

# User manual

ADA-I91402

USB to RS-485 / RS-422 converter



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## 1. GENERAL INFORMATION

Thank you for your purchase of **CEL-MAR Company** product. This product has been completely tested and is covered by a two year warranty on parts and operation from date of sale.

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](mailto:support@cel-mar.pl).

### 1.1. WARRANTED INFORMATION

**ADA-I91402** 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.

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 disassembly 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 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-I91402 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](mailto:support@cel-mar.pl).

### 1.6. PACK CONTENTS

ADA-I91402 converter, user manual, CE declaration, USB cable, CD-ROM with software.

## 2. PRODUCT INFORMATION

### 2.1. PROPERTIES

- Conversion of USB to RS485/422 standard,
- Compatibility with USB1.1 and USB 2.0 standard,
- Virtual Serial Port,
- Supported data format: number of data bits 7 or 8; parity check: none, even, odd, marker, space; number of stop bits: 1 or 2.
- Transmitted signals: RX, TX, additionally RTS, CTS or DTR, DSR (version 2-x) configure by SW2 microswitch,
- STANDARD Baud rates (bps): 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600,
- Mapped baud rates for PROFIBUS (bps): 300 bps, 600 bps, 1200 bps, 2400 bps, 4800 bps, 9600 bps, 19200 bps, **93750**(230400) bps, **187500**(460800) bps, **500000**(921600) bps, **1500000**(14400) bps.
- Possibilities of mapping other baud rates,
- Transparent for all protocols: MODBUS, DNP, PROFIBUS and other,
- Operating on RS485/RS422 2-wire (2W) bus and 4-wire (4W)
- Implemented Line Termination 120ohm of RS485/RS422 bus, activated by SW1 microswitch,
- Polarization of RS485 / RS422 bus - MASTER or SLAVE type; selected by SW1 microswitch,
- Power supply from the USB port,
- 2,7kV= optoisolation in signal channel between USB and RS485/422 interface,

- 1kV= or 3kV= (dependent on version) galvanic isolation in power supply channel between USB and RS485/RS422,
- RS-485/RS-422 interface connection via screw terminal block (section 1mm<sup>2</sup>),
- USB interface connection via USB-AA cable,
- Casing dimensions (W x D x H) 91mm x 21mm x 57mm,

## 2.2. DESCRIPTION

**ADA-I91402 converts** USB to RS-485/RS-422 standard without interference of data format and it is automatically detected by the computer system after connecting to USB socket (Plug&Play device).

The converter transmits **RX,TX signals and two additional RTS, CTS or DTR, DSR set by SW2 microswitch.**

For communication with other devices ADA-I91402 uses data transmission line like:

- **RX+,RX-,TX+/DATA+,TX-/DATA-** (RS-485/422),
- **CTS+/DSR+,CTS-/DSR-,RTS+/DTR+,RTS-/DTR-** (RS-422)

There is also the possibilities of looping the **DTR with DSR signal or RTS with CTS signals.**

This converter doesn't require external power supply (it is powered from USB bus) and it uses asynchronous baud rate up to 921,3 kbps (drivers for STANDARD baud rate) / 1500000 bps (drivers for PROFIBUS baud rate). USB cable with A-type plugs enables simple connection to a computer and on other side simple connection the RS485/422 bus provide plug-in screw terminal block.

The converter has implemented overvoltage protection RS485/RS422 interface, 2,7kV= optoisolation in signal channel between USB and RS-485/422 interface and 1kV= or 3kV= galvanic isolation (dependent on version).

Together with ADA-I91402 we provide the drivers, which after installation, create in operating system additional COM port on the next free number e.g. COM3. Can be use as standard COM port, it isn't hardware port but virtual, created in Windows system and some applications running in DOS (use this port), can operate improperly.

Support ended for Windows 98, ME, NT systems.

## 2.3. SUPPORTED OPERATING SYSTEMS

For ADA-I91402 converter, are available serial virtual ports drivers for operation systems:

-Windows: 98, ME, NT, 2000, XP, Vista, 7, 2008, 8, 8.1, 10; Windows CE,

-Windows Server: 2003, 2008 R2, 2012 R2, 2016,

-Linux: from Ubuntu 11.10, kernel 3.0.0-19 drivers implemented in system kernel,

-Raspbian - Raspberry Pi,

-Mac: OS X 10.3 to 10.8, OS X 10.9 and other.

## 3. CONFIGURATION

For configuration of ADA-I91402 are used two microswitch SW1 and SW2.

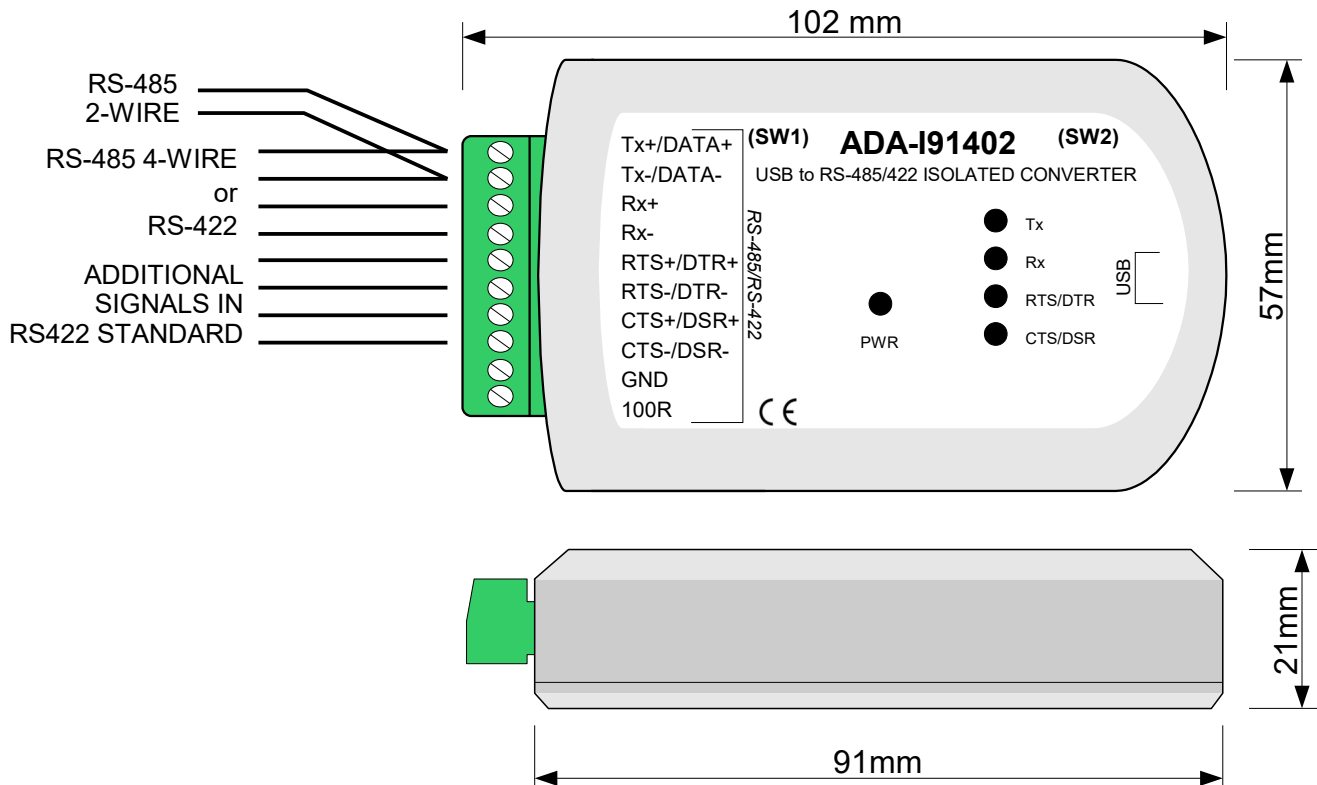


Fig. 1. ADA-I9140 view in version v.-2-x

## 3.1. ADDITIONAL SIGNAL CONFIGURATION

For configuration of additional signals is used 6-position microswitch SW2. A table below shows typical configuration of additional signals RTS, CTS, DTR, DSR. Other configuration possibilities should be agreed with Technical Support – +48 41 362-12-46.

The 6-position microswitch SW2 is located on one side of the converter.

**Table 1. Setting of SW2 microswitch for 1-x version**

<i>Function</i>	<b>SW2-1 DTR-DSR</b>	<b>SW2-2 RTS-CTS</b>	<b>SW2-3 DTR</b>	<b>SW2-4 DSR</b>	<b>SW2-5 RTS</b>	<b>SW2-6 CTS</b>
Tx, Rx signals conversion (default setting)	OFF	OFF	OFF	OFF	OFF	OFF
Tx, Rx signals conversion, RTS looped with CTS and DTR with DSR	ON	ON	OFF	OFF	OFF	OFF

**Table 2. Setting of SW2 microswitch for 2-x version**

<i>Function</i>	<b>SW2-1 DTR-DSR</b>	<b>SW2-2 RTS-CTS</b>	<b>SW2-3 DTR</b>	<b>SW2-4 DSR</b>	<b>SW2-5 RTS</b>	<b>SW2-6 CTS</b>
Tx, Rx signals conversion (default setting)	OFF	OFF	OFF	OFF	OFF	OFF
Tx, Rx, RTS, CTS signals conversion	OFF	OFF	OFF	OFF	ON	ON
Tx, Rx, DTR, DSR signals conversion	OFF	OFF	ON	ON	OFF	OFF
Tx, Rx, RTS, CTS signals conversion, DTR looped with DSR	ON	OFF	OFF	OFF	ON	ON
Tx, Rx, DTR, DSR signals conversion, RTS looped with CTS	OFF	ON	ON	ON	OFF	OFF
Tx, Rx signals conversion, RTS looped with CTS and DTR with DSR	ON	ON	OFF	OFF	OFF	OFF

**3.2. CONFIGURATION OF POLARIZATION AND LINE TERMINATION RS-485 BUS**

The SW1 microswitch is used for enabling the polarization MASTER type (terminals Tx+/DATA+/(A), Tx-/DATA-/(B)) of RS485 bus and connection of RS-485/RS-422 terminating resistors. The table below show manufacturer’s configuration settings. The 6-position microswitch SW1 is located on one side of the converter.

**ATTENTION !!!**  
**ENABLING/DISABLING THE POLARIZATION OF MASTER TYPE RS485 BUS, FOLLOWS AFTER ENABLING/DISABLING BOTH SECTION OF SW1-4 & SW1-5 MICROSWITCH.**

**Table 3. SW1 microswitch setting**

<i>Position</i>	<i>Function</i>	<i>Default Setting</i>
SW1-1	ON - enable RS422 mode   disable RS485 mode, OFF - disable RS422 mode   enable RS485 mode,	OFF
SW1-2	NC – not connected	---
SW1-3	ON - connection of Line Termination (terminator) 120Ω to terminals Rx+, Rx- OFF - disconnection of Line Termination (terminator) 120Ω to terminals Rx+, Rx-	OFF
SW1-4	ON – enable polarization of MASTER type RS485 bus, to terminal Tx-/DATA-/(B), OFF - enable polarization of SLAVE type RS485 bus, to terminal Tx-/DATA-/(B),	OFF
SW1-5	ON – enable polarization of MASTER type RS485 bus, to terminal Tx+/DATA+/(A), OFF - enable polarization of SLAVE type RS485 bus, to terminal Tx+/DATA+/(A),	OFF
SW1-6	ON - connection of Line Termination 120Ω to terminals Tx+/DATA+/(A), Tx-/DATA-/(B). OFF - disconnection of Line Termination 120Ω to terminals Tx+/DATA+/(A), Tx-/DATA-/(B).	OFF

**4. INSTALLATION**

This chapter will show how to connect ADA-I91402 to RS-485/RS-422 bus.

The GND and 100R terminals are used for connection of RS485/RS422 interface grounds, to compensate the ground potential of devices operating on RS485/RS422 bus. This connection should be done individually for each systems if standard wiring of RS485/RS422 bus not provide correct transmission.

To reduce disturbance from environment, it is recommended to:

- use multipair type shielded cables, which shield can be connected to the earthing on one end of the cable,
- lay signal cables at a distance of not less than 25 cm away from power cables,

**4.1. CONNECTION TO RS485/RS422 BUS**

RS485/RS422 interface of ADA-I91402 converter is available on screw terminal block described as: Tx+/DATA+, Tx-/DATA-, Rx+, Rx-, RTS+/DTR+, RTS-/DTR-.

ADA-I91402 can operate on RS422 bus or RS485 bus - both buses need suitable wiring.

**4.1.1. CONNECTION TO RS422 OR RS485 (4-WIRE) BUS**

Examples of connection ADA-I91402 to RS422 4-wire bus or RS485(4W) in point-to-point and multi-point topology are shown below.

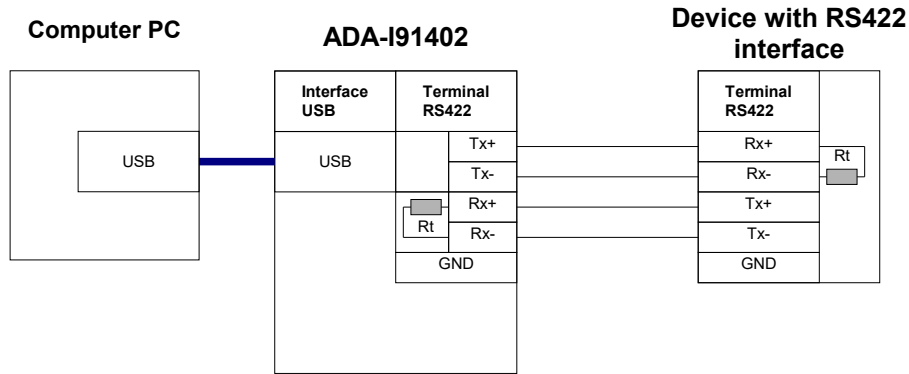


Fig 2. Example of connection in Point-to-Point topology; Tx, Rx signals

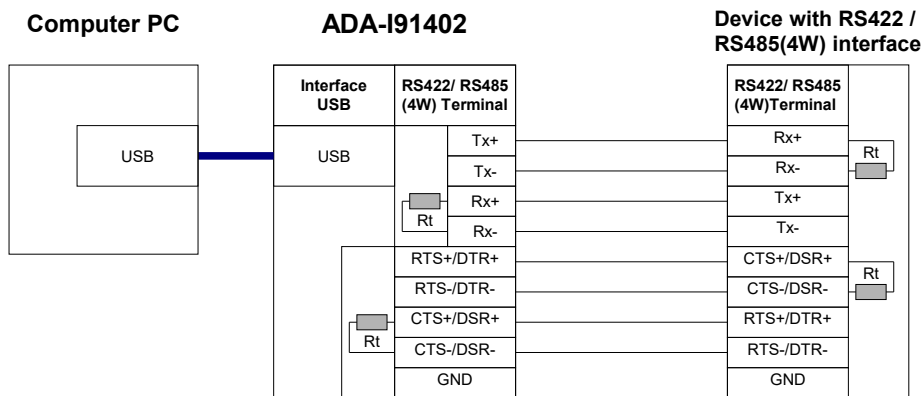


Fig 3. Example of connection in Point-to-Point topology; Tx, Rx, RTS/DTR, CTS/DSR signals

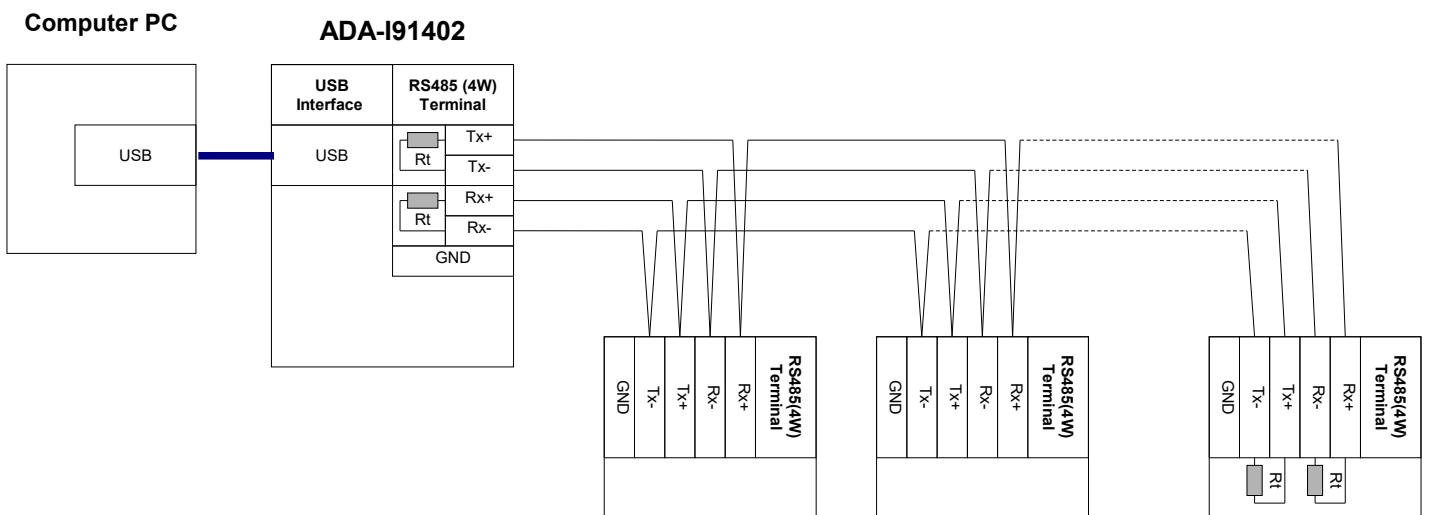


Fig 4. Example of connection RS485(4W) interface devices

#### 4.1.2. CONNECTION TO RS485 2-WIRE BUS

Most of the devices with RS485 interface use 2-wire RS485 bus for data transmission. Example connection of ADA-I91402 to RS485(2W) in multi-point topology is shown below.

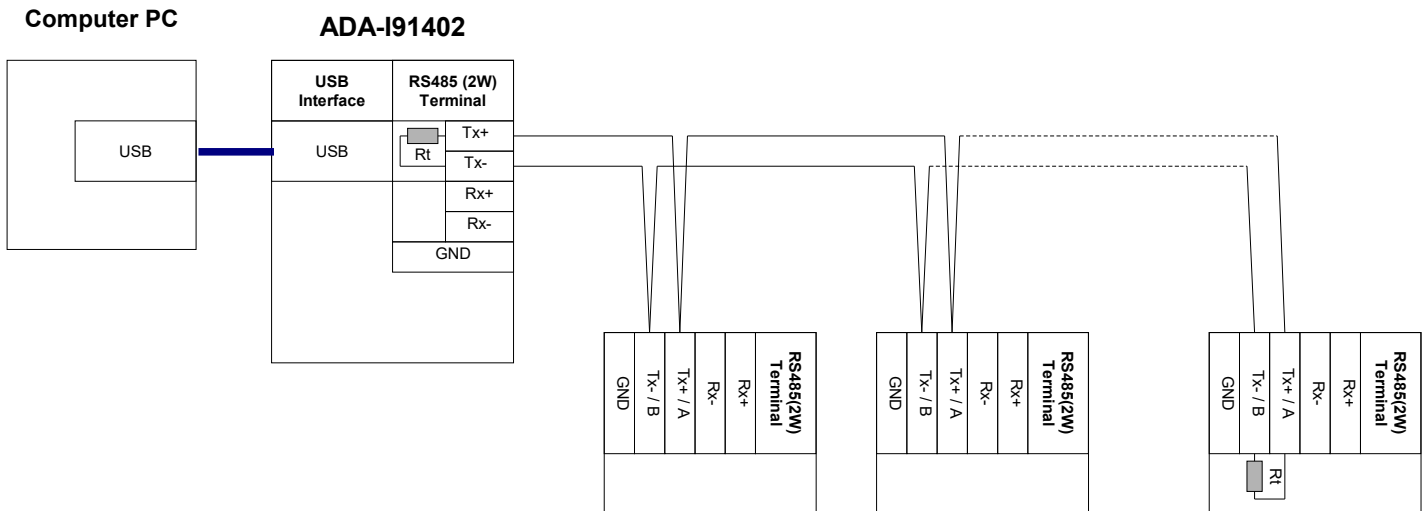


Fig 5. Example of connection RS485(2W) interface devices

#### 4.2. LINE TERMINATION

The application of Line Termination (terminator)  $R_t = 120 \text{ ohms}$  will reduce electrical reflection in data line at high baud rate. It is not needed below 9600Bd. The Line Termination resistor should be used if the distance is over 1000m @ 9600Bd or 700m @ 19200Bd transmission, the resistor can be necessary if there are problems with the transmission correctness. The terminators/resistors are connected to RS485/RS422 bus by the use of SW1 microswitch. Example connection of  $R_t$  are shown on d Fig. 2, 3, 4, 5. Resistor  $R_t = 120 \Omega$ .

#### 4.3. CONNECTION TO USB COMPUTER PORT

ADA-I91402 has socked A-type USB and connection to PC should be done by use USB-AA type cable (delivered with converter).

#### 4.4. POWER SUPPLY

The converter is powered from USB port of PC. After connection to USB port, the green LED PWR should be light. If doesn't check:

- the computer is running,
- the connection of converter cable to the computer,
- hibernation mode of computer.

### 5. DRIVERS INSTALLATION IN SYSTEM WINDOWS

ADA-I91402 is delivered with the drivers package Installer for Windows systems on CD-ROM.

For installation follow the steps below:

- a/ insert the CD-ROM to optical driver of the computer,
- b/ the installation wizard will run automatically, if not double click **ADAUSBDRV.exe**.
- c/ following the steps of installation wizard, the drivers will be installed and the Uninstaller for the Windows 98, ME, 2000, XP, 2003, Vista, Win7, 2008, Win8, Win10,
- d/ connect the convert to USB port of computer and follow the steps of installation wizard.

#### 5.1. DRIVERS INSTALLATION IN WINDOWS 10 VIA INTERNET

For installation of drivers for ADA-I91402 in Windows 10, should connected the converter to USB port (required internet connection) and wait until the system download the drivers form the internet and install them.

#### 5.2. EXAMPLE OF DRIVERS INSTALLATION IN WINDOWS 7 SYSTEM

ADA-I91402 is delivered with the drivers for Windows system 98/ME/2000/XP/Vista/7/2008/8/10 and the baud rates:

##### a/ Standard

##### b/ Profibus

Driver installation have to be done from the account with Administrator permissions. For the drivers installation follow the steps bellow:

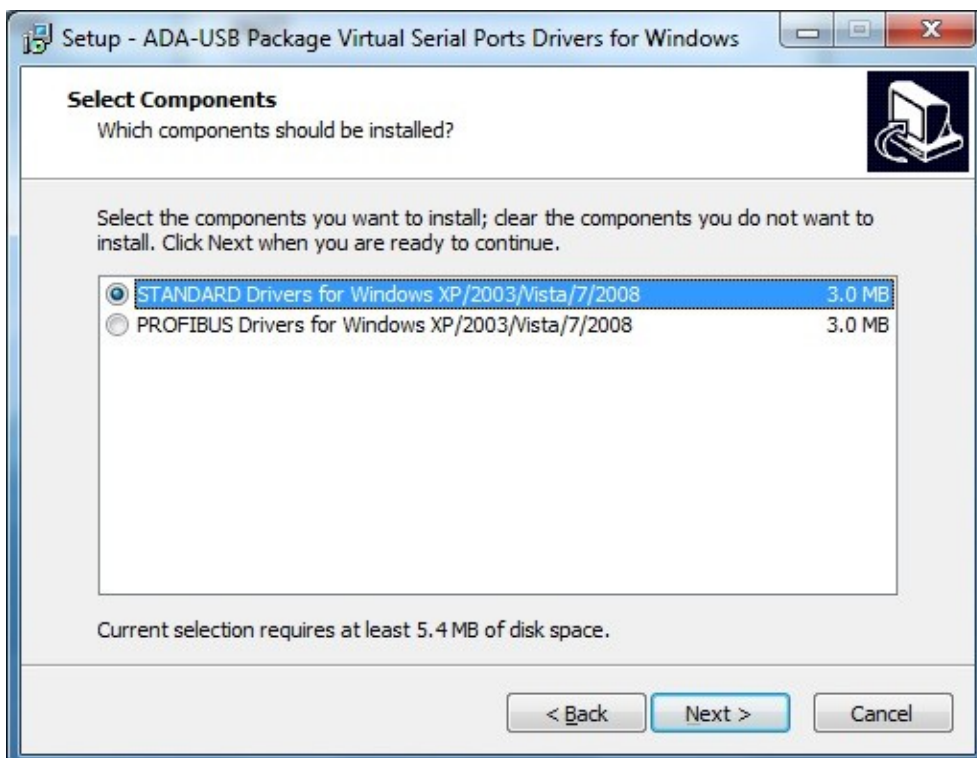
- a/ insert the CD-ROM to optical driver of computer,
  - b/ the installation wizard will run automatically, if not run **ADAUSBDRV.exe** form the CD-ROM.
- After running the installer **ADAUSBDRV.exe**, will appear window of language selection.



Select the language and press [OK].

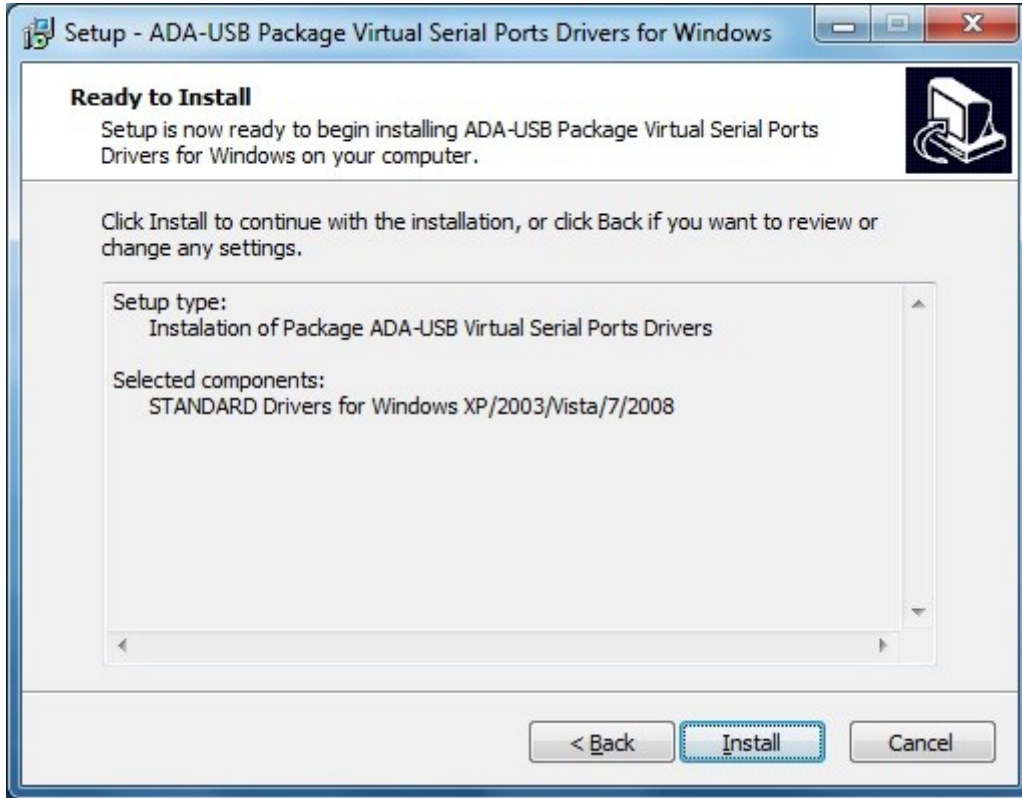


Press [Next]

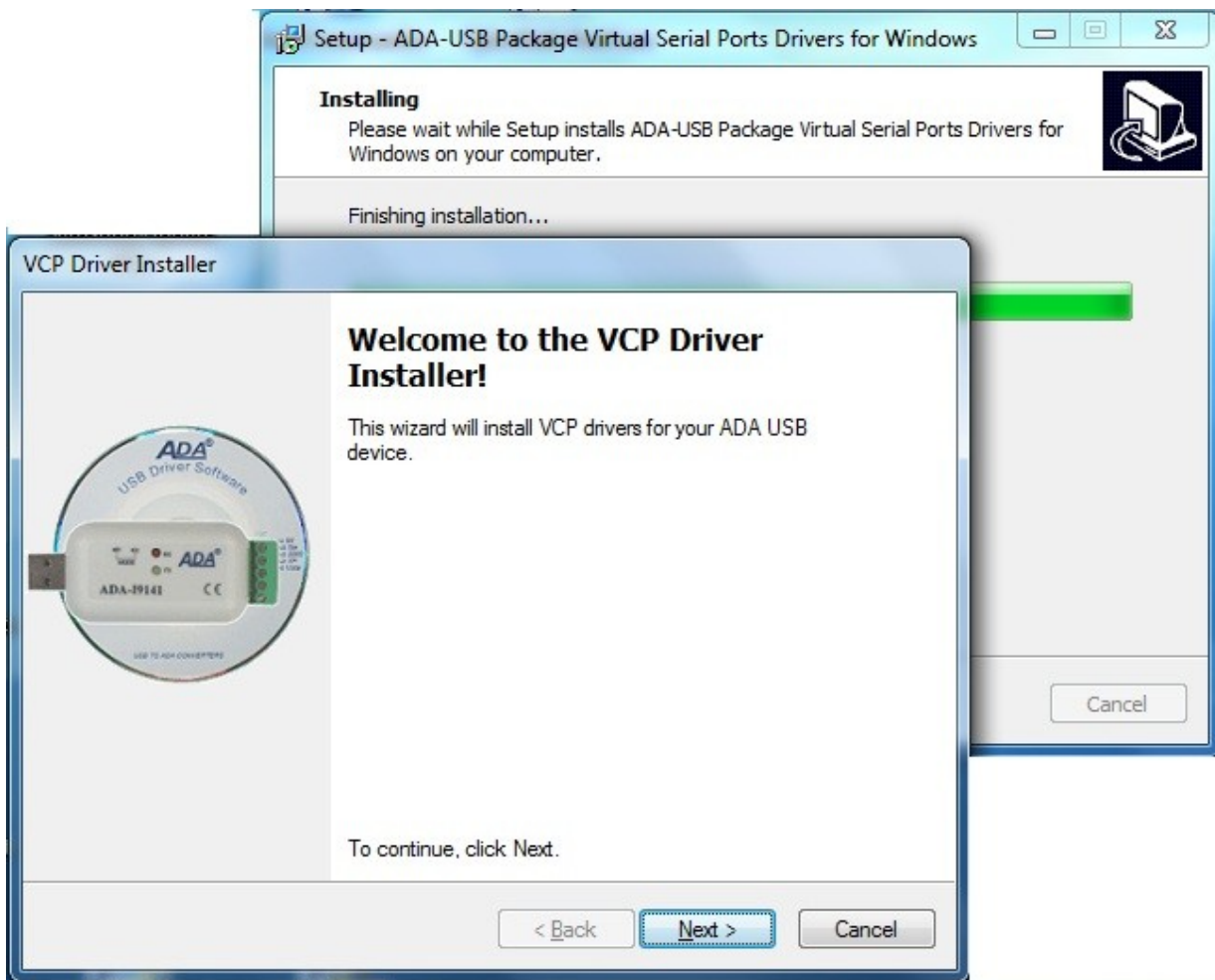


Select STANDARD Drivers and press [Next]

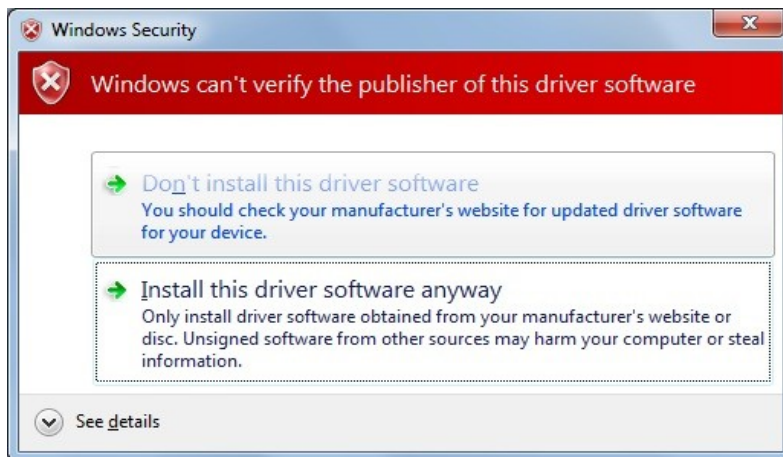
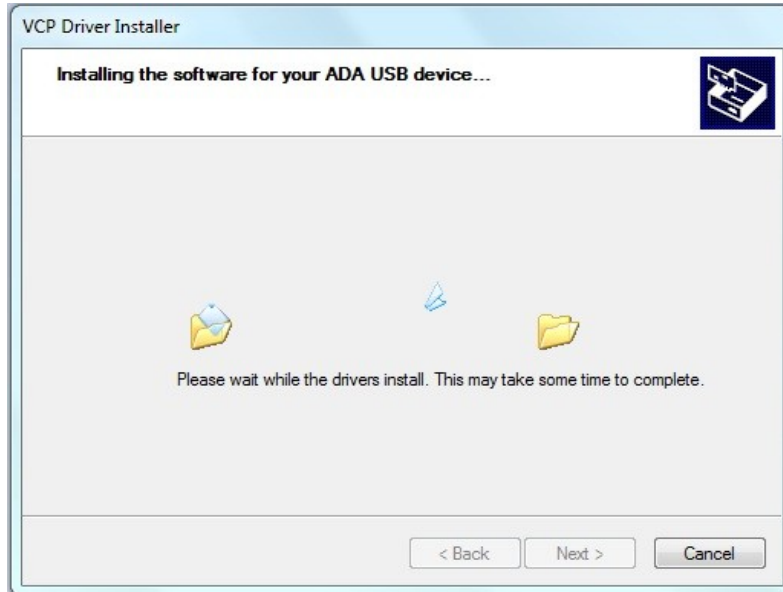




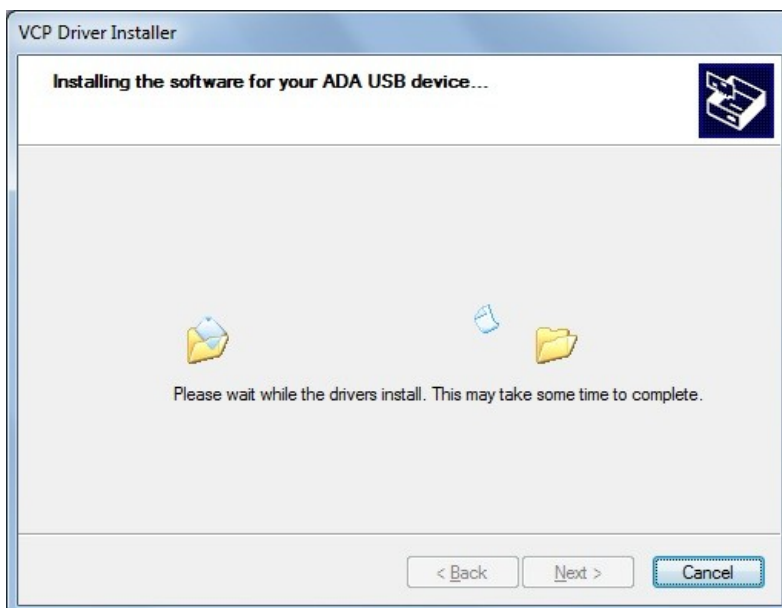
Press [Install]

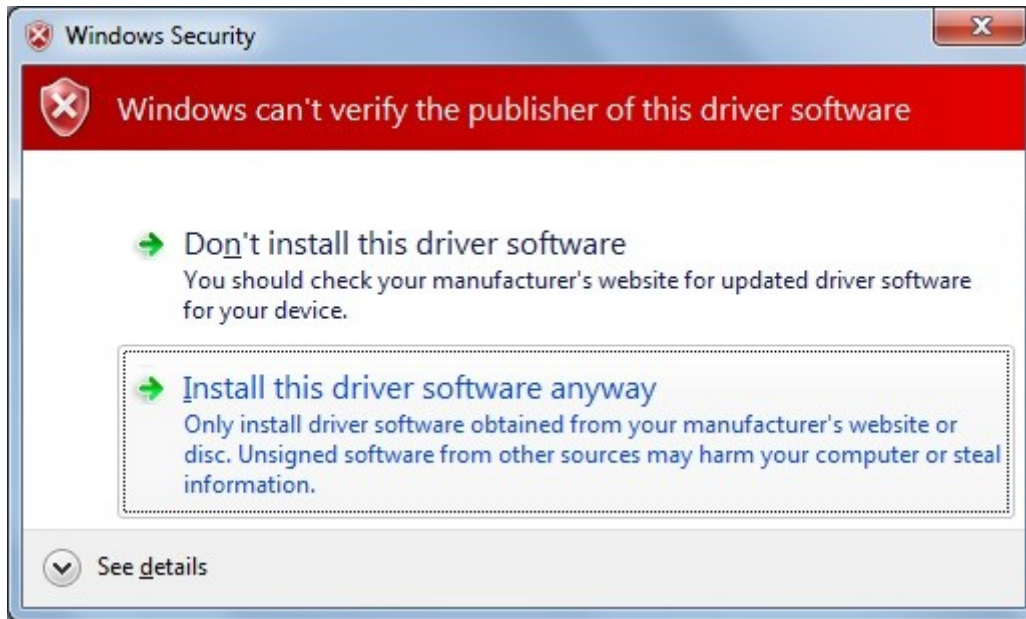


Press [Next], will be installed Drivers for USB Bus.



Press [Install this driver software anyway]. Installation of drivers for USB bus will start.

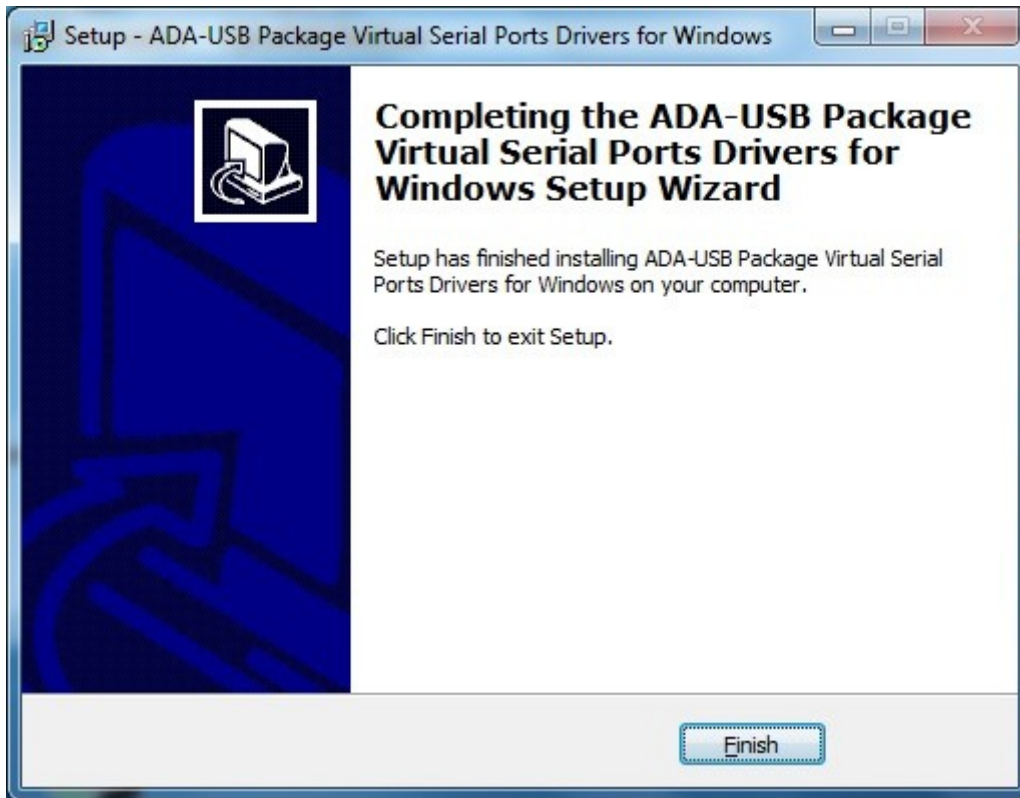




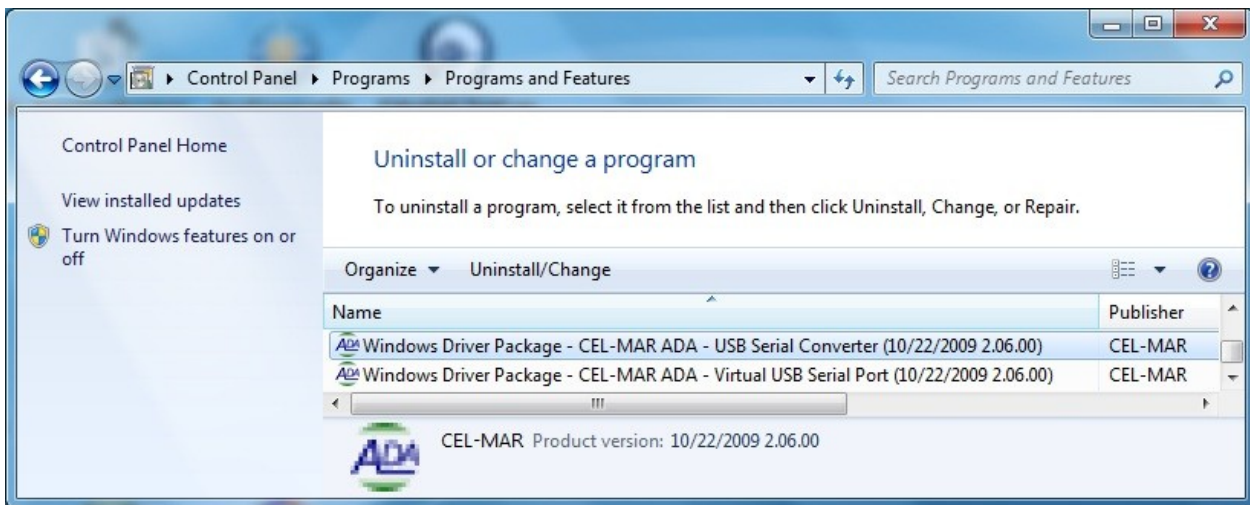
Press [Install this driver software anyway]. Installation of drivers for Virtual Port will start.



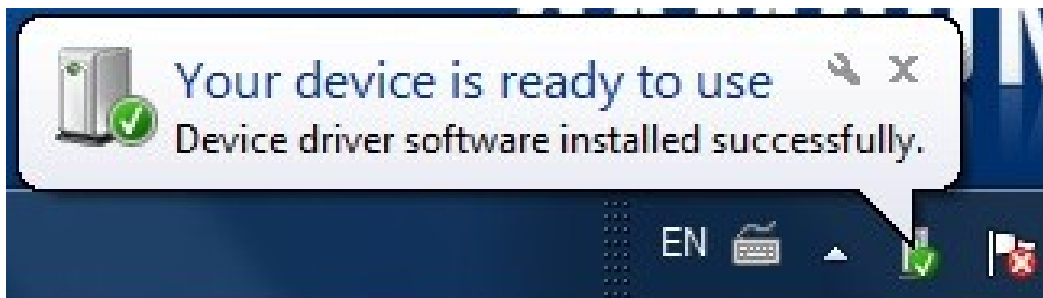
Press [Finish]



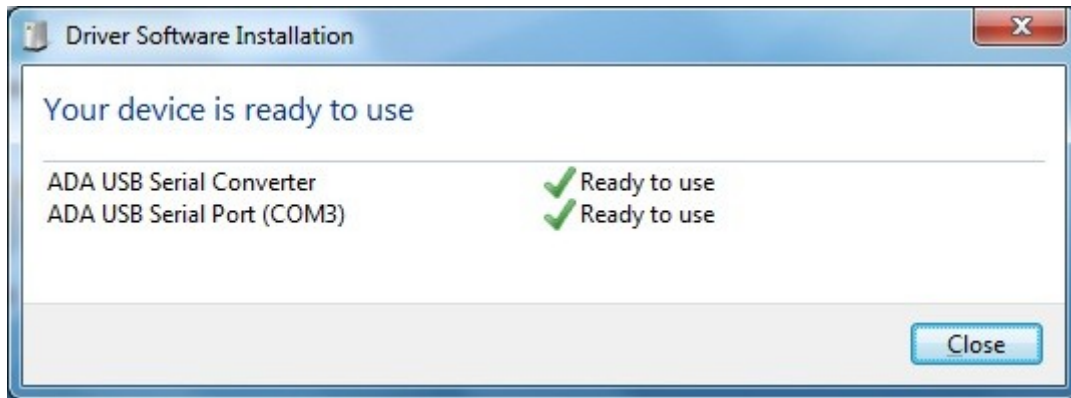
Press [Finish].  
The drivers for ADA-I91402 have been installed. This can be checked in "Uninstall or change a program".



Now connect ADA-I91402 to computer USB port.



After connection will appear the Tool tip with [Your device is ready to use]. To see the details press the Tooltip, and will appear information window where is shown which COM port was assigned to converter.



After this installation, RS485/422 port of ADA-I91402 converter is available in the system as normal COM port. It should be remembered about specified baud rate for communication.

If during installation was selected driver for Standard baud rates, it is possible to use:

300 bps, 600 bps, 1200 bps, 2400 bps, 4800 bps, 9600 bps, 19200 bps, 38400 bps, 57600 bps, 115200 bps, 230400 bps, 460800 bps, 921600 bps.

If during installation was selected driver for Profibus baud rates, it is possible to use:

300 bps, 600 bps, 1200 bps, 2400 bps, 4800 bps, **9600** bps, **19200** bps, **93750** bps (if selected 230400 bps), **187500** bps (if selected 460800bps), **500000** bps (if selected 921600 bps), **1500000** bps (if selected 14400 bps).

## 6. DRIVER UNINSTALLATION

### 6.1. DRIVERS UNINSTALLATION IN WINDOWS SYSTEMS

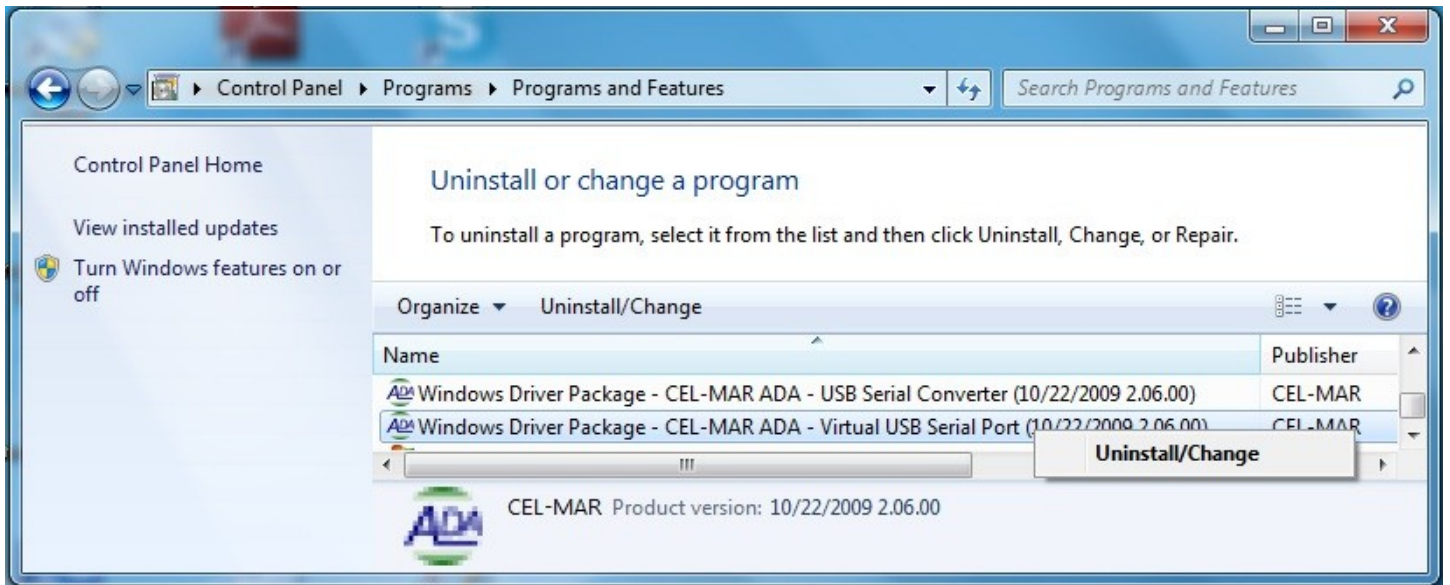
Drivers deinstallation in system Windows XP/2003/Vista/7/2008/8/10, have to be done according follow steps:

- a/ disconnect the converter from computer,
- b/ login on **Administrator account**,
- c/ select menu **Start > Setting > Control Panel > Add > Remove Programs**,
- d/ select from the list: **Windows Driver Package – CEL-MAR ADA – Virtual USB Serial Port**,  
or **Windows Driver Package – FTDI CDM Driver Package – VCP Driver**,
- e/ press [**Change / Remove**], virtual port driver will be uninstalled,
- f/ select from the list **Windows Driver Package – CEL-MAR ADA – USB Serial Converter**,  
or **Windows Driver Package – FTDI CDM Driver Package – Bus/D2XX Driver**
- g/ press [**Change / Remove**], driver converter of USB Bus will be uninstalled,
- h/ after uninstallation reboot the computer.

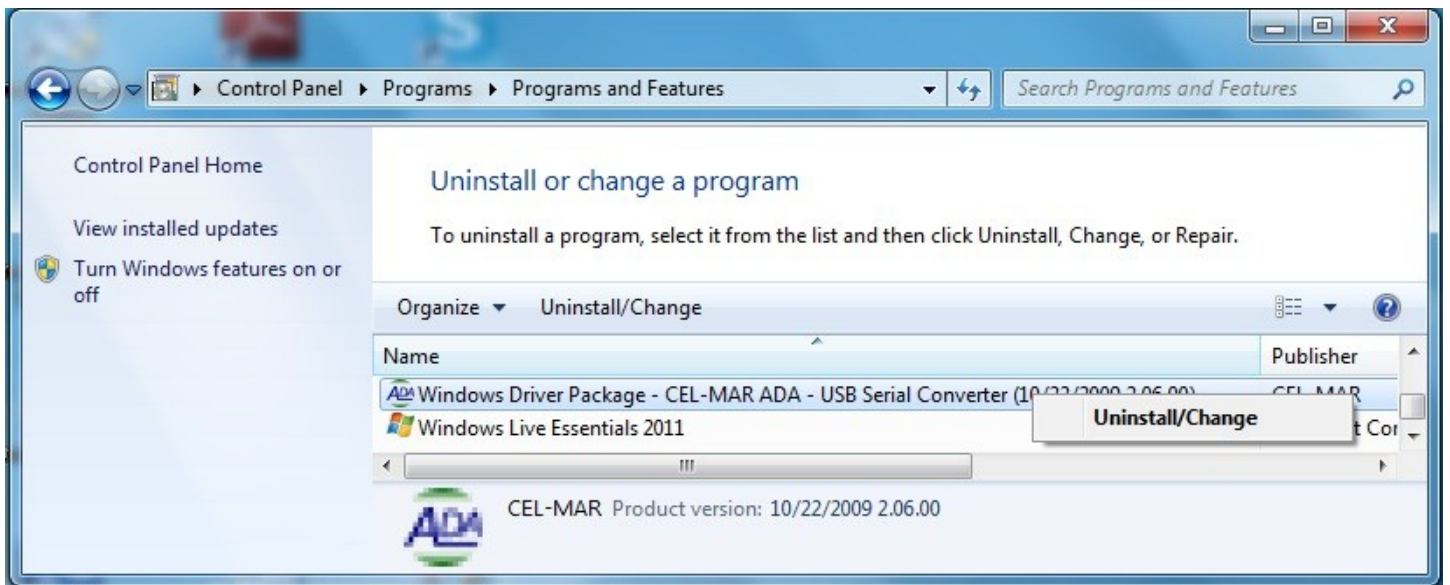
#### 6.1.1. EXAMPLE DRIVER UNINSTALLATION IN WINDOWS 7 SYSTEMS

Windows 7 system drivers uninstallation have to be done according follow steps:

- a/ disconnect converter from computer,
- b/ login the **Administrator account** ,
- c/ select menu **Start > Control Panel > Programs > Uninstall**,
- d/ select from **Windows Driver Package – CEL-MAR ADA – Virtual USB Serial Port**,
- e/ press [**Uninstall/Change**], Virtual USB Serial Port driver will be uninstalled



f/ select from the list **Windows Driver Package – CEL-MAR ADA – USB Serial Converter**



g/ press [**Uninstall/Change**], driver converter of USB Bus will be uninstalled,  
h/ after uninstallation reboot the computer.

## 6.2. EMERGENCY DRIVER UNINSTALLATION

If there are problems with correct operation of drivers, the converter or on the computer were installed other devices this type, it is possible to use the special software form delivered CD-ROM to clean the system (files and entries in the system registry). This can be done after uninstallation described in point 6.1 and 6.1.1.

### 6.2.1. EMERGENCY DRIVER UNINSTALLATION IN WINDOWS SYSTEM

Emergency drivers uninstallation in system Windows XP/2003/Vista/7/2008/8/10, have to be done according follow steps:

- a/ disconnect converter from computer,
- b/ login the **Administrator account**,
- c/ from CD delivered with converter, copy to hard disk the folder **Windows\Win-XP-2003-Vista-7-2008-8-8.1-10\CDMUninstaller**,
- d/ from **CDMUninstaller** folder run the application **uninstall.bat**,
- e/ after finishing, reboot the computer.

## 7. USING

After proper connection according to section above the converter can be used. If connection of USB cable was made property green LED PWR on front panel of converter should light. If doesn't, see point 4.4.POWER SUPPLY. During data transmission LEDs should blink and they indicate appropriately:

LED	Description
PWR	Signalling of Power Supply
RX	Signalling of data receiving through ADA-I91402 from RS485/422 port.
TX	Signalling of data transmitting from ADA-I91402 through RS485/22 port.
RTS	Signalling RTS line status on RS485/RS422 port
CTS	Signalling of CTS line status on RS485/RS422 port
DTR	Signalling of DTR line status on RS485/RS422 port
DSR	Signalling of DSR line status on RS485/RS422 port

**7.1. BAUD RATE SELECTION FOR PROFIBUS COM PORT**

For setting correct Profibus baud rate (after installation “Virtual Port” driver for Profibus) in application using virtual port COM follow table below.

Set baud rate [bps]	Actual baud rate [bps] Profibus
230400	937500
460800	187500
921600	500000
14400	1500000

**7.2. SELECTION OF COM PORT LARGER THAN COM9**

If virtual port COM of converter will install in Windows as COM10 or larger than, in application using this port, should be typed COM port address as: \\.\COM10.

**8. VERSIONS**

ADA-I91402 -			
<b>Signals:</b>			
Tx, Rx	1		
TX,RX, additionally DTR, DSR or RTS, CTS	2		
<b>Galvanic isolation:</b>			
1kV=	2		
3kV=	3		

Order example:  
Product symbol: **ADA-I91402-1-2**  
**1** – signals: Tx, Rx,  
**2** – galvanic isolation 1kV=.

**9. SPECIFICATION**

TECHNICAL DATA		
Transmission Parameters		
Interface	USB	RS-485/RS-422
Connector	USB A-type socket	Screw terminal block, max. wire Ø 1mm <sup>2</sup>
Line length	Up to 5m	1200 m (depend on baud rate)
Maximum number of connected devices	1	32
Transmission line	USB standard cable	Twisted cable 1-pair, 2- pair or 4-pair, UTP Cat.5e, shield inside large interferences STP Cat. 5e.
Standards	USB1.1, USB2.0	EIA-485, CCITT V.11,
Maximum baud rate	up to 921,6 kbps (Standard) / up to 1500 kbps (Profibus)	
Transmission type	Asynchronous, half duplex or full duplex,	

<b>Optical Signalization</b>	PWD – green LED (power supply) RX - red LED data reception on RS-485/RS-422 port, TX - yellow LED data transmission on RS-485/RS-422 port, RTS - yellow LED condition of RTS line, CTS - yellow LED condition of CTS line, DTR - yellow LED condition of DTR line, DSR - yellow LED condition of DSR line,
<b>Electrical Parameters</b>	
<b>Power requirements</b>	from USB of Computer
<b>Power Cable</b>	USB cable
<b>Power</b>	< 1W
<b>Protection from reverse power polarization</b>	Not applicable
<b>Galvanic isolation</b>	1kV= or 3kV= between signal line RS-485/RS-422 and USB
<b>Optoisolation</b>	2,7kV= between signal line USB and RS-485/RS-422
<b>Electromagnetic compatibility</b>	Resistance to disruptions according to the standard PN-EN 55024. Emission of disruptions according to the standard PN-EN 55022.
<b>Safety requiring</b>	According to the PN-EN60950 norm.
<b>Environment</b>	Commercial and light industrial.
<b>Environmental Parameters</b>	
<b>Operating temperature</b>	0 ÷ 50°C
<b>Humidity</b>	5 ÷ 95% - non-condensing
<b>Storage temperature</b>	-20 ÷ 70°C
<b>Casing</b>	
<b>Dimensions (W x D x H)</b>	92mm x 21mm x 57mm.
<b>Material</b>	ABS
<b>Degree of casing protection</b>	IP30
<b>Weight</b>	< 0,10 kg
<b>Implementation of Standard</b>	Not applicable
<b>Location during work</b>	Free
<b>Mounting method</b>	Not applicable

Dear Customer,

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

We hope that the **ADA-I91402 converter** and this user manual help simplify your network of 1-Wire sensor for industrial applications. We also wish to remind you that CEL-MAR Company are a manufacturer of the widest selections of data communications products in the world in applications such as: data transmission converters in RS232, RS485, RS422, USB, Current Loop, Fibre-Optic and Ethernet Converters and many others.

We welcome your feedback so please contact us to tell how you like our products and how we can satisfy you present and future needs.

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