

User manual

ADA-11040

RS485/RS422 to RF converter



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1. GENERAL INFORMATION

This product is manufactured by CEL-MAR Company and has been thoroughly checked and tested.

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 or e-mail support@cel-mar.pl.

1.1. WARRANTED INFORMATION

ADA-11040 converter is covered by a two year warranty from date of sale. In case of being damaged it will be repair or the damaged component will be replace. The warranty does not cover damage caused from improper use, materials consumption or any unauthorized changes. If the product does not function (is damaged), or not operate in accordance with the instructions, will be repaired or replaced.

All warranty and no warranty repairs must be returned with paid transport and insuring to the **CEL-MAR Company**.

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 is not be held responsible for damages and loss including: loss of profits, loss of data, pecuniary losses ensuing from using or the impossibility of using this product.

In specific cases **CEL-MAR Company** discontinue all warranties and in particular do not follow the user manual and do not accept terms of warranty by the user.

1.2. GENERAL CONDITIONS FOR SAFE USE

The device should be installed in a safe and stable places (eg, electroinstallation cabinet), the powering cable should be arranged so as not to be exposed to trampling, attaching, or pulling out of the 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 disable from the supply network is only after disconnecting the power supply circuit voltage.

Do not carry out the assembly or dis-assembly of the device if it is enabled. This may result to short circuit and damage the device.

The device can not be used for applications that determine human life and health (eg. Medical).

1.3. CE LABEL



The CE symbol on the device CEL-MAR means compatibility with Radio Directive **2014/53/UE**, electromagnetic compatibility Electromagnetic Compatibility Directive **EMC 2014/30/WE**.

Declaration of Conformity is delivered with purchased converter.



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 MAINTENANCE

ADA-11040 converter does not require the servicing and maintenance.

Technical support is available at number +48 41 362-12-46 in 8.00-16.00, from Monday to Friday or e-mail support@cel-mar.pl.

1.6. PACK CONTENTS

ADA-11040 converter, User Manual, CE declaration, Antenna, CD with ADARF software.

2. PRODUCT INFORMATION

Attention!

Class A device designed for installation in environments commercial and light industrial. In residential environment may cause harmful interference radio-electric, in which case the user will have to take appropriate steps to eliminate them.

2.1. PROPERTIES

- Work on wireless network in ISM 868/433/470/915 MHz band, globally without a license,
- FSK modulation, 2-way half duplex communication, strong protection against interference,
- Wireless network baud rate 1200 - 115200 bps,
- Maximum output power of transmitter 100mW (20dBm), adjustable in the range 1-20dBm,
- Receiver sensitivity: -117dBm,
- RSSI function,
- SMA connector for connection of antenna,
- Operating on 2 or 4 wire RS485 bus and on 2 or 4 wire RS422,
- RS485/RS422 baud rate (bps): 1200, 1800, 2400, 4800, 9600, 14400, 19200, 28800, 38400, 57600, 115200,
- RS485/RS422 data format: data bit: **8**; parity: **None**; stop bits: **1**,
- Power supply 10 - 30 VDC stable min. 2W,
- ~3kV= optoisolation in signal channel between RF and RS485/422 interfaces,
- 1kV= or 3kV= galvanic isolation between RF & RS485/422 interfaces and power supply (depend on version),
- Connection RS485/RS422 network via screw terminal block 2.5 mm² .
- Implemented short circuit protection and over-voltage protection on RS485 / RS422 network,

- Implemented protection against power supply reverse connection,
- Cover compatible with DIN 43880 standard– mounting in typical electro-installation unit,
- Cover adapt to rail mounting according to DIN35 / TS35 standard,
- Cover dimensions (W x D x H) 53mm x 62mm x 90mm,
- Antenna dimensions: length 110mm, diameter 9mm.

2.2. DESCRIPTION

ADA-11040 converter is a device used for connection together devices with RS485/RS422 interface via wireless RF network. The converter transmits data with baud rate from 1200bps to 115200 bps via RS485/RS422 interface, and steady data format: 8 data bits, None parity bit, One stop bit (8N1).

ADA-11040 converter has screw terminals blocks for connection of RS485/RS422 , power supply and SMA connector for RF antenna. The converters work in the same radio channel, create wireless RF network. ADA-11040 uses signals: RX+, RX-, TX+/A, TX-/B of RS485/RS422 for operation. To RS485 bus, constructed on the base of ADA-11040, can be connect 32 devices operating in half duplex mode to RS485(2W) bus to RS485(4W) bus. The converter is adapted to supply an external voltage source from 10V to 30V and power 2W. Has implemented protection against opposite polarization of power supply and over-voltage protection on RS485/RS422 bus. ADA-11040 has galvanic isolation between power supply and RF and RS485/RS422 interfaces, has also optoisolation between RF and RS485/RS422 interface.

Transmission range in wireless RF network:

- in buildings - from 30m to 300m
- in an open area up to 1000m,

The transmission range can be enlarged by use the additional direction antennas

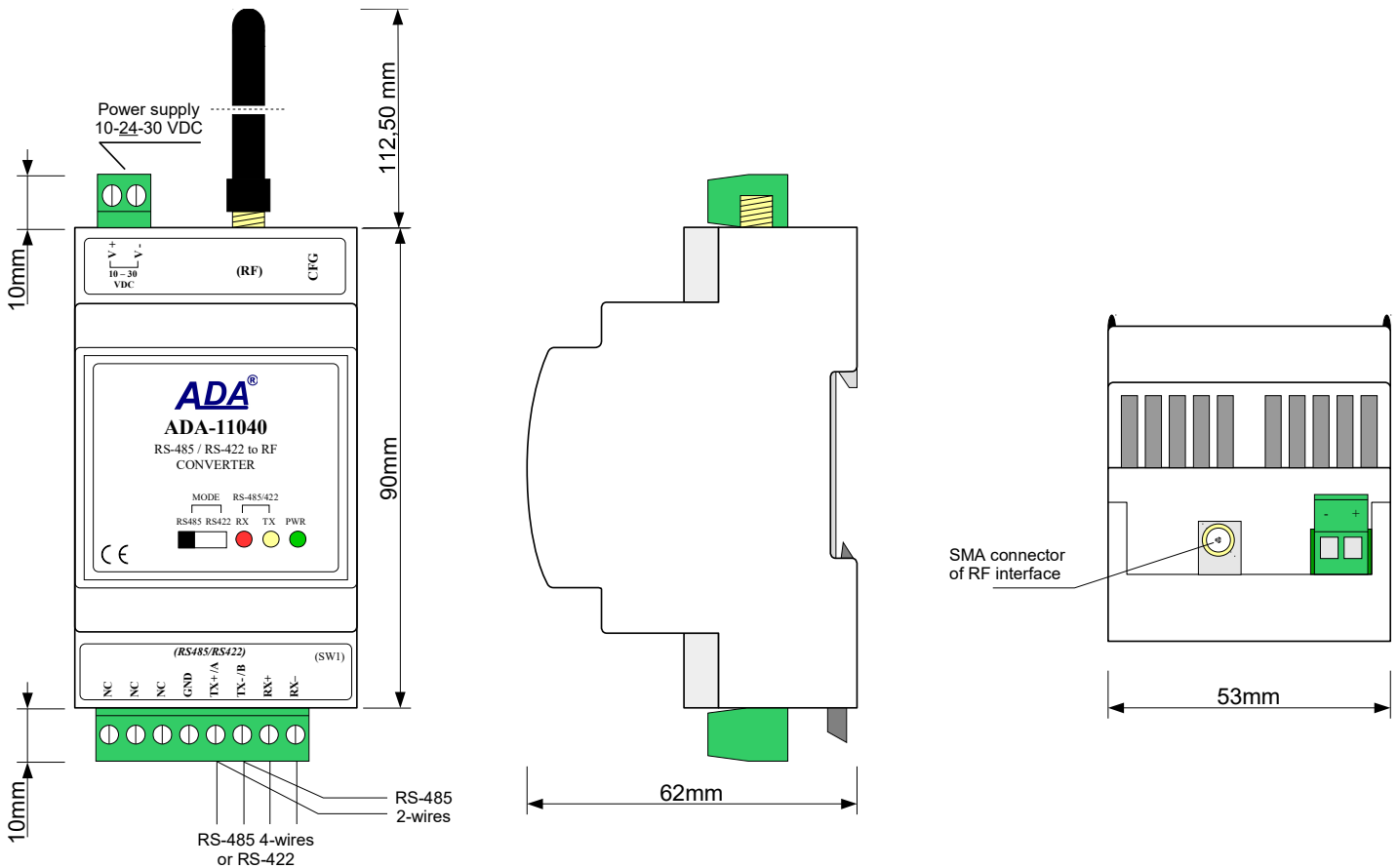


Fig 1. ADA-11040 view.

2.3. ISOLATION

Converter ADA-11040 has 3-way galvanic isolation on the levels 1kV= or 3kV=, depend on version described in section VERSIONS.

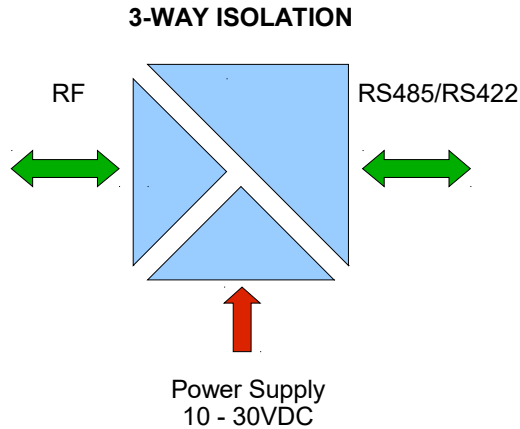


Fig 2. Isolation structure

3. INSTALLATION

This chapter will show how to use and connect ADA-11040 to RS485,RS422 bus and RF network and power supply. In the purpose of minimization of disruptions from environment is being recommended to:

- apply 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.
- apply cable of adequate cross-section due to voltage drops for converter powering,
- use suppression filters for powering converters that are installed within a single object.
- not supply converter from power circuit device that generates large impulse interference such as transmitters, contactors.

3.1. ASSEMBLING

The cover of ADA-11040 converter is adapted to assembly on TS-35 (DIN35) rail. To install the converter, should be mounted on the rail upper part of the cover then press bottom part to hear characteristic „Click” sound.

ATTENTION!
THE DISTANCE BETWEEN RF DEVICES HAS TO BE LARGER THAN 20CM. DO NOT INSTALL, SET RF DEVICES IN LESS DISTANCE.

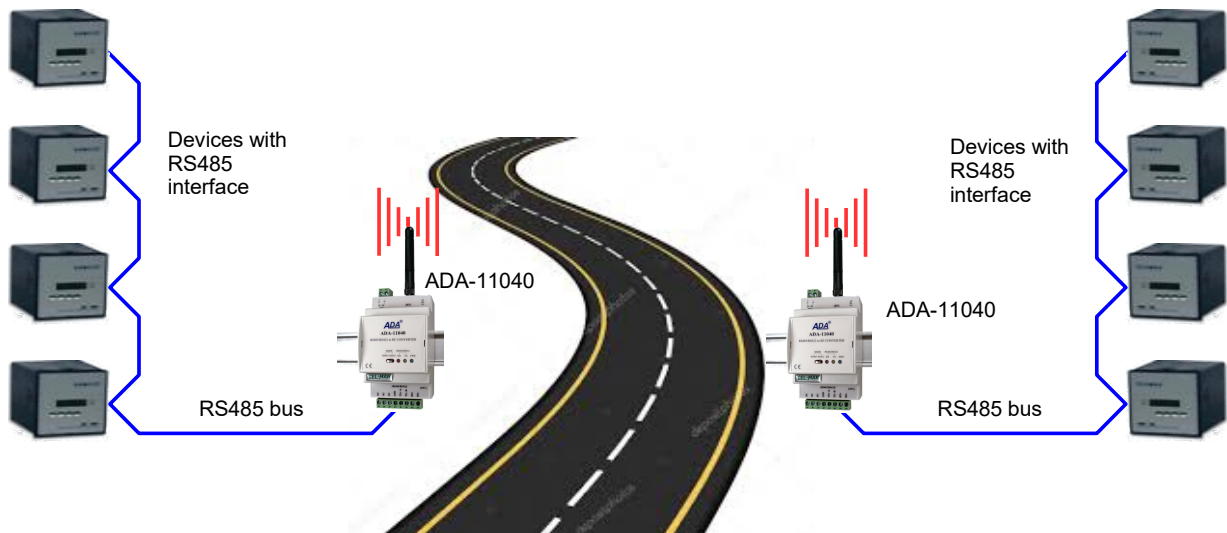
3.2. WIRELESS RF NETWORK CONNECTION

Using ADA-11040 converter, can be connected devices with RS485/422 interfaces to wireless RF network.

3.2.1. EXTENSIONS RS485/RS422 BUS

On the drawing below was shown, the using of ADA-11040 as extender of RS485/422 bus above obstacle terrain.

ATTENTION !
THE CONFIGURATION OF RF PARAMETERS HAVE TO BE THE SAME FOR BOTH CONVERTERS, IN PURPOSE OF PROPER WORK WIRELESS CONNECTION.

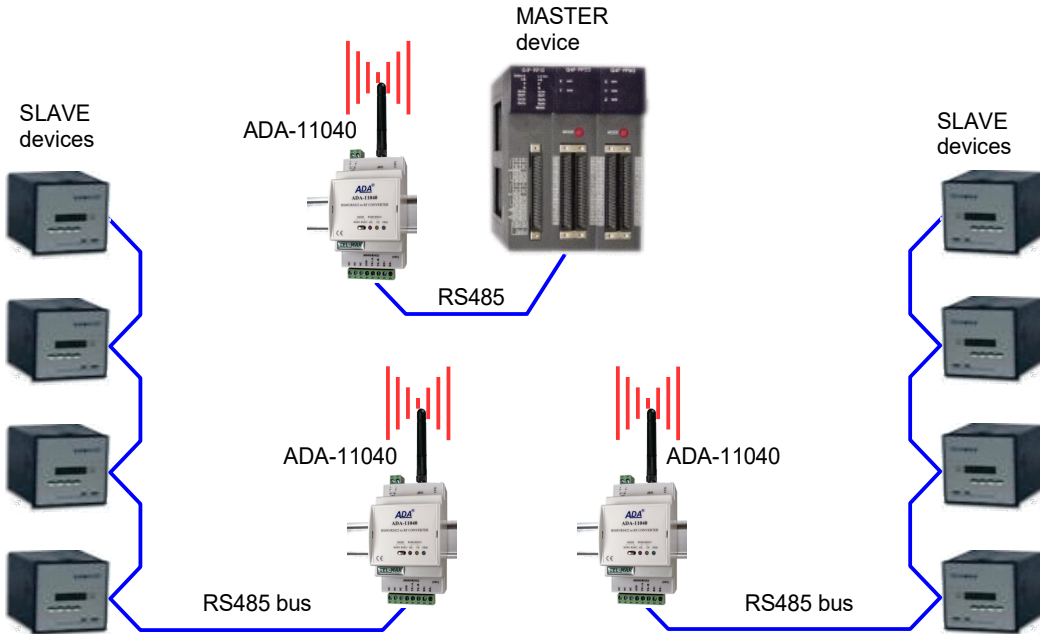


3.2.2. EXTENSIONS OF FEW RS485/RS422 BUSES

On the drawing below was shown, connection of two RS485 buses and MASTER device by the use of wireless RF network.

ATTENTION !

THE CONFIGURATION OF RF PARAMETERS HAVE TO BE THE SAME FOR BOTH CONVERTERS, IN PURPOSE OF PROPER WORK WIRELESS CONNECTION.

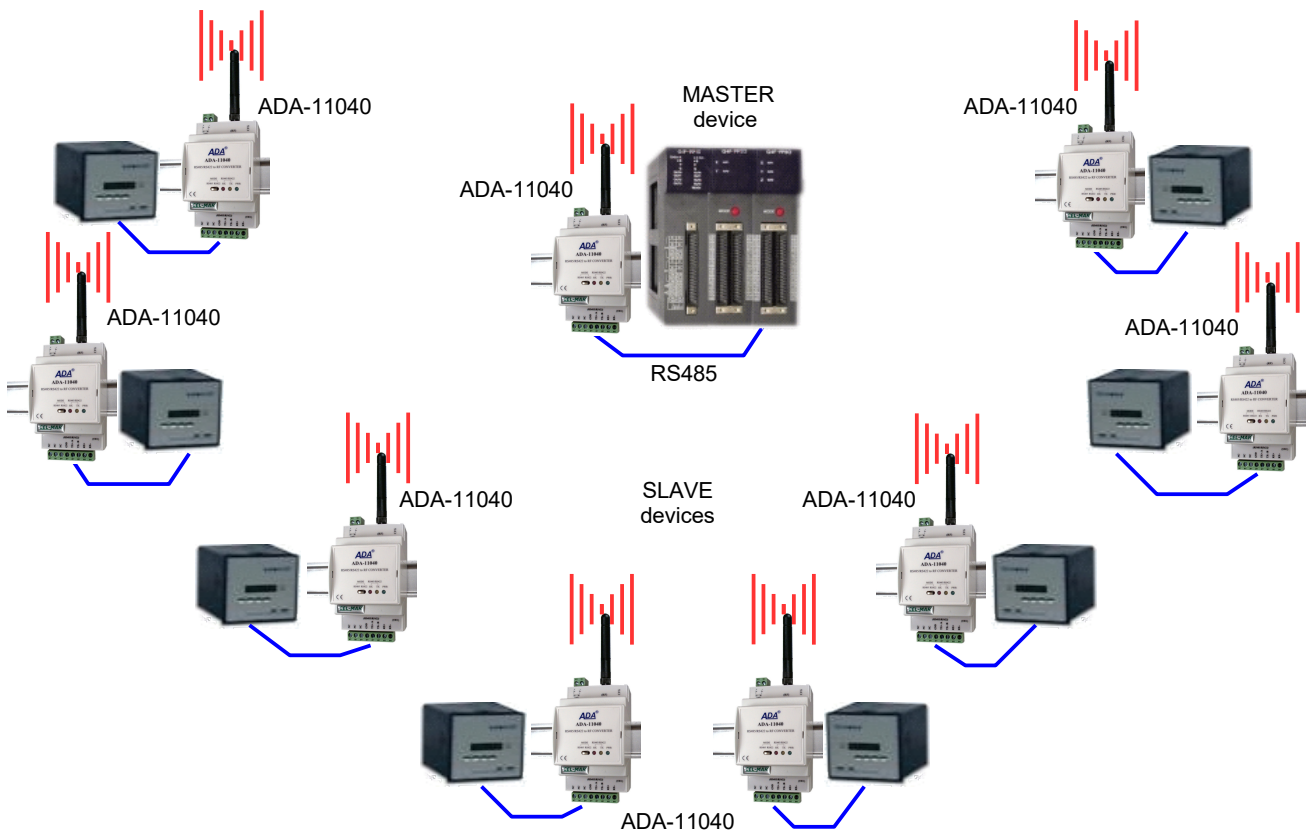


3.2.3. CONNECTION MANY RS485/RS422 DEVICES VIA WIRELESS RF NETWORK.

On the drawing below was shown, connection of many RS485/RS422 devices by the use of wireless RF network.

ATTENTION !

THE CONFIGURATION OF RF PARAMETERS HAVE TO BE THE SAME FOR BOTH CONVERTERS, IN PURPOSE OF PROPER WORK WIRELESS CONNECTION.



3.3. COMPUTER CONNECTION

To connect ADA-11040 to USB computer port, is needed additional converter USB to RS485 eg. ADAI9141, connected to RS485/422 port of ADA-11040 converter.

Typical connections of ADA- 4040PC1 to PC are shown below.

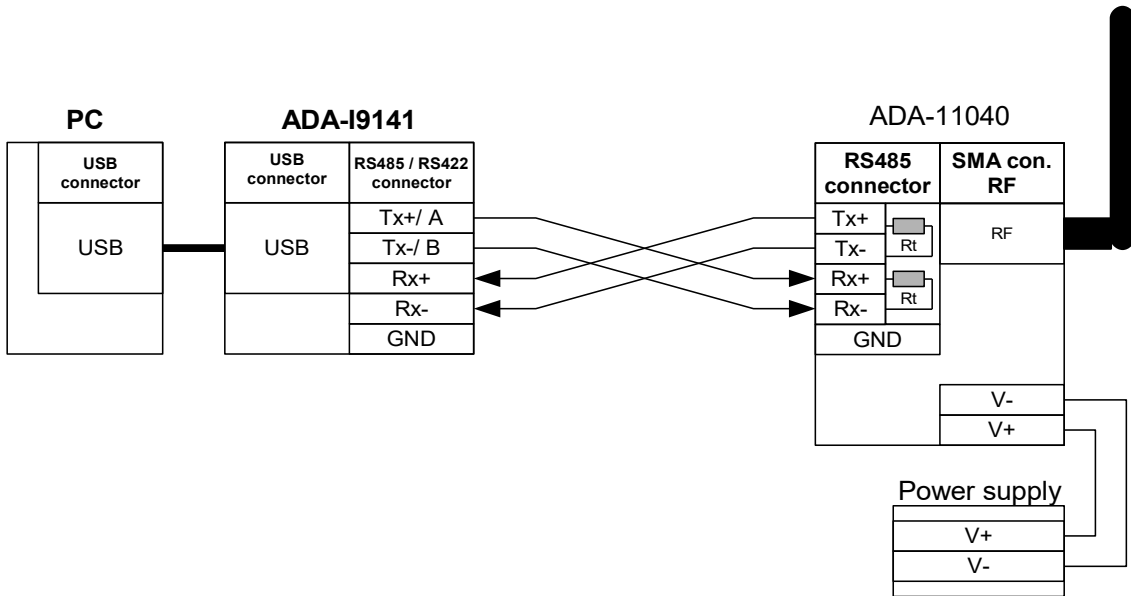


Fig 3. 4-wires connection of ADA-11040 to PC by the use of USB to RS485/RS422 converter ADA-I9141.

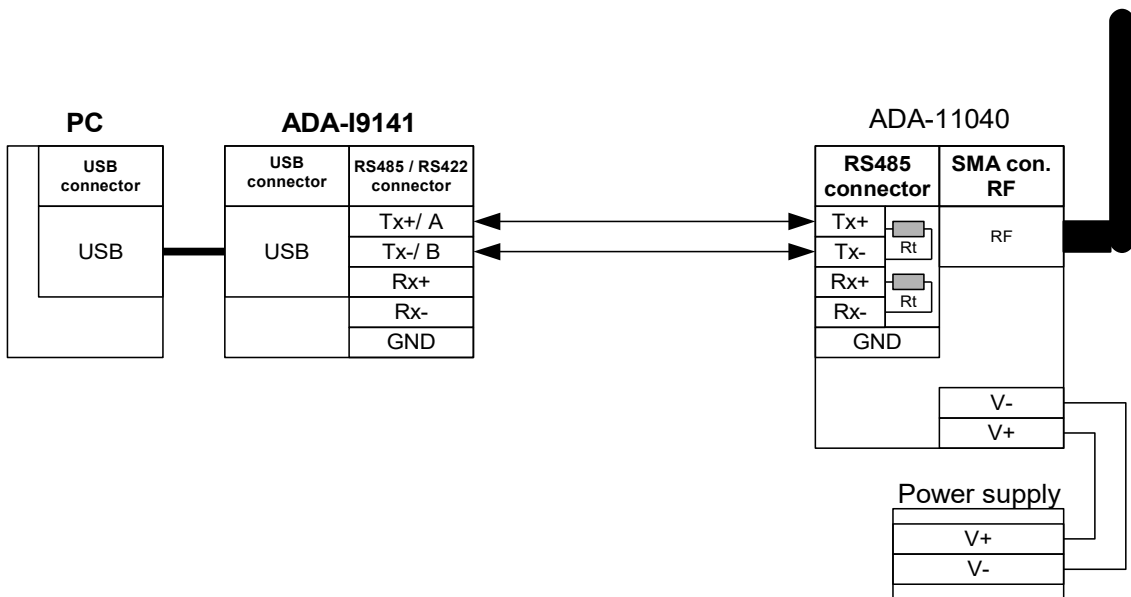


Fig 4. 2-wires connection of ADA-11040 to PC by the use of USB to RS485/RS422 converter ADA-I9141.

3.4. RS485/RS422 NETWORK CONNECTION

RS485/RS422 interface in ADA-11040 converter is described as: Tx+/A, Tx-/B, Rx+, Rx-, GND. ADA-11040 lets work on RS485 bus & RS422 bus. Both buses need correct cabling.

3.4.1. RS422 (4W) BUS CONNECTION

Before connection 4-wire RS422 bus, should be setted MODE switch to RS422 mode, located on the front panel of ADA-11040. Then connect bus wires to connectors TX+/A, TX-/B, RX+, RX - as shown bellow.

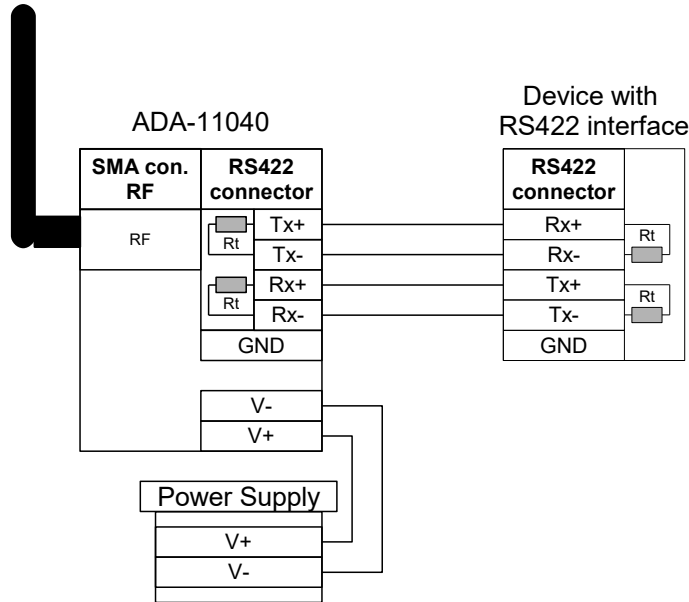


Fig 5. Example connection of RS422 devices to ADA-11040

3.4.2. RS485 (4W) BUS CONNECTION

Before connection 4-wire RS485 bus, should be setted MODE switch to RS485 mode, located on the front panel of ADA-11040. Then connect bus wires to connectors TX+/A, TX-/B, RX+, RX - as shown bellow.

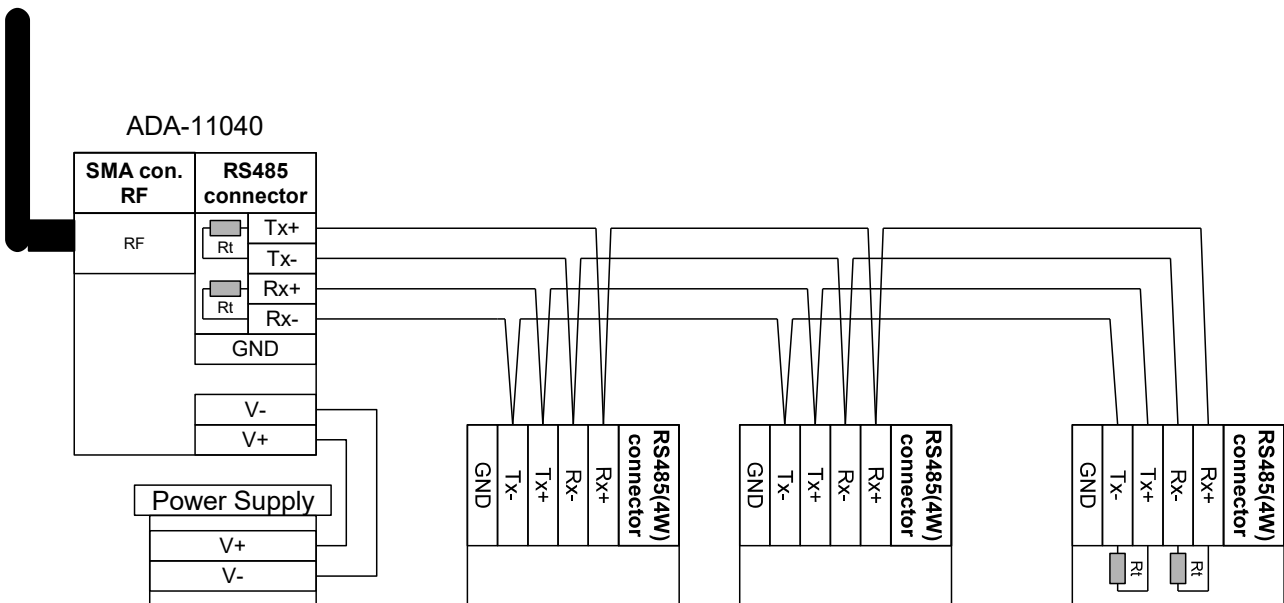


Fig 6. Example connection of RS485 (4W) devices to ADA-11040

3.4.3. RS485 (2W) BUS CONNECTION

Most of device with RS485 interface use 2-wire bus for transmission.

Before connection 2-wire RS485 bus, should be setted MODE switch to RS485 mode, located on the front panel of ADA-11040. Then connect bus wires to connectors TX+/A, TX-/B, - as shown bellow.

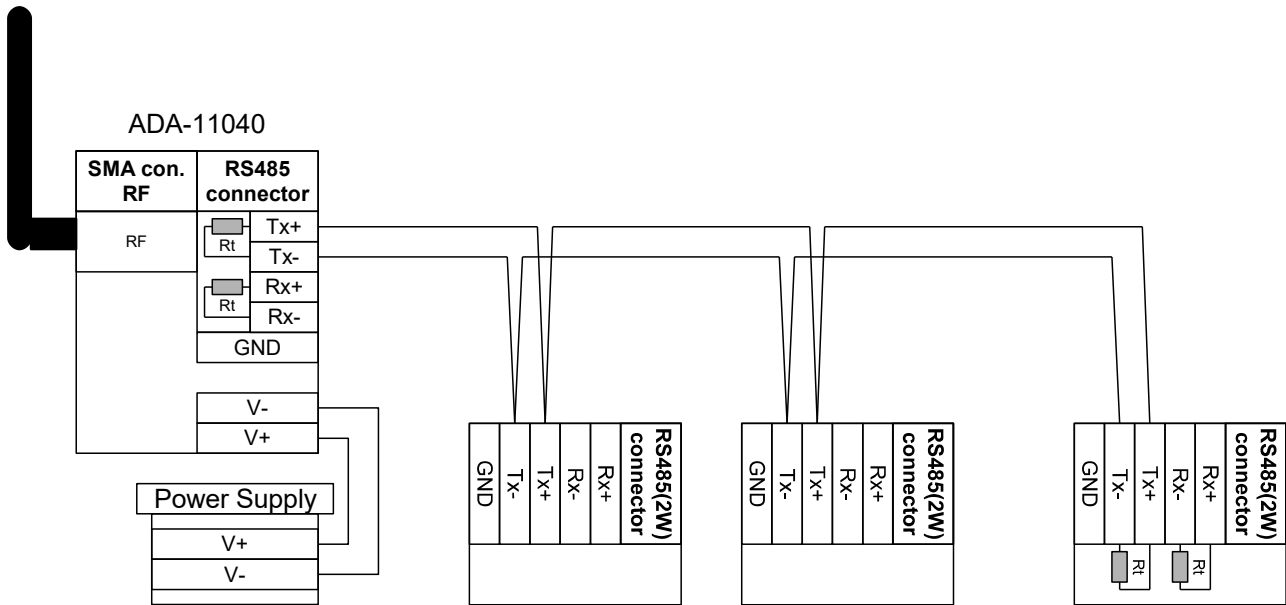


Fig 7. Example connection of RS485 (2W) devices to ADA-11040

3.4.4. GND TERMINALS CONNECTION

Connection of GND terminals of RS485/422 interfaces, devices connected to RS485/422 bus, should be done in the case of a potential difference RS485 / RS422 interfaces, which prevents proper data transmission.

ATTENTION!
CANNOT CONNECT TO THE GND TERMINAL - CABLES SCREENS, PE CIRCUIT OF ELECTRICAL INSTALLATION, SIGNALS GROUNDS OF OTHER DEVICES.

3.4.5. LINE TERMINATION Rt OF RS485 BUS

The application of Line Termination (terminator) $R_t = 120$ ohms on the ends of the bus, will reduce electrical reflection in long data line at high baud rate. It is not needed below 9600Bd. For over 1000m @ 9600Bd or 700m @ 19200Bd the line termination can be used, if there are problems with proper transmission.

Example connection of R_t are shown on figures above. The resistor $R_t = 120 \Omega$.

ADA-11040 converter has two implemented terminators, connected to terminals Tx+/A – Tx-/B and Rx+ - Rx-, by the use SW1 microswitch (see table below).

SW1	Description
SW1-1	ON – enable the terminator 120Ω to terminals Tx+/A and Tx-/B OFF – disable the terminator 120Ω to terminals Tx+/A and Tx-/B
SW1-2	ON – enable the terminator 120Ω to terminals Rx+ and Rx- OFF – disable the terminator 120Ω to terminals Rx+ and Rx-

3.5. POWER SUPPLY CONNECTION

To connect power supply to the converter, should have DC power supplies (regulated) output voltage from 10 V= to 30V=, min. nominal power 2W, e.g. HDR-15-24. Power cable from DC power supplies to device can not be longer than 3m. Should connect positive (+) end of DC power supplies to V+ device terminal and negative (-) end to V- on terminal block. ADA-11040 has protection against power supply reverse connection.

4. ACTIVATION

If connection was made properly a green LED PWR on front panel of converter should lit after power on, if not check polarization of connected power. When data is transmitted via the converter, RX, TX LED's on front panel and LED's on the module of RF interface should blink.

This LED are described below:

LED	Description
Power	
PWR	Signalling of Power Supply.
RS485/RS422 interface	
RX	Signalling of data receiving by ADA-11040 from RS485/RS422 port.
TX	Signalling of data transmitting from ADA-11040 via RS485/RS422 port.

5. CONFIGURATION

For correct work of ADA-11040 converter, is needed the configuration of settings wireless RF network and RS485/RS422 serial port.

5.1. OPERATION MODE

ADA-11040 converter can operates in two modes:

- RUN,
- configuration,

Those modes are setted by use of CONFIG jumper, located by SMA connector. To set mode, should remove terminal cover, marked as CFG and put on or remove the jumper.

All available adjusting of the CONFIG jumper, are shown in table below.

Converter operation modes

CONFIG jumper	Operation mode
OFF - open	RUN
ON - close	Device configuration

5.2. CONFIGURATION BY USING ADARF

5.2.1. ADARF INSTALLATION

The configuration of setting wireless RF network ADA-11040, can be made by the use of ADARf Software, which should be download from web side of ADA-11040 converter (https://cel-mar.pl/en/rs485rs422_rf_11040.htm), tab **Download**, and then extract adarf.zip file and run setup.exe.

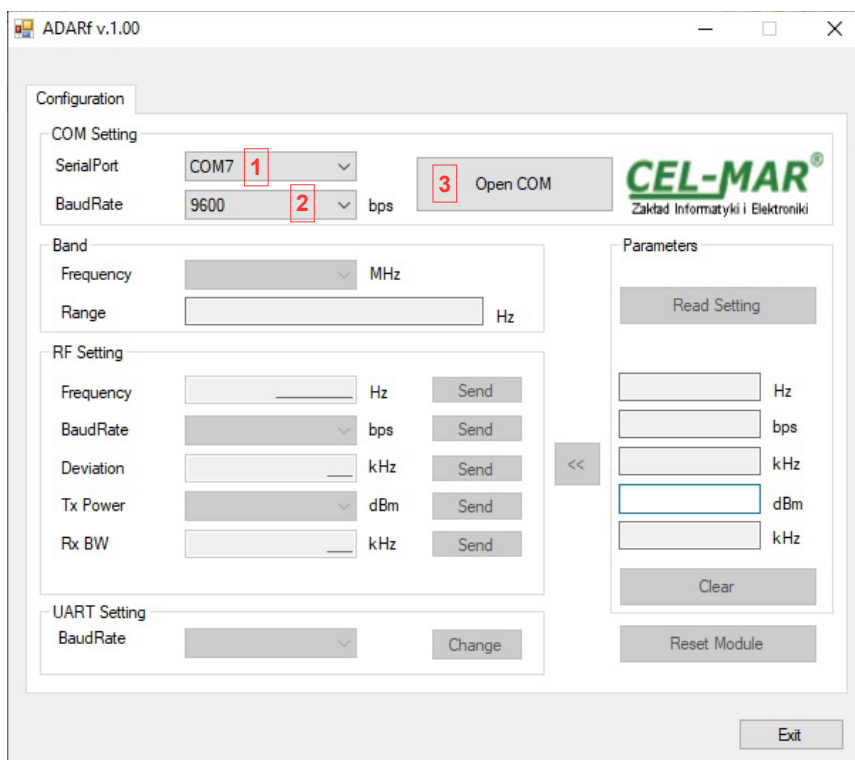
After installation the ADARF software is available in menu **Start=>CEL-MAR=>ADARf** and icon on Desktop

5.2.2. CONFIGURATION THE WIRELESS NETWORK SETTINGS

Set ADA-11040 converter in configuration mode, then connect the converter to PC according to point '*COMPUTER CONNECTION*', run ADARF software. Then follow the steps:

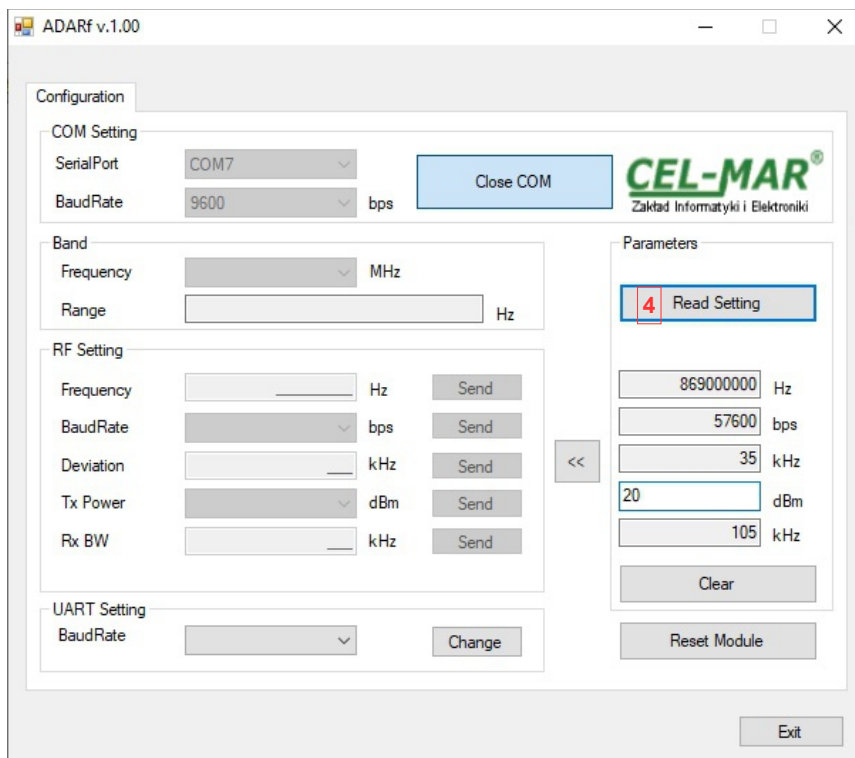
[1] select COM port.

[2] select baud rate of RS485/RS422 serial port.



[3] open COM port, by button [Open COM].

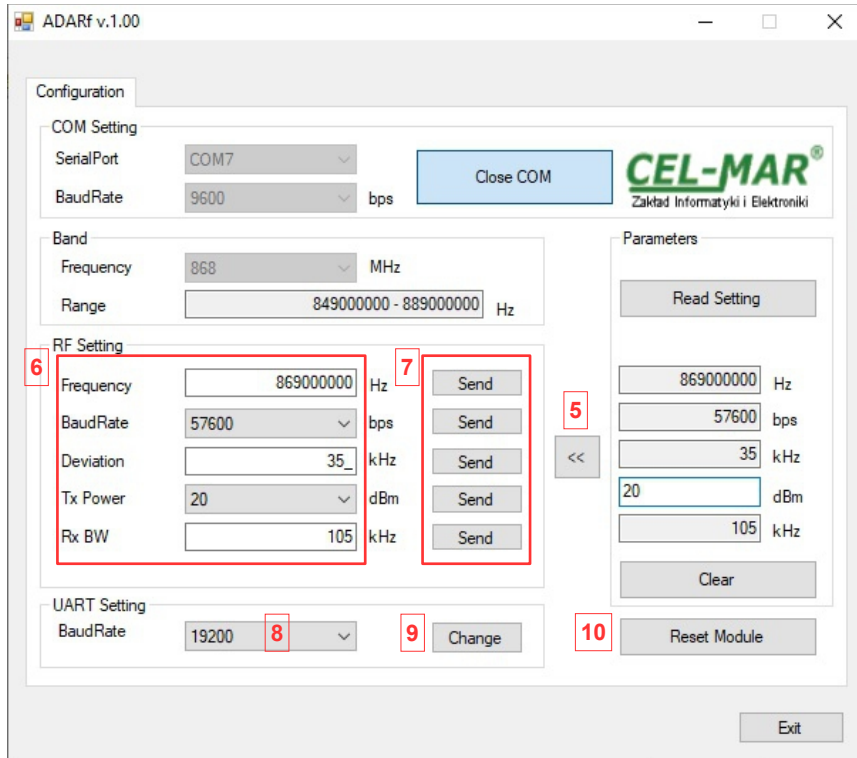
[4] read configuration parameters of the converter by button [Read Setting]



[5] read out configuration parameters are copied to edit boxes of section [RF Settings], by button [<<],

[6] in the edit boxes, change RF configuration parameters,

[7] press button [Send] to send the parameter to the converter.



5.2.3. BAUD RATE CONFIGURATION OF RS485/RS422 PORT

After read out the configuration parameters, change baud rate of RS485/422 serial port in section [UART Setting]: [8] select baud rate, [9] press button [Change] to send the parameter to the converter.

5.2.4. FACTORY DEFAULT

Converter reset to factory default can be done by: [10] button [Reset Module], but first has to be read the setting, by button [Read Setting].

Factory default.

Parameter	Value
Wireless RF	
Operate frequency	869 [MHz]
Baud rate	9600 [bps]
Frequency deviation	35 [kHz]
Transmission power	20 [dBm]
bandwidth reception	105 [kHz]
RS485/RS422 serial port	
Baud rate	9600 [bps]
Data bits	8
Parity	Non
Stop bits	1

6. TROUBLESHOOTING

Problem	Solution
I forgot what the transmission speed of the serial port is and I can not read the configuration parameters.	You can only select next baud rates, open COM port [Open COM] and readout the settings by button [Read Setting], until it succeeds.

7. VERSIONS

ADA-11040 - -

Electronic versions:

Basic on 868 MHz	1
Special on 433 MHz	1A
Special on 470 MHz	1B
Special on 915 MHz	1C

Galvanic isolation:

1kV DC (3-WAY) - Standard	23
3kV DC (3-WAY)	33

Order example:

Product Symbol: **ADA-11040-1-23**

1 – basic version of electronic

23 – galvanic isolation 1kV= (3-way),

8. SPECIFICATION

TECHNICAL DATA

Transmission Parameters

Interfaces	RF	RS485/RS422
Connector	SMA-Plug + Antenna	Screw terminal block – max. Ø 2,5mm ²
Max. number of connected device	Unlimited	32
Max. baud rate	From 1200 bps to 115200 bps	From 1200 bps to 115200 bps Data format: 8N1
Standards	ISAM 869/433/470/915 MHz	EIA-485, CCITT V.11
Transmission range / Max. Line length	- in buildings - from 30m to 300m - in an open area up to 1000m,	1200 m
Transmission line RS485/RS422	2-pair twisted cable, UTP Nx2x0,5 (24AWG), shield inside large interferences STP Nx2x0,5(24AWG).	
Transmission type	Asynchronism half duplex.	
Optical Signalization	<ul style="list-style-type: none"> • PWD – green LED, power supply, • RX - red LED, data receiving on RS485/RS422, • TX - yellow LED, data transmission via RS485/RS422. 	

Electrical Parameters

Power requirements	10 - 24 – 30 V DC
Power Cable	Recommended length – up to 3m
Power	2W
Protection from reverse power polarization	Yes
Galvanic Isolation	1kVDC or 3kVDC (3-WAY) depending on the version.
Optoisolation	~3kV DC between RF and RS485/RS422 interfaces
Electromagnetic compatibility	According to the PN-EN55024 norm PN-ETSI EN 301 489-1 V2.1.1:2017-08 PN-ETSI EN 300 220-2 V3.2.1:2018-12
Safety requiring	According to the PN- EN60950 norm
Environment	Commercial and light industrial. Device A class.

Environmental Parameters

Operating temperature	-30 ÷ 50 °C
Humidity	5 ÷ 95% - non-condensing
Storage temperature	-40 ÷ 70°C

Casing

Dimensions	53 x 90 x 62mm
Material	PC/ABS
Degree of casing protection	IP40
Degree of terminal protection	IP20
Weight	0,10 kg
According to standards	DIN EN50022, DIN EN43880
Location during work	Free
Mounting	Rail mounting according to DIN35 standard / TS35.

Dear Customer,

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

We hope that this user manual helped connect and start up the **ADA-11040 Converter**. We also wish to inform you that we are a manufacturer of the widest selections of data communications products in the world such as: data transmission converters with interface RS232, RS485, RS422, USB, Ethernet, Wi-Fi, Current Loop, Fibre-Optic Converters and the other.

Please contact us to tell how you like our products and how we can satisfy you present and future expectation.

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