

*Let's communicate*



## RS-232/485 Converter with Galvanic Isolation of the Interface



# ELO E06A

## Operation manual

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## 1.0 Introduction

RS-232 is the interface with asymmetric signals designed for two terminal equipments connection (DTE). The load impedance is to be 3-7 kilohm that enables to induce disturbing pulses into the cable even from relatively soft supplies. Since the signals have to be symmetric, the terminal equipments have to have the same neutral potentials. For this reason, RS-232 interface range is limited to 15m distance. Signals conversion to RS-485 allows increase communication range, transmission interference immunity and communication partners' number.

### 1.1 Use of the converter

The converter increases transmission immunity against electrical disturbance and isolates RS-232 interface from RS-485. Insulation strength is 3 kV. As for permissible over-voltage the converter is designed to be used in the environments where lightning over-voltage is not necessary to be considered. To lead the cable outside buildings it is necessary to provide additional over-voltage protection on the input points.

The converter allows transmission rate up to 115200 bps. This maximum attainable rate decreases due to the line length and/or its impedance growth. Recommended maximum line length is 1200m at the rate of 9600 bps.

### 1.2 Operation principles

RS-485 interface is used to two-way simultaneous communication in one pair of conductors. For this reason, the transmission has to be half-duplex that means switching off RS-485 transmitter when receiving to allow transmitting to other communication partners and switching on only during its own transmitting.

There are two methods of transmitter switching:

- 1) The terminal equipment (DTE) changes RTS signal from the "OFF" state (negative polarity) to the "ON" state (positive polarity). When transmitting is finished it changes RTS signal back to "OFF".
- 2) DTE does not use RTS (this signal is not disposed by this interface or the application does not use it) and the converter has to interpret its signal TxD **automatically**. At the TxD changing moment from the idle state (from negative to positive polarity), the converter activates the link transmitter automatically.

**The transmitter is switched off after the certain time  $\tau$**  of RTS switching off or TxD return to the neutral polarity. Time interval length  $\tau$  has to be dependent on applied transmission rate because in the automatic mode there it is necessary to keep the transmitter active for the period equal to one byte transmission time. In the automatic mode, one important communication protocol request is necessary to observe: every **device that is to transmit has to wait for at least the time  $\tau$  from the**

last byte recorded on the RS-485 bus. If it is to the contrary the first transmitted byte would be damaged.

### 3.0 Installation

The converter has to be installed with the respect for specifications of both interfaces.

#### 3.1 Converter connection to RS-232 Interface

Signals assignment to the contacts and DTE - DCE interconnection is in the following table:

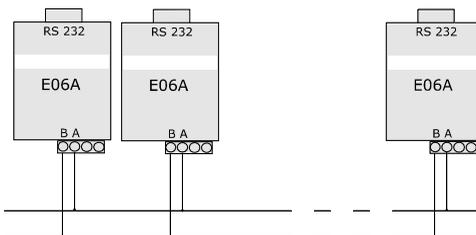
Signal name	abbrev (DB9M)	DTE connector E06A(DB9F)	connector DTE	trans.direction	
				E06A	
Signal Ground	SG	5	5	--	--
Transmitted Data	TxD	3	3	output	input
Received Data	RxD	2	2	input	output
Request To Send	RTS	7	7	output	input
Clear To Send	CTS	8	8	input	output
Data Terminal Ready	DTR	4	4	output	input
Data Set Ready	DSR	6	6	input	output
Data Carrier Detect	DCD	1	1	input	output

ELO E06A transmits RxD and TxD signals. Control signals are not transmitted. The converter contains local interconnectors RTS-CTS and DTR-DST-DCD.

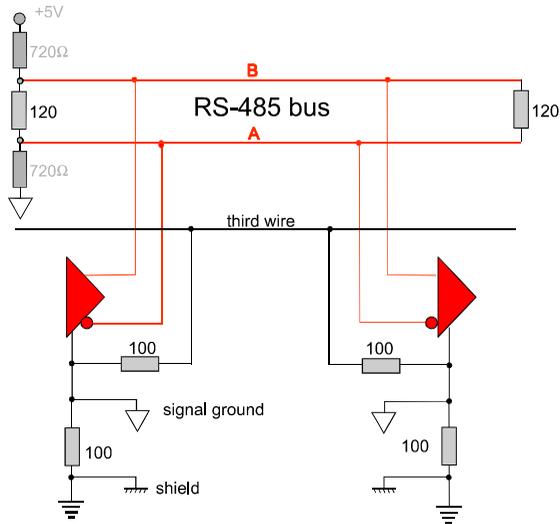
#### 3.2 RS-485 link connection

Clamps are used to converter connection to the link. Single DTE can be interconnected via bus (see Fig.) up to 32 partners.

The RS-485 line should be terminated with the 100-120Ω resistors on both ends



placed between A - B conductors (so-called passive terminators). These terminators are used for the converter impedance matching, undesirable echo suppression and they influence transfer immunity against interference.



To eliminate influence of the ground potentials differences each device is earthed on the neutral or the third conductor is used (see Fig.).

100 Ω resistors are needed in this case to eliminate currents resulting from the ground potentials differences. At the close of the chapter there is the description of the RS-485 interface connector together with an example of the passive terminator connection mode:

CLAMP (No.- name)	1(24V)	2(GND)	3(A)	4(B)
signal passive terminator	+9-24V	GND	A	B

The red LED indicates transmitted data, the green LED received ones.

### 3.3 Converter setting

To work properly, the converter needs transmitter operating mode setting and time out setting for switching off the transmitter  $\underline{\tau}$  (see chap. 2.0).

Switches, accessible on the RS-485 clamps side, are used to select the time out  $\underline{\tau}$ . Switches combinations typical of common communication rates are listed on the labels. Be aware of the fact, this setting refers to the time the transmitter is switched off from the last bit of the same polarity as the start bit. The time  $\underline{\tau}$  setting is needed in case all data bits in the last byte are of the stop bit polarity so the transmitter has to be switched on for the time sufficient to all data bits transmitting with reserve,

potential parity and the stop bit. If the last bit is of the equal polarity to the start bit in the last byte the transmitter has to be switched on for about time needed for another byte transmission. Setting shorter time  $\tau$  can be more convenient in this case.

For this reason, the table on the label should be looked as recommendation of suitable time

Rate bps	switches			
	5	4	3	2
1 200	Off	Off	Off	Off
2 400	On	Off	Off	Off
4 800	Off	On	Off	Off
9 600	On	On	Off	Off
19 200	Off	Off	On	Off
38 400	On	On	On	Off
57 600	Off	Off	Off	On
62 500	On	Off	Off	On
115 200	On	On	On	On

The switch allows “ECHO” mode to choose, i.e. mode in which terminal (RS-232) equipment receives all what occurs on the RS-485 bus and so its own data.

### 3.4 Power Supply Connection

The converter needs external power supply 9-24V/200 mA that is connected to the clamps marked 9-24V. The polarity is given by the labelled “+” sign. The input is protected against polarity reversing. The proper supply is indicated by the “POWER” LED.

## 4.0 Specifications

### 4.1 Electrical parameters

Interface

Transmitted signals

Control signals RS-232

RS-232 connector

Transmission mode

Power supply

Isolation voltage between interfaces

Permissible over-voltage on the line  
under ČSN 33 0420:

Required link impedance

RS-232/RS-485

TxD and RxD

interconnected locally RTS-CTS,  
DTR-DSR-DCD

DB9F, DCE

half-duplex, simplex

External DC supply 9-24V/200mA  
max. 3kV for 1 s

the line must not be exposed to the  
atmospheric discharge influences

100Ω

Power take off from the signal TxD, RTS typically 3mA

## 4.2 Other

Range without repeaters	1200 m
Maximum transmission rate	115 200 bps
Minimum AUT rate	1 200 bps
Dimension: width x length x height	55 x 100 x 24 mm
Weight	80 g
Stocking temperature	- 10° to +55 ° C
Working temperature	+ 0° to +50° C
Humidity	0 – 85% (non-condensing)

## 5.0 Testing

“POWER” has to light up when the power supply switching on. When transmitting, the red LED marked Tx has to blink. If ECHO switch is On the green LED Rx has to blink, too

## 6.0 Troubleshooting

Symptom	Action
Converter does not work after installation	Check if the link is connected properly if A-B contacts are not changed. Check the time constant selection accuracy. Check RS-232 connection.
“POWER”LED is not alight	Check the power supply.
Connection in normal operation quit working	Check the power supply. Check the cable connection. Use the test as with 5.0.

## 7.0 Ordering information

Supply code is ELO E06A.

