

User manual

ADA-4040PC8

VIRAP* JCT-ASCII to MODBUS-RTU Protocol 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.

1.1. WARRANTED INFORMATION

ADA-4040PC8 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 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 device.



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

Converter ADA-4040PC8 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-4040PC8 converter; User Manual; CE declaration; Line terminators 120Ω (4 pcs.); CD with ADAConfig software.

2. PRODUCT INFORMATION

2.1. PROPERTIES

- Conversion of the VIRAP* JCT-ASCII protocol to the protocol MODBUS-RTU and inversely.
- Conversion of the baud rate of transmission and the data format among ports JCT-ASCII and MODBUS-RTU.
- Operating he 2 or 4 wire buses in RS485 / RS422 standard,
- Baud rate settled he RS485 / RS422 interfaces (bps): 300, 600, 1200, 1800, 2400, 4800, 7200, 9600, 14400, 19200, 28800, 38400, 57600, 76800, 115200, 230400.
- Date format settled he RS485 / RS422 interfaces: Date bit: 5, 6, 7, 8; Parity: None, Odd, Even; Number of melt bits: 1, 2.
- Power supply 10 - 30 VDC stable min. 3 in,
- ~ 3 kV = optoizolation in signal channel between RS485 / RS422 (MODBUS-RTU) and RS485 / RS422 (JCT-ASCII),
- 1 kV = or 3 kV = galvanic isolation between RS485 / RS422 (MODBUS-RTU), RS485 / RS422 (JCT-ASCII) interfaces and power supply (depend he version),
- Connection RS485 / RS422 network and power supply via screw terminal block 2.5 mm2.
- Implemented short circuit protection and over-voltage protection he RS485 / RS422 network,
- Implemented protection against power supply reverse connection,
- Cover compatible with of Dinas 43880 standard- mounting in typical electro-installation unit,
- Cover adapt it rail mounting according it is DIN35 / TS35 standard,
- Cover dimensions (in x D x H) 53 x mm of 62 x mm of 90 mm.

2.2. DESCRIPTION

VIRAP * JCT-ASCII to MODBUS-RTU converter ADA-4040PC8 is a device that allows you to connect VIRAP * JCT1 controllers communicating with the JCT-ASCII protocol to the RS-485 bus to which devices communicating with the MODBUS-RTU protocol are connected. At the same time, the converter can change the baud rate and format of transmitted data between the JCT-ASCII protocol port and the MODBUS-RTU protocol port. Depending on the configuration, you can set the baud rate, number of data bits, parity check or no parity, as well as the number of stop bits. The settings may be different for JCT-ASCII and MODBUS-RTU port. Additionally, ADA-4040PC8 separates JCT controller from RS-485 MODBUS-RTU bus. Galvanic separation provided by ADA-4040PC8 protects the system built on the RS422 / RS485 bus and increases its reliability. ADA-4040PC8 supports asynchronous data transmission with baudrate up to 230.4 kbps through two or one pair of twisted pairs connected to screw terminals. The device for its operation uses the lines RX +, RX-, TX + / A, TX- / B led to the terminal strips. Up to 32 ADA-4040PC8 devices operating in half duplex mode can be connected to the RS485 / RS422 bus. Overvoltage protection on each RS485 / RS422 line is made on the basis of 600W over voltage diodes and fuses.

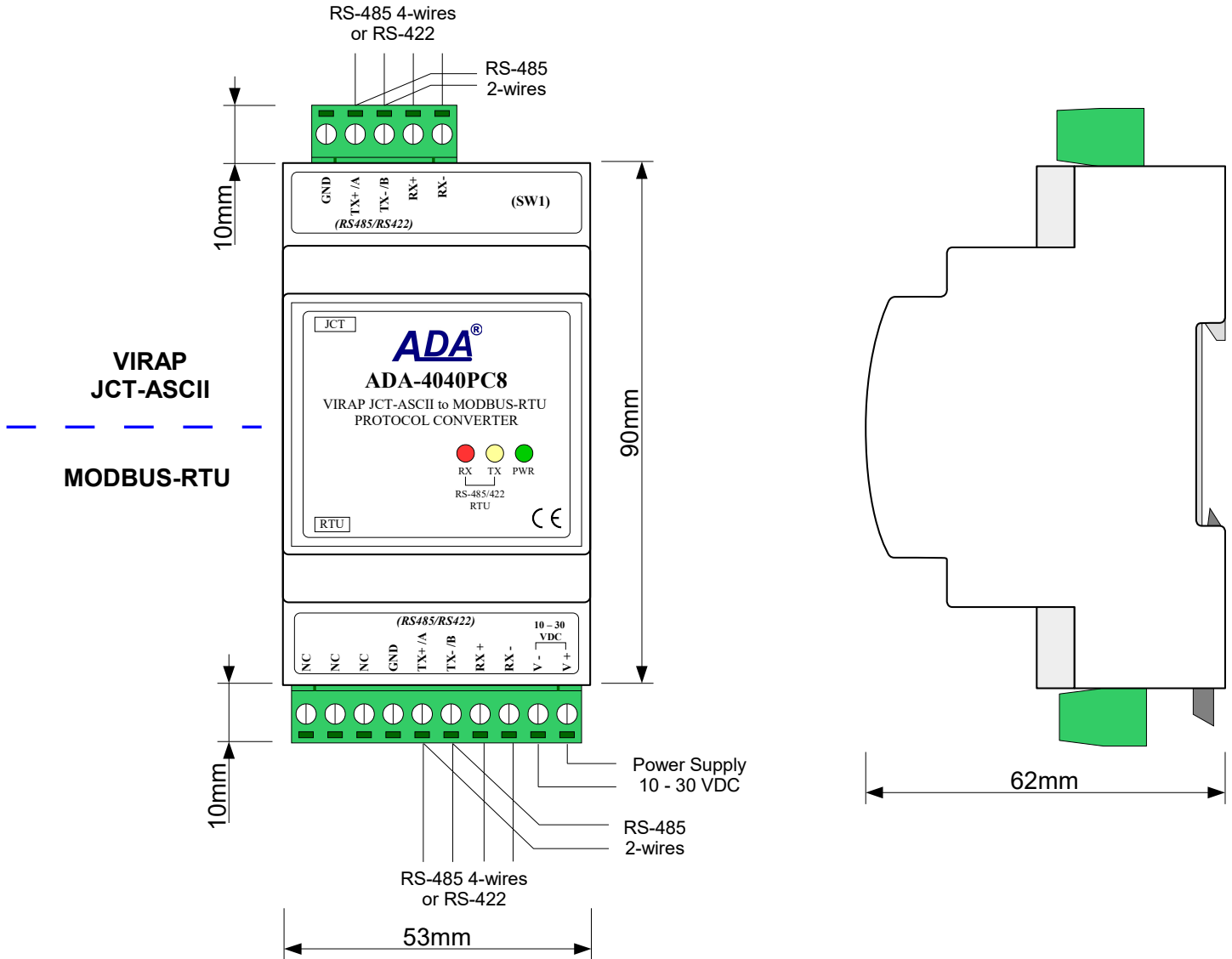


Fig 1. ADA-4040PC8 view and location of SW1

2.3. SUPPORTING CONTROL SYSTEMS OF THE VIRAP* COMPANY

ADA-4040PC8 converter supported controllers JCT1 series of the VIRAP* <https://www.virapsales.com>. company

2.4. ISOLATION

ADA-4040PC8 converter has 3-way galvanic isolation on the levels 1kV= or 3kV=, depend on version described in section *VERSIONS*.

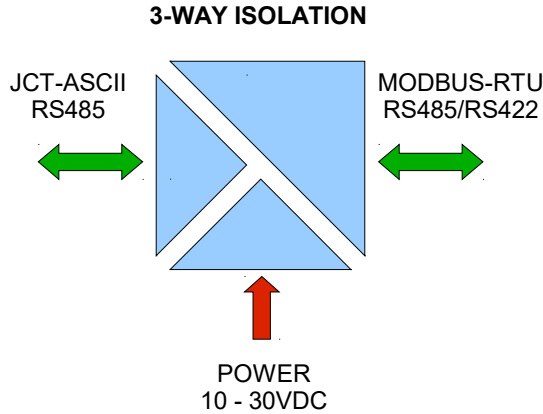


Fig 2. Isolation structure

3. INSTALLATION

This chapter will show how to use and connect ADA-4040PC8 to JCT controllers (VIRAP* company with RS485 interface); to RS485 / RS422 bus 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

Casing of ADA-4040PC8 is adapted to assembly on the TS-35 (DIN35) rail. It install the converter, should be mounted on the rail upper part of the cover then press bottom part it hear characteristic "Click" sound.

3.2. COMPUTER CONNECTION

To connect ADA-4040PC8 to computer, is needed additional converter e.g. ADA-I9141 USB to RS485/RS422 converter; connected to JCT port (5-pins connector) of ADA-4040PC8.

Typical connections of ADA-4040PC8 to PC are shown below.

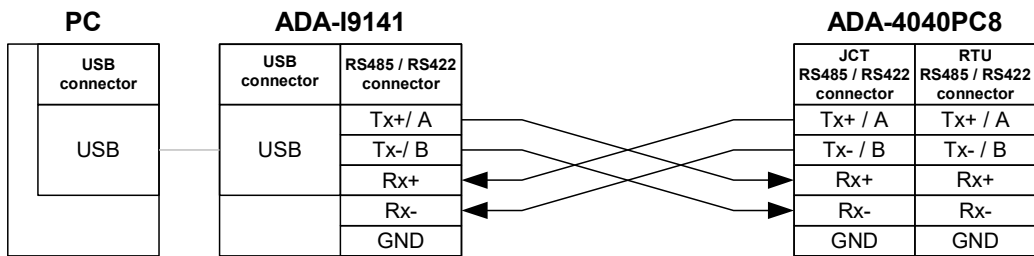


Fig 3. 4-Wires connection of ADA-4040PC8 to PC by the use of ADA-I9141 USB to RS485/RS422 converter.

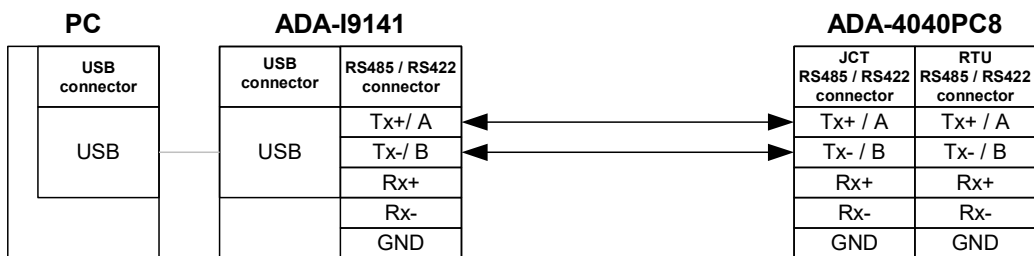


Fig 4. 2-Wires connection of ADA-4040PC8 to PC by the use of ADA-I9141 USB to RS485/RS422 converter.

3.3. RS485 NETWORK CONNECTION

RS485/RS422 interface in ADA-4040PC8 converter is available on terminal block, described as: Tx+/A, Tx-/B, Rx+, Rx-. Connection of ADA-4040PC8 to RS485(4W) and RS485(2W) network are shown below.

3.3.1. CONNECTION OF JCT1 CONTROLLER TO RS485 (4W) MODBUS-RTU BUS

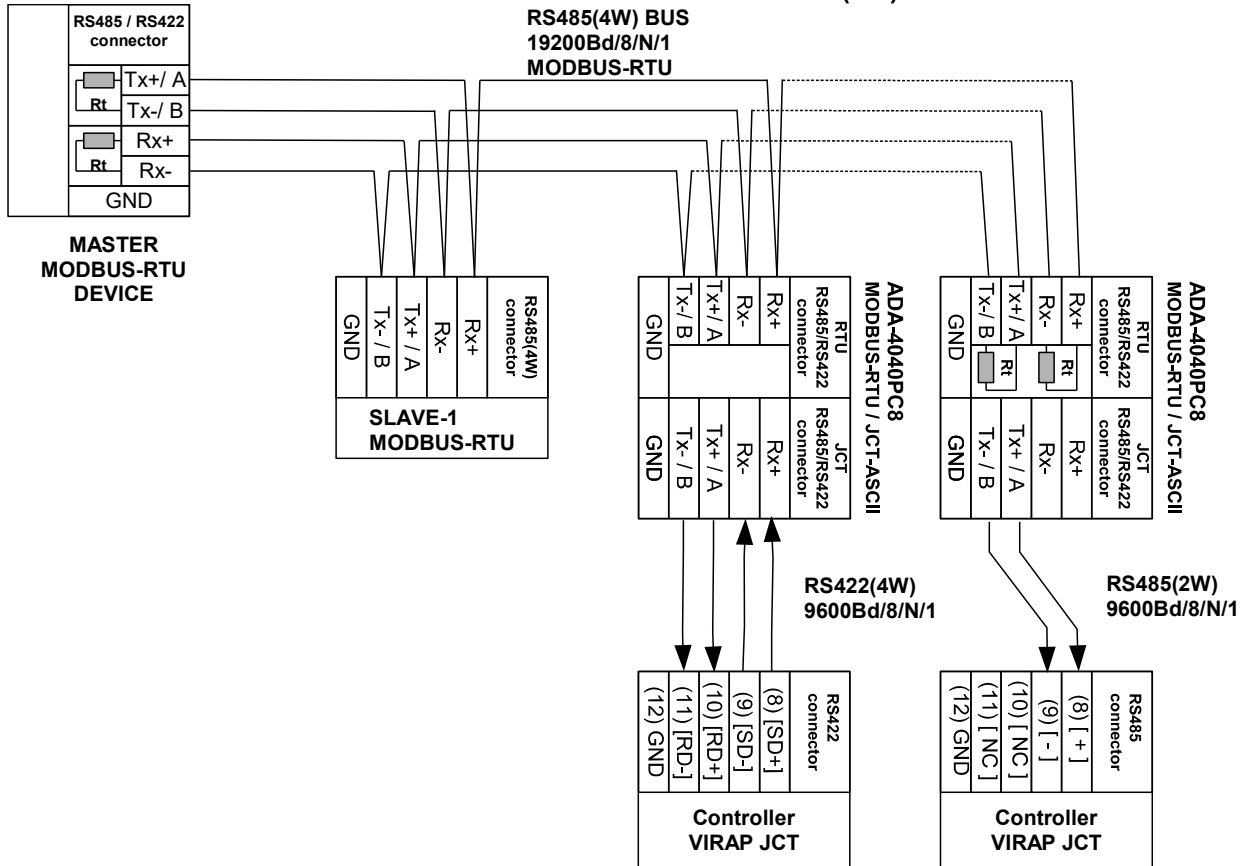


Fig 5. Example connection of ADA-4040PC8 to RS485 (4W) 4-wires bus and JCT1 controller to ADA-4040PC8

3.3.2. CONNECTION OF JCT1 CONTROLLER TO RS485 (2W) MODBUS-RTU BUS

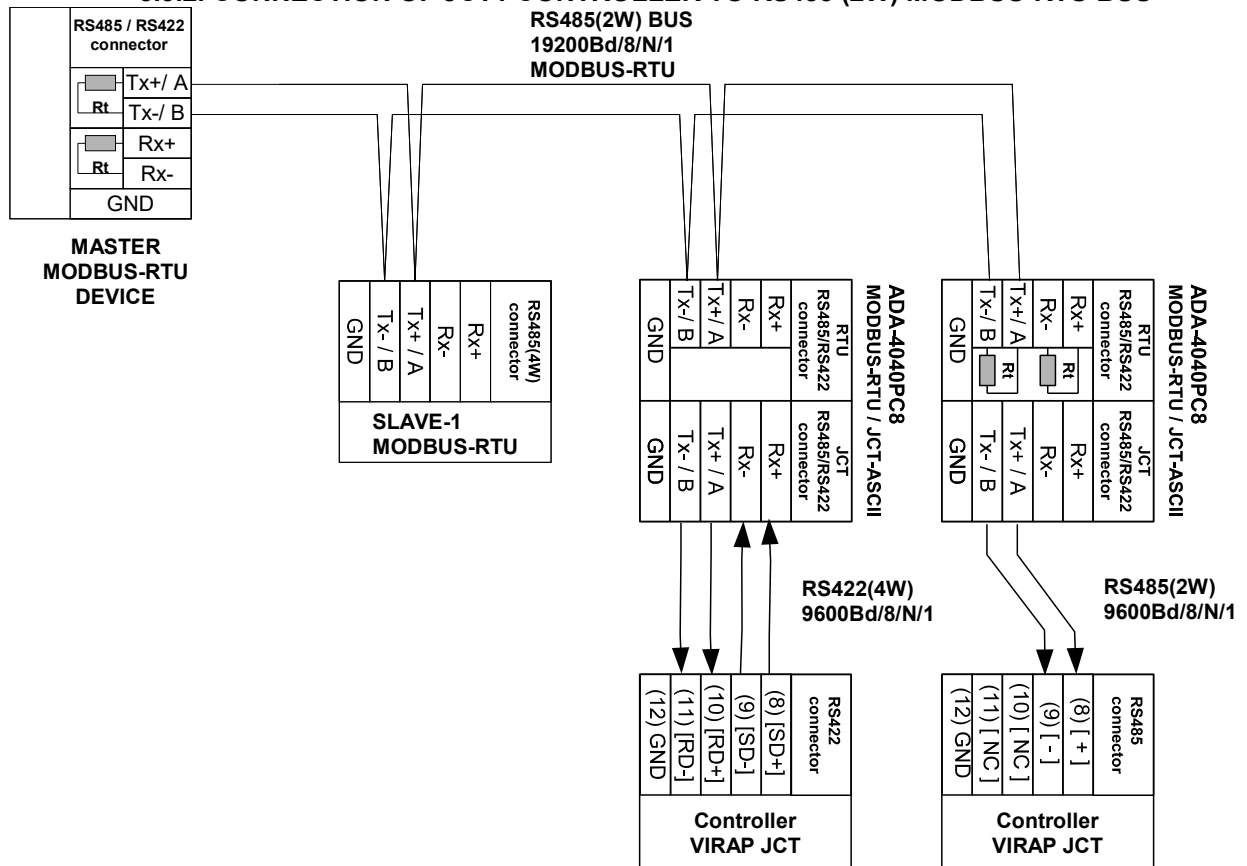


Fig 6. Example connection of ADA-4040PC8 to RS485 (2W) 2-wires bus and JCT1 controller to ADA-4040PC8

3.3.3. 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 of the signals grounds on interfaces RS485 / RS422, which prevents proper data transmission.

Cannot connect to the GND terminal - cables screens, PE circuit of electrical installation, signals grounds of other devices.

3.3.4. LINE TERMINATION Rt

The application of Line Termination (terminator) $R_t = 120$ ohms will reduce electrical reflection in data line at high baud rate. It is not needed below 9600Bd. Should be used the Line Termination resistor if the distance is over 1000m @ 9600Bd or 700m @ 19200Bd, and if the disturbance in transmission will appear. Example connection of R_t are shown on the figures below. Four $R_t=120 \Omega$, 0,25W are delivered with the converters.

3.4. POWER SUPPLY CONNECTION

We recommend for powering of ADA-4040PC8 to use individual, stabilized power supply with 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-4040PC8 has protection against power supply reverse connection.

4. START-UP

The converter can be power on after properly connection according to section above.

If after connection power supply on front panel will not light green led PWR, check correctness of power supply connecting (polarization). When data is present the LEDs Tx and Rx should blink

ATTENTION!

AT BAUD RATE ABOVE 38.4 KBPS OF THE TX DIODE, MORE POORLY WILL LIGHT RX DURING THE DATA TRANSFER

4.1. DESCRIPTION OF SIGNALLING LEDES

LED	Description
PWR	Signalling of Power Supply
RX	Signalling of data receiving through ADA-4040PC8 from RTU RS485/RS422 port.
TX	Signalling of data transmitting from ADA-4040PC8 through RTU RS485/RS422 port.
Yellow LED by SW1	Not light – signalling of normal operating mode (RUN)
	Blinking at frequency 1 Hz - signalling of configuration mode or data flow of software to the converter.
	Blinking at frequency 2 Hz - signalling of factory default mode
	Lit continuously – signalling of emergency firmware update

4.2. TROUBLESHOOTING

Problem	Solutions
PWR LED is not lit	Check polarization and parameters of connected power supply.
Rx LED lights continuously	RS485(4W) /422 network. Wrong polarization on terminals: Rx+, Rx- RTU port; change polarization.
No transmission Tx LED is blinking	RS485(4W) / RS422 network. Check correctness of connection to terminals Tx, Rx; according to point 3 and the converter configuration.

5. CONFIGURATION

5.1. OPERATION MODE

ADA-4040PC8 converter can operates in and few modes:

- RUN,
- configuration,
- factory default,
- emergency firmware update mode,

Those modes can be set by use SW1 located by terminal block JCT port. To set the switch section, should remove terminal cover marked as SW1 and make the appropriate settings by the use a small, flat screwdriver.

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

Operation modes

SW1 - 1	SW1 - 2	Mode	Yellow LED
OFF	OFF	Run	Not lit
ON	OFF	Configuration	Flashes every 1 sec.
OFF	ON	Factory default	Flashes every 0,5 sec.
ON	ON	Emergency firmware update	Continuous light

5.2. CONFIGURATION BY USING ADACONFIG

The configuration of ADA-4040PC8 converter can be made by the use of *ADAConfig* Software - selling with converter. To make the configuration, connect converter to computer (see pt. 3.2) and power supply. If after power, on the front panel is not lit green LED PWR, check the power connection (polarity). If the PWR LED lights, set the section of SW1 switch to configuration mode as in table below.

SW1-1	SW1-2
ON	OFF

In the configuration mode the yellow LED located by SW1 micro-switch will blink with frequency 1 Hz. Start the ADAConfig Software and make the configuration of transmission parameters for each converter interfaces.

First should be set the number of **[COM port] [1]** for communication with the converter, then readout the configuration from ADA-4040PC8 memory, using the button **[Read configuration] [2]** and make the proper changes of each interfaces setting, as below:

[3] setting the converter address from the RTU port RS485 MODBUS-RTU field [Address] (range 1-247).

In the section **[Converter addressing]**, select the field **[Enable]** and in the field **[Address]** enter the MODBUS-RTU converter address from the **RTU** port.

[4] setting the address of the connected VIRAP * JCT device to the **JTC RS485** port [Mapped Address] field (range 1-99).

In the section **[Device addressing]**, select the field **[Address mapping]** and in the field **[Mapped address]** enter the address of VIRAP * JCT controller, connected to the **JCT** port.

[5] setting transmission parameters for the **JCT** port:

– 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),

[6] setting transmission parameters for the **RTU** port:

– 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),

After configuration, the setting should be saved on converter memory by using button **[Write configuration] [7]**. Return to work in run mode is made by using SW1 switch as below.

SW1-1	SW1-2
OFF	OFF

The yellow LED will turn off in the RUN mode.

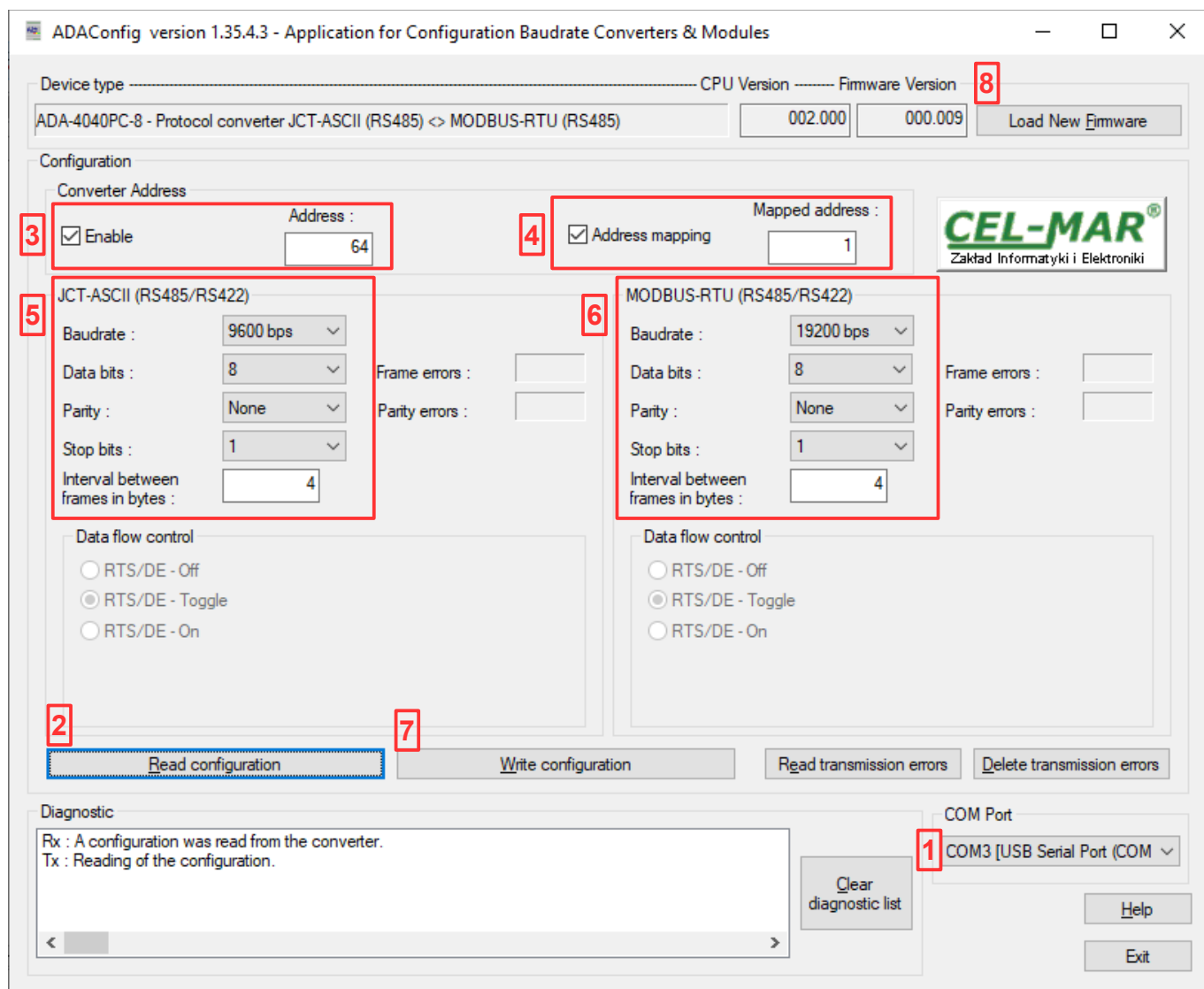


Fig. 7. View of ADAConfig software interface

5.3. FIRMWARE UPDATE

Set SW1 micro switch to configuration mode as in table below.

SW1-1	SW1-2
ON	OFF

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

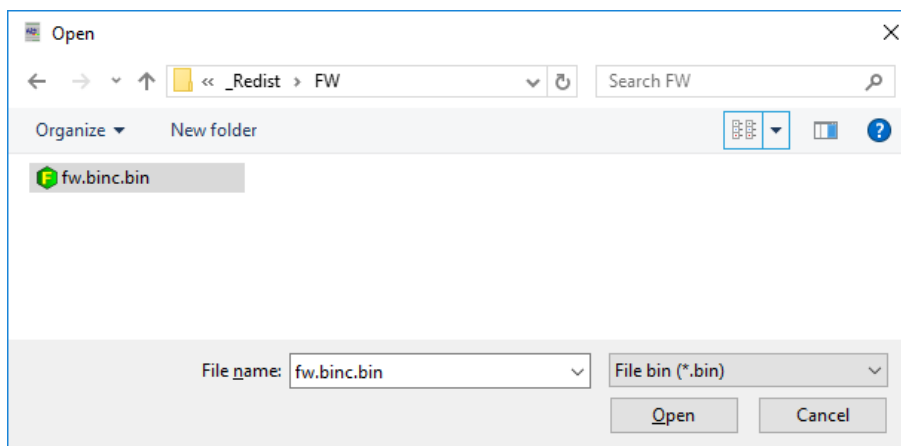


Fig. 8. Selection of firmware file

During loading software the yellow LED located beside SW1 micro-switch will blink, showing data flow to the converter. If the software was loaded correctly yellow LED will be blink again with frequency 1 Hz. After that, set microswitch SW1 to RUN mode as shown in the table below.

SW1-1	SW1-2
OFF	OFF

In the RUN mode the yellow LED (located near the SW1), will turn off.

5.4. EMERGENCY FIRMWARE UPDATE

In case of the unsuccessful update of the converter software, try again according to description in the above point. If the update is still incorrect use emergency firmware update. Set SW1 microswitch mode as in the table below.

SW1-1	SW1-2
ON	ON

After microswitch setting, converter should be restarted, by turning OFF and then ON the power supply. The yellow LED will light continuously and the converter will be in Emergency Firmware Update mode. Now follow the description in the above point. After successful software update, set microswitch SW1 to the RUN mode as shown in the table below.

SW1-1	SW1-2
OFF	OFF

In the RUN mode the yellow LED (located near the SW1), will turn off.

5.5. FACTORY DEFAULT

In case of faulty functioning of ADA-4040PC8, like:

- no communication in the configuration mode,
- transmission errors on RS485/422 bus,

can be restored the factory default setting of the converter internal registers.

Factory default

Parameter	JCT RS485/RS422	RTU RS485/RS422
Device address	1	64
Baud rate	9600 bps	9600 bps
Data bits	8	8
Parity	None	None
Stop bits	1	1
Interval between frames in bytes	4	4

Set SW1 microswitch mode as in the table below.

SW1-1	SW1-2
OFF	ON

Disconnect the power and after while connect again the power. After that, will be loaded the factory default setting to the converter internal registers.

After this operation, the converter parameters should be set again for operating in the application.

Set micro switch SW1 to run mode as shown in the table below.

SW1-1	SW1-2
OFF	OFF

In the RUN mode the yellow LED (located near the SW1), will turn off.

6. DATA TRANSMISSION DIAGNOSTICS

To readout diagnostics, the SW1 microswitch should be set to the configuration mode.

SW1-1	SW1-2
ON	OFF

In the configuration mode the yellow LED will blink with frequency 1Hz.

Correctness of transmission proceed on JCT (RS485) and RTU(RS485) interfaces can be checked by readout the errors list by *ADAConfig* Software from the converter memory. Frames error counter will be increased, in case of: improper speed set compared to real speed of data transmission. Parity error counter will be count the errors which can arise in case of misrepresent bytes in transmitted sign. This counter will not work in case of disable control parity.

To check those counters press the button **[Read transmission errors]**, and to delete (zeroing of counters in the memory of the converter) press **[Delete transmission errors]**. In case of parity errors or frame errors, should be checked the ADA-4040PC8 converter's configuration and correctness connection of RS485 bus to RTU and JCT converter ports.

After finishing the diagnostics, the SW1 microswitch should be set to the run mode as shown in the table below.

SW1-1	SW1-2
OFF	OFF

In the run mode the yellow LED (located near the SW1), will turn off.

7. OPERATION

ADA-4040PC8 is a bidirectional converter of JCT-ASCII protocol to MODBUS-RTU protocol, with the possibility of converting the baud rate, data format (number of data bits, parity bit, stop bits) and the type of RS485 interface to RS422.

Additionally, it is a separator of the JCT-ASCII port from the MODBUS-RTU port.

ADA-4040PC8 reads data from the JCT-ASCII controller and properly processed, saves it to the MODBUS-RTU protocol registers described in the section IMPLEMENTATION OF THE MODBUS-RTU PROTOCOL.

MODBUS protocol frames with the CRC error are rejected by the converter.

JCT-ASCII protocol frames with a checksum error are rejected by the converter.

In case of no response from the JCT-ASCII controller, the ADA-4040PC8 converter corresponds to the MODBUS protocol exception described in the section EXCEPTIONS OF THE MODBUS-RTU PROTOCOL.

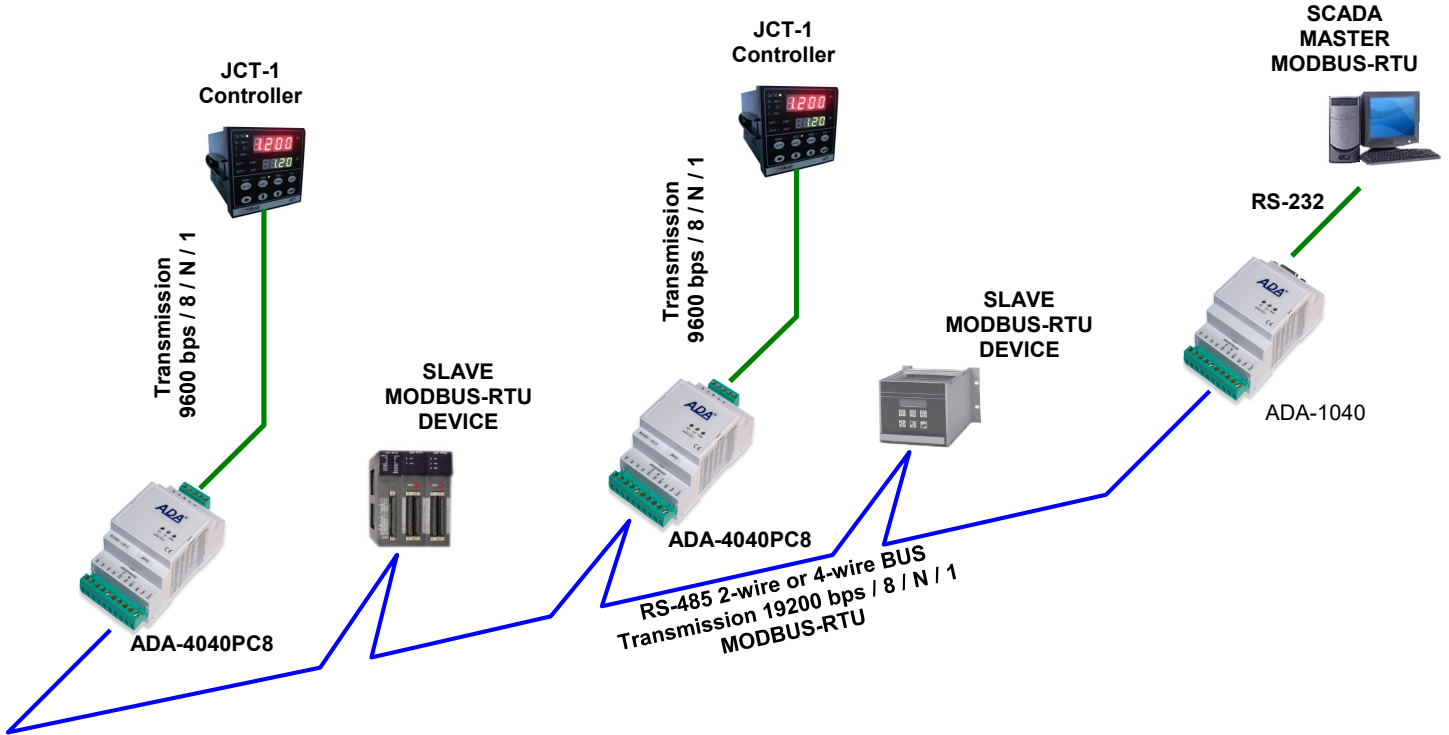


Fig. 9. Connecting VIRAP* JCT control systems to the MODBUS-RTU RS485 bus

8. IMPLEMENTATION OF THE MODBUS-RTU PROTOCOL

ADA-4040PC8 protocol converter allows connecting controllers with the JCT-ASCII protocol as SLAVE to the RS485 bus MODBUS-RTU. The length of RS485 bus can be extended (next segments of 1200 m) by the use of ADA-4040 repeaters or ADA-4044H HUBs RS485.

The MODBUS-RTU protocol used for communication between ADA-4040PC8 converters and SCADA-type system or PLC controller enable easy integration of JCT controllers in existing automation systems.

8.1. TABLE OF MODBUS-RTU ADDRESSES

8.1.1. REGISTERS OF ACTUAL MEASUREMENTS VALUES OF JCT CONTROLLER, READOUT BY FUNCTION 04 [3 X - REFERENCES] INPUT REGISTERS

No.	Modbus registers Address 3X	Registers for the Reading	Range of data	Range of Modbus data	DW divisor of the value of the Modbus register	Parameter symbol	Parameter description
1.	30121	Read	0.0~2.000	0~2000	1000	PV	Cp PV value
2.	30122	Read	0~1500	0~1500	1	PO	O ₂ mV PV value
3.	30123	Read	0.0~999.9	0~9999	10	PT	Temperature PV value
4.	30124	Read	0.0~2.000	0~2000	1000	SV	Cp SV value
5.	30125	Read	-2.000~2.000	-2000~2000	1000	CC	Cp compensation value
6.	30126	Read	-100~100	-100~100	1	TC	Temperature compensation
7.	30127	Read	-100~100	-100~100	1	MC	O ₂ mV compensation value
8.	30128	Read	10.00~50.00	1000~5000	100	CO	Carbon monoxide value
9.	30129	Read	0~1300	0~1300	1	TA	Safety temperature value
10.	30130	Read	0~1300	0~1300	1	TM	Enriching gas start temperature
11.	30131	Read	1~1000	1~1000	1	KP	Proportion band value
12.	30132	Read	1~1000	1~1000	1	TI	Integral factor value
13.	30133	Read	0~1000	0~1000	1	TD	Derivative factor value
14.	30134	Read	0.0~2.000	0~2000	1000	EV	Event value
15.	30135	Read	0,1	0,1	1	CM	Communication mode
16.	30136	Read	0,1	0,1	1	AM	Automatic/manual mode
17.	30137	Read	0,1	0,1	1	SR	Execution/stop mode
18.	30138	No Read	0~100	0~100	1	AO	Carrier control output (out2)
19.	30139	No Read	0,1	0,1	1	ED	Prompt of finishing
20.	30140	No Read	0~100	0~100	1	OT	Enriching control output (out1)

8.1.2. REGISTERS OF ACTUAL MEASUREMENTS VALUES OF JCT CONTROLLER, READOUT BY FUNCTION 03 OR SAVED BY FUNCTION 06 [4 X - REFERENCES] HOLDING REGISTERS

No.	Modbus registers Address 4X	Registers for the Reading/ Writing	Range of data	Range of Modbus data	DW factor of Modbus register value	Parameter symbol	Parameter description
1.	40121	Read	0.0~2.000	0~2000	1000	PV	Cp PV value
2.	40122	Read	0~1500	0~1500	1	PO	O ₂ mV PV value
3.	40123	Read	0.0~999.9	0~9999	10	PT	Temperature PV value
4.	40124	R/W	0.0~2.000	0~2000	1000	SV	Cp SV value
5.	40125	R/W	-2.000~2.000	-2000~2000	1000	CC	Cp compensation value
6.	40126	R/W	-100~100	-100~100	1	TC	Temperature compensation
7.	40127	R/W	-100~100	-100~100	1	MC	O ₂ mV compensation value
8.	40128	R/W	10.00~50.00	1000~5000	100	CO	Carbon monoxide value
9.	40129	R/W	0~1300	0~1300	1	TA	Safety temperature value
10.	40130	R/W	0~1300	0~1300	1	TM	Enriching gas start temperature
11.	40131	R/W	1~1000	1~1000	1	KP	Proportion band value
12.	40132	R/W	1~1000	1~1000	1	TI	Integral factor value
13.	40133	R/W	0~1000	0~1000	1	TD	Derivative factor value
14.	40134	R/W	0.0~2.000	0~2000	1000	EV	Event value
15.	40135	R/W	0,1	0,1	1	CM	Communication mode
16.	40136	R/W	0,1	0,1	1	AM	Automatic/manual mode
17.	40137	R/W	0,1	0,1	1	SR	Execution/stop mode
18.	40138	Write	0~100	0~100	1	AO	Carrier control output (out2)
19.	40139	Write	0,1	0,1	1	ED	Prompt of finishing
20.	40140	Write	0~100	0~100	1	OT	Enriching control output (out1)

8.2. FRAME STRUCTURE OF MODBUS-RTU PROTOCOL

<i>Device address (1-byte)</i>	<i>Function (1-byte)</i>	<i>Dane (n-bytes)</i>	<i>CRC-16Lo (1-byte)</i>	<i>CRC-16Hi (1-byte)</i>
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8.3. USED FUNCTIONS OF MODBUS-RTU PROTOCOL

Code of the Function	Description
03 (0x03)	Reading of controller parameters from the HOLDING MODBUS-RTU registers
04 (0x04)	Readout of controller parameters from INPUT MODBUS-RTU registers
06 (0x06)	Setting of a single HOLDING MODBUS-RTU register

8.3.1. 0x03/0x04 FUNCTION - READING OF THE 16-BITS VALUE OF REGISTERS [4X/3X-REFERENCES]

Function 0x03 / 0x04 are used for readout the registers from ADA-4040PC8, in which are available measurement values and status values of JCT controller.

The measurement values readout form MODBUS-RTU register is presented by a 16-bit register.

The registers with the measurement value are in the integer format of 16-bit sign (in C/C++ type short int).

The actual measurement value is obtained from the read register using the following algorithms, using the appropriate **DW** factor value (see table below).

Algorithm 1. Readout register is saved to regular type variable (float) and then divide it by the **DW** factor.

```
// Fragment of code in C language (VS6.0) presenting above algorithm
short int siMeasureReg;
float fMeasureVal;
.....
fMeasureVal = (float) siMeasureReg;
fMeasureVal = fMeasureVal / DW;
```

Algorithm 2. Readout register is saved to regular type variable 16-bit (short int) and then divide by the **DW** factor, received change of the dividing it is a number of the hundredth parts of the measurement value.

```
// Fragment of code in C language (VS6.0) presenting above algorithm
short int siMeasureReg;
div_t div_MeasureVal;
.....
div_MeasureVal = div ((int) siMeasureReg, DW);
```

```
printf ("Total value of the measurement = % d\n, the hundredth parts of the value of the measurement = % d\n", div_MeasureVal.quot, div_MeasureVal.rem);
```

Query register 40124 / 30124 (Cp SV value)

Byte no.	Designation	Size	Value [hex]
00	Converter Address	1 Byte	40 [01 to F7]
01	Function Code	1 Byte	03 / 04
02	Address of the register Hi	1 Byte	00
03	Address of the register Lo	1 Byte	7C
04	Number of registers Hi	1 Byte	00
05	Number of registers Lo	1 Byte	01
06	CRC-Lo	1 Byte	- - -
07	CRC-Hi	1 Byte	- - -

Example. Query for a value from the register address 40124 / address 30124 (Cp SV value).

40-03-00-7C-00-01-CRCLo-CRCHI
40-04-00-7C-00-01-CRCLo-CRCHI

Response with register value 40124 / 30124 (Cp SV value)

Byte no.	Designation	Size	Value [hex]
00	Converter Address	1- Byte	40 [01 to F7]
01	Code of the function	1- Byte	03 / 04
02	Number of data bytes	N- Byte	02
03	Data1-Hi	1- Byte	04
04	Data1- Lo	1- Byte	D2
05	CRC-Lo	1- Byte	- - -
06	CRC-Hi	1- Byte	- - -

Example. Reading value from the register address 40124 / address 30124 (Cp SV value).

40-03-02-04-D2-CRCLo-CRCHI
40-04-02-04-D2-CRCLo-CRCHI

In response value from the register (Cp SV value) is introduced to 2-byte with values:

$T_SV = 0x04D2 = 1234$, real value = $T_SV/DW = 1234 / 1000 = 1,234 \text{ } ^\circ\text{C}$

Response - in case of error

Byte no.	Designation	Size	Value [hex]
00	Converter Address	1- Byte	40 [01 to F7]
01	Function Code	1- Byte	83 / 84
02	Error code	1- Byte	01-unknown function 02-unknown data address 03-unknown amount of data 04-JCT controller is not responding, is not connected, or is damaged
03	CRC-Lo	1- Byte	
04	CRC-Hi	1- Byte	

8.3.2. 0x06 FUNCTION - SAVE VALUES TO 16-BITS REGISTER [4 X-REFERENCES]

0x06 function is used for save values to 16-bits of the MODBUS register of the ADA-4040PC8 converter.

The saved value in the register is processed and transmitted to the JCT controller.

MODBUS registers are in the format of the 16-bits integral number with the character (in C/C++ type short int).

The value saved in the MODBUS register of ADA-4040PC8, is obtained by multiplying real measurement value by the **DW** factor, according to the following algorithm.

Algorithm 1. The value of the MODBUS siMeasureReg register is obtained by multiplying the real value of the measurement represented by the variable fMeasureVal of the float type by the DW factor (table above).

// Fragment of code in C language (VS6.0) presenting above algorithm

short int siMeasureReg;

float fMeasureVal;

siMeasureReg = (short int) (fMeasureVal * DW);

siMeasureReg = 1,235 * 1000 = 1235 = 0x04D3 (HEX)

Data saving to register 40124 (Cp SV value)

Byte no.	Designation	Size	Value [hex]
00	Converter Address	1 Byte	40 [01 to F7]
01	Code of the function	1 Byte	06
02	Address of the register Hi	1 Byte	00
03	Address of the register Lo	1 Byte	7C
04	Value of the register Hi	1 Byte	04
05	Value of the register Lo	1 Byte	D3
06	CRC-Lo	1 Byte	- - -
07	CRC-Hi	1 Byte	- - -

Example. Data saving to register 40124 (Cp SV value)

40-06-00-7C-04-D3-CRCLo-CRCHI

Response - confirming the data saving to register 40126 (Temperature SV value)

Byte no.	Designation	Size	Value [hex]
00	Converter Address	1- Byte	40 [01 to F7]
01	Code of the function	1- Byte	06
02	Address of the register hee	1- Byte	00
03	Address of the register Lo	1- Byte	7 D
04	Value of the register hee	1- Byte	04
05	Value of the register Lo	1- Byte	D3
06	CRC-Lo	1- Byte	- - -
07	CRC-Hi	1- Byte	- - -

Example. Confirmation the data saving to register 40126 (Temperature SV value)

40-06-00-7D-04-D3-CRCLo-CRCHI

In response the converter sends the frame – confirming saving to the register.

Response - in case of error

Byte no.	Designation	Size	Value [hex]
00	Converter Address	1-Byte	40 [01 to F7]
01	Code of the function	1- Byte	86
02	Error code	1- Byte	01-unknown function 02-unknown data address 03-unknown amount of data 04-JCT controller is not responding, is not connected, or is damaged
03	CRC-Lo	1- Byte	- - -
04	CRC-Hi	1- Byte	- - -

8.4. EXCEPTIONS OF THE MODBUS-RTU PROTOCOL

ADA-4040PC8 in case of received MODBUS-RTU frame, includes:

- unsupported function,
- unknown data address,
- unknown data value
- or when JCT controller not respond on inquiries returns to MASTER type device the frame containing the appropriate exception – described below.

Response – in case of error

Byte no.	Designation	Size	Value [hex]
00	Converter Address	1- Byte	40 [01 to F7]
01	Code of the function	1- Byte	80 + FC (Code of the function)
02	Error code	1- Byte	01-unknown function 02-unknown data address 03-unknown amount/value of data 04-JCT controller is not responding, is not connected, or is damaged
03	CRC-Lo	1- Byte	- - -
04	CRC-Hi	1- Byte	- - -

9. VERSIONS

ADA-4040PC8 -			
Version:	Standard	1	
3-way galvanic isolation:			
1 kV =			23
3 kV =			33

Order example:
Product Symbol: **ADA-4040PC8-1-23**
1 – standard version ,
23 - 1 kV =, 3-way galvanic isolation,

10. SPECIFICATION

TECHNICAL DATE		
Transition Parameters		
Protocol	VIRAP* JCT-ASCII	MODBUS-RTU
Interface	RS-485 / RS-422 (JCT)	RS-485 / RS-422 (RTU)
Connector	Screw terminal, wire max. Ø 2.5 mm ²	Screw terminal, wire max. Ø 2.5 mm ²
Line length	1200 m (depends he baud rate)	1200 m (depends he baud rate)
Max. number of connected device	1 device	Up it 32 devices
Baud rates (bps)	300, 600, 1200, 1800, 2400, 4800, 7200, 9600, 14400, 19200, 28800, 38400, 57600, 76800, 115200, 230400,	
Date formats	Date bits 5, 6, 7, 8, Parity: None, Parity, Odd, Number of melt bits: 1, 2,	
Transmission line	Twisted cable 1-pair or 2-pair, UTP Nx2x0, 5 (24 AWG), shield inside large interferences STP Nx2x0, 5 (24 AWG).	
Transmission type	Asynchronism maximum duplex, half duplex.	
Standards	EIA-485, CCITT V. 11	EIA-485, CCITT V. 11
Optical signalisation	• PWR - green LED power supply, RX - of LED roadsteads receiving date from RTU of ports - RS485 / RS422, TX - yellow LED date transmission through RTU of ports - RS485 / RS422.	
Electrical Parameters		
Power requirements	10 - 24 - 30 V DC	
Power Cable	Recommended length of power cable - up it is 3m.	
Power	< 2 W	
Protection from reverse power polarization	YES	
Galvanic Isolation	1 kVDC or 3 kVDC - between power circuit and signal lines RS-485 / RS-422 JCT and RTU - depend the version.	
Optoisolation	~ 3 kV - between signal line RS-485 / RS-422 (JCT) and RS-485 / RS-422 (RTU)	
Electromagnetic compatibility	Resistance it disruptions according it the standard PN-EN 55024. Emission of disruptions according it the standard PN-EN 55022.	
Safety requiring	According it the PN-EN 60950 norms.	
Environment	Commercial and light industrial.	
Environmental Parameters		
Operating temperature	-30 ÷ 60 ° C	
Humidity	5 ÷ of the 95% - non-condensing	
Storage temperature	-40 ÷ 70 ° C	
Casing		
Dimensions	53 x 90 x 62 mm	
Material	PC/ABS	
Degree of casing protection	IP40	
Degree of terminal protection	IP20	
Weight	0.10 kg	
According is a standard	DIN EN50022, DIN EN43880	
Position during operation	Free	
Mounting	Rail mounting according it is DIN35 standard / TS35.	

*) - Names of companies and logotypes have been used only for informational purposes

Dear Customer,

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

We hope that this user manual helped connect and start up the **ADA-4040PC8 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, Current Loop, Fibre-Optic Converters and Ethernet or Wi-Fi.

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

CEL-MAR sp.j.

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