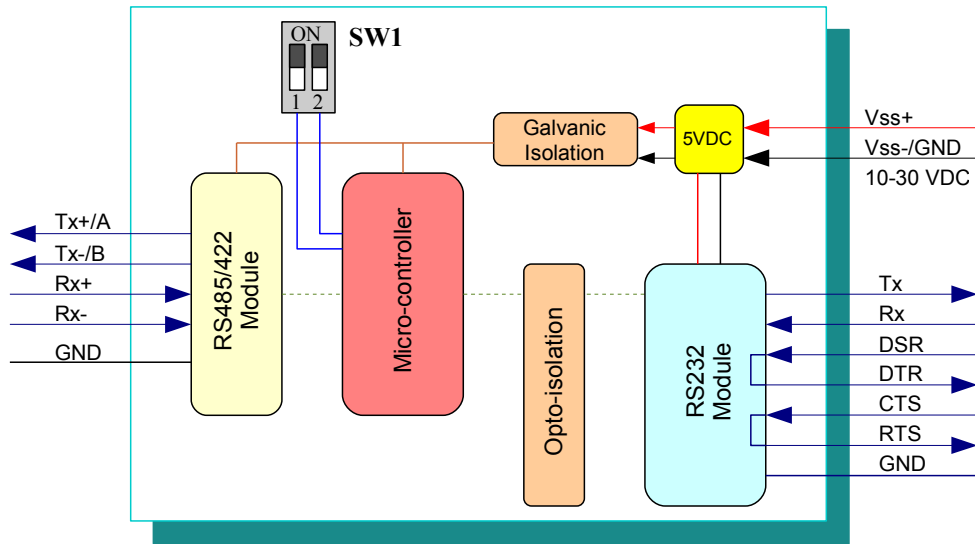


Fig 3. ADA-4010A diagram

**3. INSTALLATION**

This chapter will show you how correctly connect ADA-4010A to Computer, RS485 and RS422 network, power supply and how to use the ADA-4010A.

In the purpose of minimization of disruptions from environment is being recommended::

- applying multipair type shielded cables, which shield can be connected to the earthing on one end of the cable,
- arrange signal cables in the distance not shorter than 25 cm from powering cables.

**3.1. CONVERTER ASSEMBLING**

ADA-4010A case is adapted to assembly on TS-35 (DIN35) rail. To install converter you should mount device on the rail upper part of the case then press bottom part to to hearing characteristic „Click” sound.

**3.2. COMPUTER CONNECTION**

To connect ADA-4010A converter to:

- RS232 port of computer you should make a cable according to schema on Fig.3,
- USB port of computer you need additional converter USB to RS232 e.g. ADA-I9110 converter or ADA-I9111 converter. Typical connection of ADA-4010A to PC is shown on Fig. 4.

Transmission parameters of PC <=> ADA-4010A used during configuration:

- baud rate 9600 bps,
- 8 data bits,
- non parity bit,
- 1 stop bit.

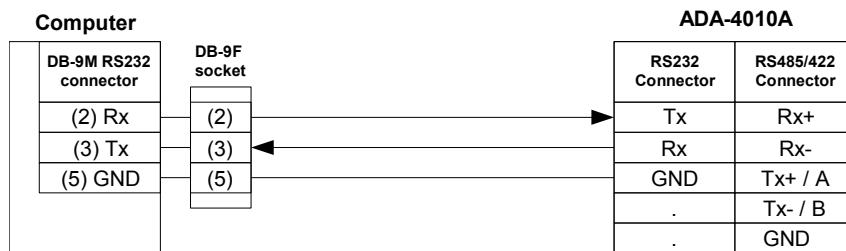


Fig 3. ADA-4010A connection to Computer using cable.

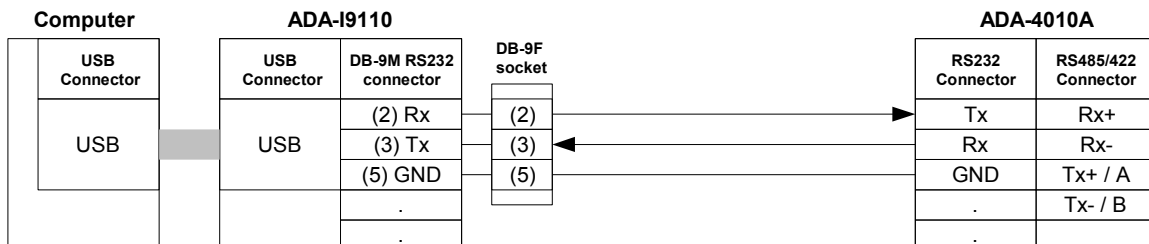


Fig 4. ADA-4010A connection to Computer using USB to RS232 converter (ADA-I9110/ADA-I9111)

**3.3. RS485 NETWORK CONNECTION**

RS485/RS422 interface in ADA-4010A converter is describe as:

Tx+/A, Tx-/B, Rx+, Rx-.

You should connect ADA-4010A to RS485(4W) and RS485(2W) network as bellow.

3.3.1. RS485(4W) BUS CONNECTION

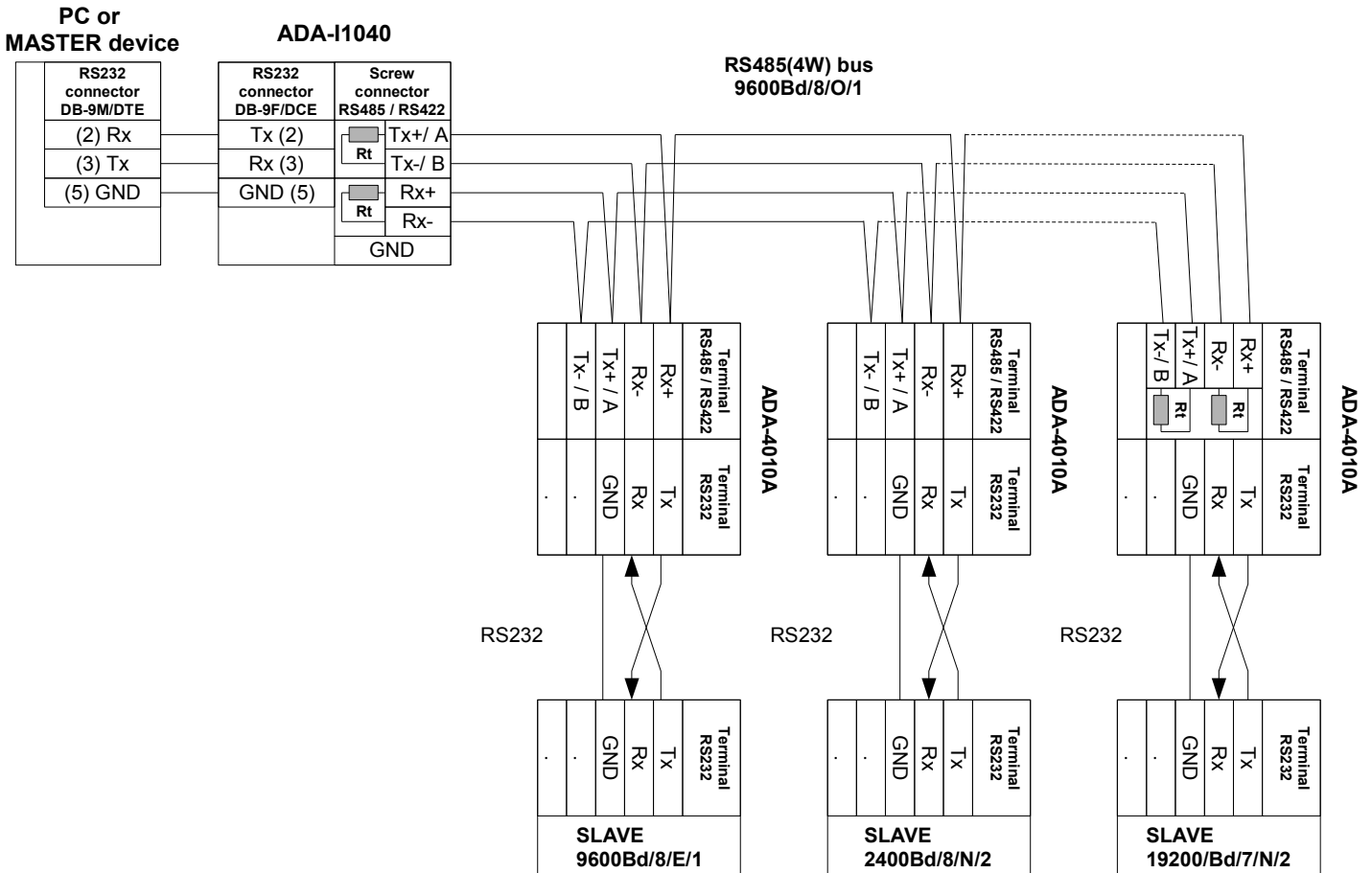


Fig 5. Example connection of ADA-4010A to RS485(4W) 4-wire bus and galvanic separation SLAVE device

3.3.2. RS485(2W) BUS CONNECTION

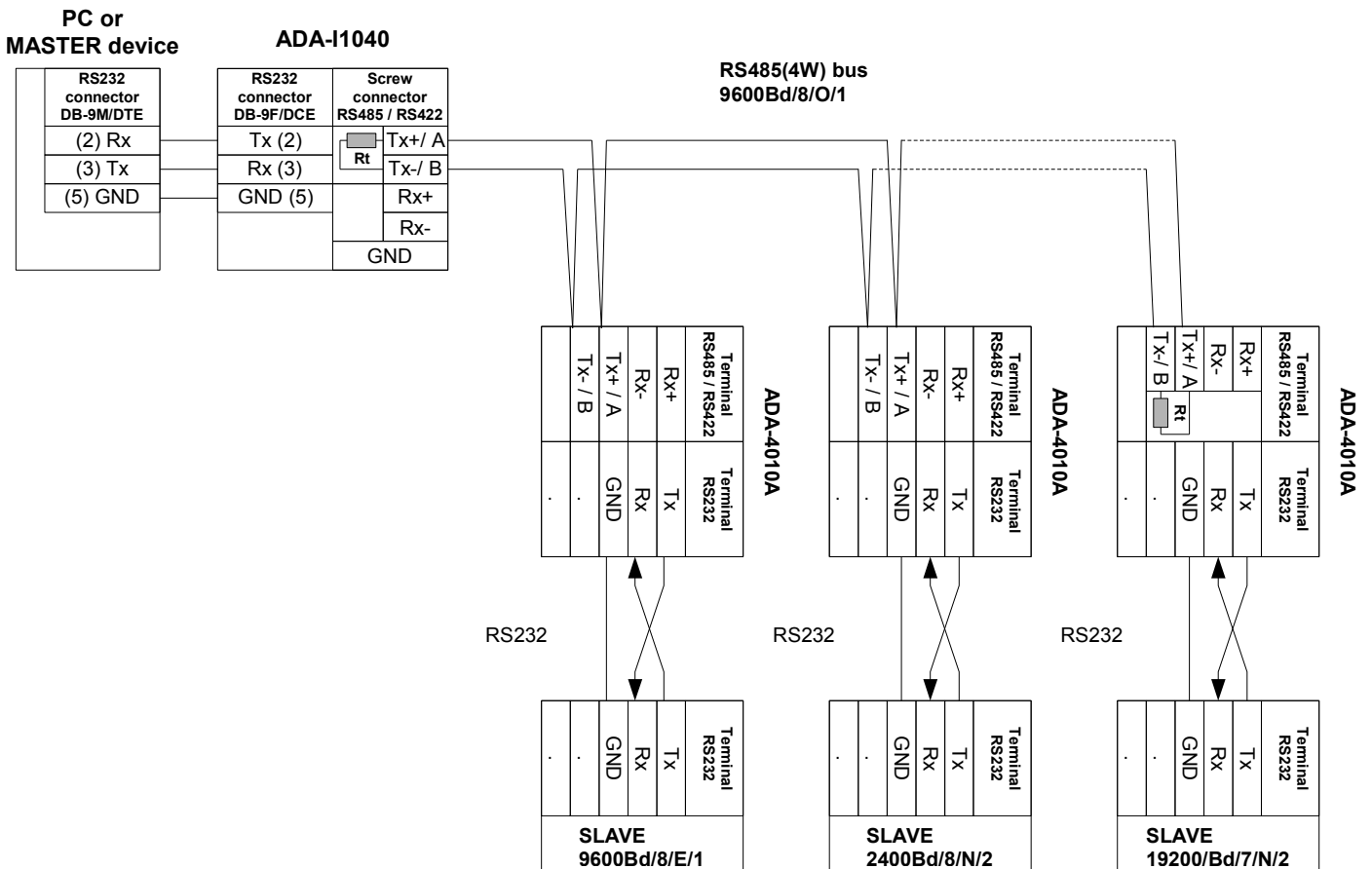


Fig 6. Example connection of ADA-4010A to RS485(2W) 2-wire bus and galvanic separation SLAVE device

**3.3.3. LINE TERMINATION Rt**

Line Termination (terminator)  $R_t = 120 \Omega$  let reduce influence of reflect in long lines and by high baud rate. It is not needed below 9600Bd but for distance upper then 1000m and 9600Bd or 700m and 19200Bd you should use the Line Termination if the transmission will be incorrect. Example of connection resistor  $R_t$  is shown on fig.5 and fig.6. Two resistors  $R_t=120 \Omega$  , 5%, 0,25W is delivered with ADA-4010A.

**3.3.4. SLAVE DEVICE CONNECTION**

Connection of SLAVE device to ADA-4040A is shown on fig.5 and fig.6.

**3.4. POWER SUPPLY CONNECTION**

To connect power supply to converter you should have DC power supplies (regulated) output voltage from 10 V= to 30V=, min. nominal power 2W, e.g. ZS-12/250 or ADA-SPS240040D. Power cable from DC power supplies to device can not be longer than 3m. You should connect positive (+) end of DC power supplies to Vss+ device terminal and negative (-) end to Vss- on terminal block. ADA-4010A has protection against power supply reverse connection and if after connection power supply on front panel will not lighting green led PWR, You should check correctness of power supply connecting (polarization).

**4. ACIVATION**

You can power on the unit after properly connection according to section above. If connection was made properly green LED PWR on front panel of converter should lighting. When data is present the LEDs Tx and Rx should blink.

**4.1. DESCRIPTION OF SIGNALLING LEDS**

LED	Description
PWR	Signalling of Power Supply
<b>Normal Operating</b>	
RX	Signalling of data receiving through ADA-4010A converter from RS232 port.
TX	Signalling of data transmitting from ADA-4010A converter through RS232 port.
<b>Configuration</b>	
LED by SW1	Blink with frequency 1 Hz - signalling of configuration mode (see micro-switch SW1 setting).
<b>Software updating</b>	
LED by SW1	Blinking - signalling data flow of software to converter.

**ATTENTION!**  
At baud rate above 38.4 kbps the LED's Tx, Rx will light weakly during data transmission

**4.2. PROBLEMS'S ELIMINATION**

Problem	Solutions
PWR led not light	Check polarization and parameters of connected power supply.
Tx led light continuously	RS485(4W) / RS422 bus. Wrong polarization on Rx+, Rx- terminals. Change polarization
Tx led light continuously	RS485(2W) bus. Wrong polarization on Tx+/A, Tx-/B terminals. Change polarization
No transmission, Tx led blinking.	RS485(4W) / RS422 bus. Check connection correctness of Tx, Rx terminals according to chapter 3.

**5. CONFIGURATION**

**5.1. CONVERTERS OPERATION MODE**

ADA-4010A converter can operate in few modes as:

- normal operating,
- configuration,
- firmware emergency updating,

This mode can be set by use SW1 switch located by RS455/RS422 terminal block after removing terminal cover marked as SW1. Figure 1 present the location of two-position SW1 micro-switch inside ADA-4010A.

All available adjusting the SW1 switch are shown in table bellow.

**Table 1. Converters operation mode**

SW1- 1	SW1- 2	Operating mode
OFF	OFF	Normal operating
ON	OFF	Device configuration
ON	ON	firmware emergency updating mode

**5.2. CONFIGURATION BY USING ADACONFIG**

You can make the configuration of ADA-4010A converter by using *ADAConfig* Software - selling with converter. You have to connect converter to computer and power supply to make the configuration. If the PWR LED lights you should set the section of SW1 switch to configuration mode. Example is shown below:

<b>SW1-1</b>	<b>SW1-2</b>
ON	OFF

If you set configuration mode the yellow LED located by SW1 micro-switch will blink with frequency 1 Hz. Now you can start *ADAConfig* Software and make the configuration of transmission parameters for each converter interfaces and set his visible address from side of RS485/RS422 port. First you should set in *ADAConfig* Software number of COM port for communication with converter, then readout the configuration from converter memory using the button [*Read converter configuration*] and make the proper changes of interface setting. If you set option addressing converter, on configuration window you should set proper converter address from range 1 - 255. If you set OFF this option the converter function as baud rate converter

In both cases you can set additional transmission parameters for RS232 interface and RS485/422 interface as below:

- baud rate (kbps): 0.3, 0.6, 1.2, 1.8, 2.4, 4.8, 7.2, 9.6, 14.4, 19.2, 28.8, 38.4, 57.6, 76.8, 115.2, 230.4,
- number of data bites: 5, 6, 7, 8,
- control parity: no control, parity control, control of none parity,
- number of stop bits : 1, 2,
- frame spacing – range from 1 to 255 (time silence as frame's end),

When you finish configuration setting you should save changes on converter memory by using button [*Write converter configuration*]. Return to work in normal mode is made by using SW1 switch (yellow LED blink OFF) as below.

<b>SW1-1</b>	<b>SW1-2</b>
OFF	OFF

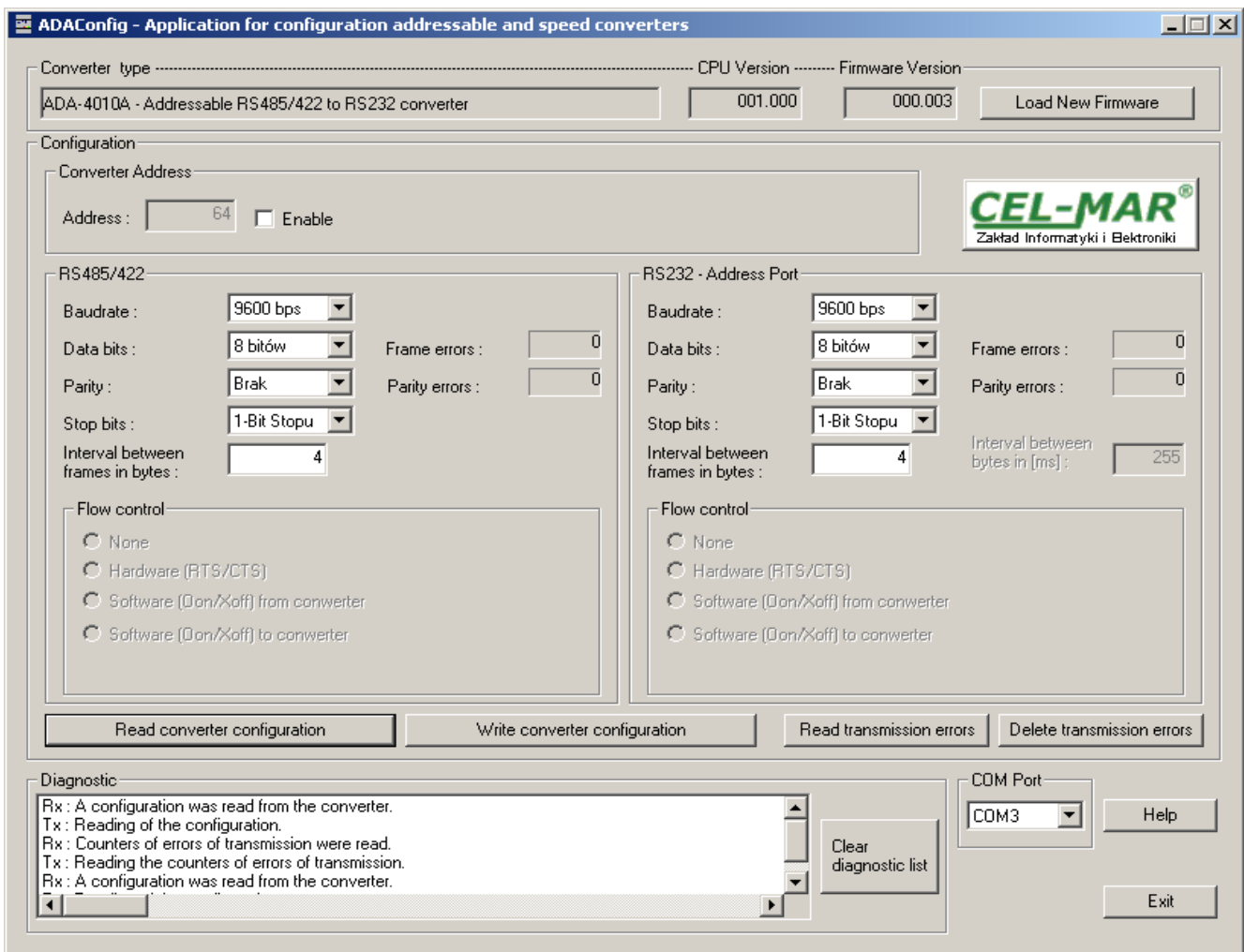


Fig 7. ADAConfig view

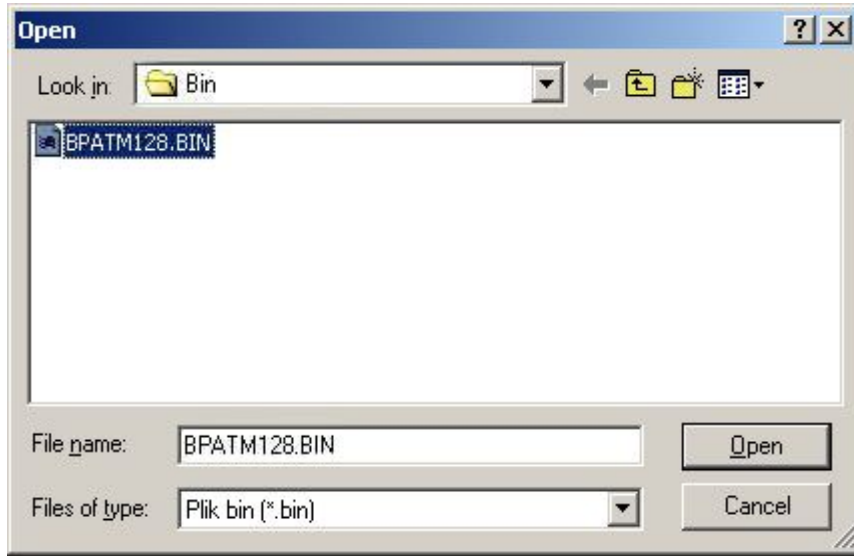
**5.3. SOFTWARE CHANGING**

In case of software changing (firmware) you should set configuration mode by using SW1 micro-switch as below:

<b>SW1-1</b>	<b>SW1-2</b>
ON	OFF



If you set configuration mode an yellow LED located beside SW1 micro-switch will blink with frequency 1 Hz. Press a button *[Load New Firmware]* to change the software delivered by manufacturer. The Select File window will open (Fig.8) and select the \*.bin file then click *[Open]* - software will be load to *ADAConfig* buffer storage and checked. If *ADAConfig* does not detect errors in loaded file you can change converter software. Process of software changing is visualized by *ADAConfig* in use Progress Window and after proper changing confirmed by correct message.



**Fig 8. Selection of firmware file**

During loading software an yellow LED located by SW1 micro-switch will blinks, showing data flow to converter. If the Software loaded correctly yellow LED will be blink with frequency 1 Hz.

Return to normal operating mode is made by using SW1 switch (yellow LED blink OFF) as below.

<b>SW1-1</b>	<b>SW1-2</b>
OFF	OFF

**5.4. EMERGENCY SOFTWARE UPDATING**

In a case of the unsuccessful updating of the converter software, try again according to description in item 5.2. If the exchange is still incorrect use emergency software changing. You can entered in this mode by using SW1 micro-switch as below:

<b>SW1-1</b>	<b>SW1-2</b>
ON	ON

After micro-switch setting you should restart the converter by turning OFF and then ON ADA-4010A power supply. If the yellow LED is light continuously the converter will be in emergency software updating mode. Now you have to follow on the description in item 5.2 .

**ATTENTION!!!**

**AFTER SUCCESSFUL RELOAD OF PROGRAM MICRO SECTION OF SW1 SWITCH SHOULD BE SET LIKE IN TABLE BELOW**

<b>SW1-1</b>	<b>SW1-2</b>
OFF	OFF

**6. DATA TRANSMISSIONS DIAGNOSTIC**

To readout diagnostics you should set SW1 to configuration mode (see paragraph 5.1).

Correctness of transmission proceed on RS232 and RS485/422 interfaces you can check by readout error list by use *ADAConfig* Software form the converter memory. Frames error meter will be increased for example: in case of improper speed set compared to real speed of data transmission. Parity error meter will be counted errors which can arise in case of misrepresent bytes in transmitted sign. This meter will not work in case of disable control parity. If you want to check this meters press the button *[Read transmission errors]*, and to delete (zeroing of meters in the memory of the converter) press *[Delete transmission errors]*.

In case of parity errors or frame errors you should check ADA-4010A converter's configuration and connection correctness of

- RS485 network connection to RS485/RS422 port,
- addressable device to converter's RS232 port.

When you will finish diagnostic you should set SW1 micro-switch to normal mode (see paragraph 5.1)

**7. OPERATES DESCRIPTION**

ADA-4010A converter can operate in addressable mode and not addressable mode.

**7.1. OPERATING IN NOT ADDRESSABLE MODE**

ADA-4010A operates as baud rate and data format converters in not addressable mode and let you to set different baud rates and data formats on RS232 and RS485/422 interfaces.

This allows you to connect old devices operates with not configure baud rate and data format on RS485 Bus, where operate devices with different baud rate or different data format.

**7.2. OPERATING IN ADDRESSABLE MODE**

In this mode ADA-4010A operates as baud rate and data format converters and let you to connect not addressable RS322 interface devices transmitting data with different baud rates and data frames format to RS485 Bus, and thus let to cooperate with not addressable devices.

Example connection is shown on Fig.9.

Frame of protocol for not addressable devices connected to RS232 port of ADA-4010A on RS485 Bus should be created in the following way:

<b>ADDRESS ADA-4010A</b>	<b>FRAME OF PROTOCOL FOR NOT ADDRESSABLE DEVICES</b>
--------------------------	--

Where:

**ADDRESS ADA-4010A**

- one byte of address from 1-255 scope - set in the memory of ADA-4010A during configuration in use of ADAConfig,

**FRAME OF NOT ADDRESSABLE DEVICES**

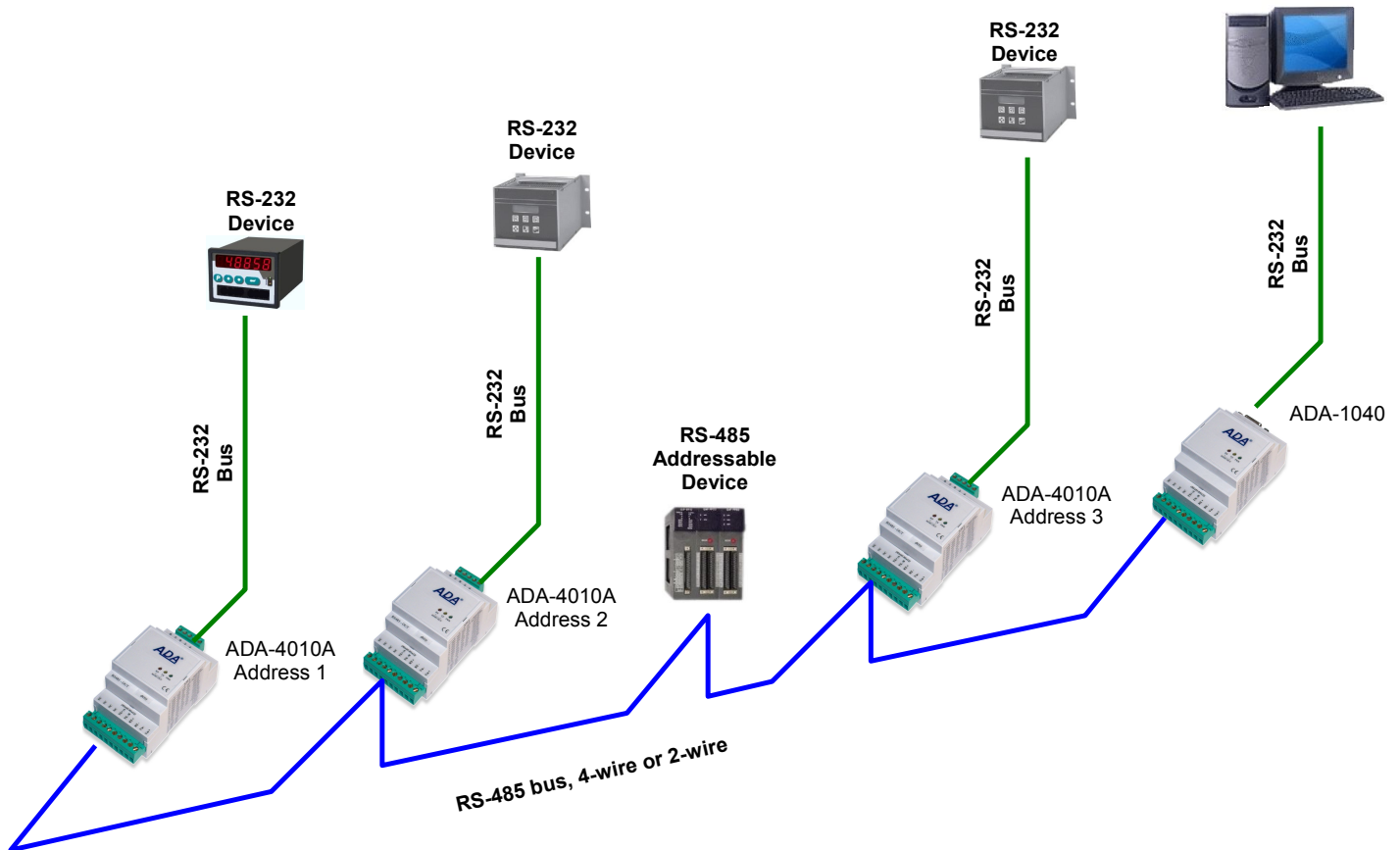
- free sequence of bytes containing the appropriate frame of connected device of the RS2 port. Not longer than 950 bytes.

ADA-4010A converter with set up addressing is listening constantly to frame on RS485 bus via RS485/22 port. If received frame contains byte of address equal to converter address then another bytes of frame are received right up to silence on RS-485 bus equal to 'space between frames in signs'. If the frame is received correctly, the address byte is deleted and transmitted over as typical to the RS232 port.

In case of errors in received frame, it isn't transmitted to RS232 port. In this case should be send the previous frame. The frame received from device connected to RS232 port is being tested of transmission errors and in case of their missing converter adds address to beginning of frame and send it to RS-485 bus via RS485/RS422 port. Frame containing errors isn't being transmitted to RS232 port. In case of transmitting of frames containing more than 950 bytes converter receive only 950 bytes and next are ignored.

ADA-4010A was equipped with separate buffers for RS232 and RS485/422 ports, therefore converter can operate at full duplex mode on RS-422 and RS-485 (RS2) 4-wire bus.

Figure 9 presents possibility of using the addressable ADA-4010A baud rate converter.



**Fig 9. Connection of not addressable RS232 devices to RS485 Bus**

APPENDIX A. TERMINAL DESCRIPTION OF RS232 INTERFACE.

Terminal	Signal	Description	ADA-4010A
TX	(TD)	Transmitted Data	Transmitter
RX	(RD)	Received Data	Receiver
RTS	(RTS)	Request To Send	Looped with CTS
CTS	(CTS)	Clear To Send	Looped with RTS
DSR	(DSR)	Data Set Ready	Looped with DTR
DTR	(DTR)	Data Terminal Ready	Looped with DSR
GND	(SG)	Signal ground	GND

APPENDIX B. SPECIFICATION

Transition Parameters		
	RS-232	RS-485/RS-422
Connector	Screw terminal block - max. Ø 2,5mm <sup>2</sup>	Screw terminal block - max. Ø 2,5mm <sup>2</sup>
Line length	up to 15 m	1200 m
Max. number of connected device	1	32
Transmission line	Multewire cable 9x0,34 in shield	1-pair or 2-pair twisted cable, UTP Nx2x0,5 (24AWG), shield inside large interferences STP Nx2x0,5 (24AWG)
Standards	EIA-232, CCITT V.24,	EIA-485, CCITT V.11
Transmission type	Asynchronous full duplex, half duplex.	
Optical Signalization	<ul style="list-style-type: none"> <li>• PWD – green LED power supply,</li> <li>• RX - red LED data receiving on RS-232 side,</li> <li>• TX - yellow LED data transmission via RS-232 interface.</li> </ul>	
Nominal Operating Conditions		
Power requirements	10 - 24 – 30 V DC	
Power Cable	Recommended length of power cable – up to 3m	
Power	<2W	
Protection from reverse power polarization	YES	
Galvanic Isolation	1kV= or 3kV= DC between power circuit and RS-485/422 signal line	
Optoisolation	5kV= between signal line RS485/422 and RS-232	
Operating temperature	0 ÷ +23 ÷ +50°C	
Humidity	5 ÷ 95% - non-condensing	
Location during work	Free.	
Mounting	Rail mounting according to DIN35 standard / TS35.	
Electromagnetic compatibility	Resistance to disruptions according to the standard PN-EN 55024. Emission of disruptions according to the standard PN-EN 55022.	
Safety requiring	According to the PN-EN60950 norm.	
Environment	Commercial and light industrial.	
Casing		
Dimensions	53 x 90 x 58 mm	
Material	Noryl UL. 94 V-O	
Degree of casing protection	IP40	
Degree of terminal protection	IP20	
Weight	0,10 kg	
According to standards	DIN EN50022, DIN EN43880	
Storing and Transportation		
Storage temperature	-40 ÷ +70°C	
Humidity	5 ÷ 95% - non-condensing	

## APPENDIX C. VERSIONS

ADA-4010A - <input type="checkbox"/> - <input type="checkbox"/>	
<b>Galvanic isolation:</b>	
1kV=	<b>2</b>
3kV=	<b>3</b>
<b>Terminal &amp; Terminal Cover:</b>	
Cover without inlets, screw terminal block	<b>1</b>
Cover without inlets, screw terminal block	<b>2</b>
Cover without inlets, plug-in screw terminal block	<b>3</b>

Order example:

Product Symbol: **ADA-4010A-2-3**

**2** - galvanic isolation 1kV=,

**3** - cover without inlets, plug-in screw terminal block,

### Dear Customer,

Thank you for purchasing **CEL-MAR Company** products.

We hope that this user manual helped You to connect and start up the **ADA-4010A converter**. We also wish to inform You that we are a manufacturer of the widest range of data communications products in the world such as: data transmission converters with interface RS232, RS485, RS422, USB, Current Loop, Fibre-Optic Converters, 1-Wire and other.

Please express Your opinion by e-mail or phone on this product, and advise Us how We can satisfy you present and future of expecting.

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