

*Let's communicate*



## **RS-232 / 20mA Interface Converter**



# **ELO E00Q**

# **Operation manual**



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## 1.0 Introduction

The RS-232 interface (V.24) is a common equipment of the devices in the computer technology and automation. The interface is designed for the point-to-point connection at the distance of the order of units of metres. To use the current loop interface for the longer distances, transmission is one of the options.

### 1.1 Use of the converter

Historically, the current loop is linked with the teletype technology that is why the TTY abbreviation (TeleTYpe) is often used to mark it. 50 bps was a typical rate of the teletype transmitted data at the distance of the order of kilometres. Now it is used to the data transmission at the range of hundreds of metres at the rates of the order of kilobits per second.

### 2.0 Operation principles

TxD signal of the terminal equipment is isolated and emitted to the transmitting current loop. The rated current via the current loop conforms the TxD idle state (negative polarity), 0 mA current conforms the reversed TxD state.

The 20mA current from the receiving loop is converted to the RxD signal. There is also the galvanic isolation between the loop and the RxD. The rated current via the receiving loop of 20mA equates the idle RxD state (negative polarity). Both loops are two-state and asymmetric.

### 3.0 Installation

When installing the converter there are two problems to be solved: the connection of individual interfaces and their supply.

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

Signals assignment to the contacts and TE (DTE) interconnection is in the following table:

Signal name	abbrev	TE connector (DB25M)	connector E00Q (DB25F)	transmis. direction	
				TE	E00Q
Signal Ground	SG	7	7	--	--
Transmitted Data	TxD	2	2	output	input
Received Data	RxD	3	3	input	output
Request To Send	RTS	4	4	output	input
Clear To Send	CTS	5	5	input	output
Data Set Ready	DSR	6	6	input	output
Data Terminal Ready	DTR	20	20	output	input
Data Carrier Detect	DCD	8	8	input	output

The modems transmit RxD and TxD signals only. Control signals are not transmitted. The modem contains local jumpers RTS-CTS and DTR-DST-DCD.

**!!! Be careful of a mistake !!!**

The converter is often connected to the TE via the cable which has been connected to the neutral (TxD and RxD signals are crossed). The cable has to be connected 1:1.

**3.2 Current loops´ connection**

Both transmitting and receiving current loop can be set to the active (A) and passive (P) mode. When in the active mode, the converter supplies the loop with the current, when in the passive mode the current is supplied via the opposite part.

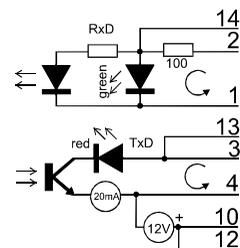
The transmitter limits the maximum current to the rated value via the loop. The transmitter short-circuit protection is made by 100Ω resistor. This precaution decreases the converter maximum range, or maximum loop resistor to be spanned. To avoid the resistor, the IN+A contact is used instead of IN+ resulting in the receiver voltage drop decrease.

The transmission rate and the link length to be spanned depend on the link parameters particularly on its capacity and resistance. There are only information data of the rate depending upon the cable length. The reported values are measured on the twisted pair of 200 Ω resistor and the capacity of 50nF per km.

Connector (Male/Female)		Loop mA	Loop		Rate kbps		Loop supply V	Isolation voltage V
RS232	line		mode	trans.	10m	1km		
DB25F	DB25M	20 / 0	A	A	115	9.6	9-24	3000
		20 / 0	A	P	115	9.6	9-24	3000
		20 / 0	P	P	115	9.6	0	3000

**3.3 Transmitter and receiver operation mode selection**

The transmitter and receiver operation mode (A=active= supplying power to the loop, P=passive, the power is supplied via the opposite device) can be selected via the connection of the DB25M connector contacts. The following table shows their importance.



The interface circuits' schematic representation of the current loop is in the adjacent figure.

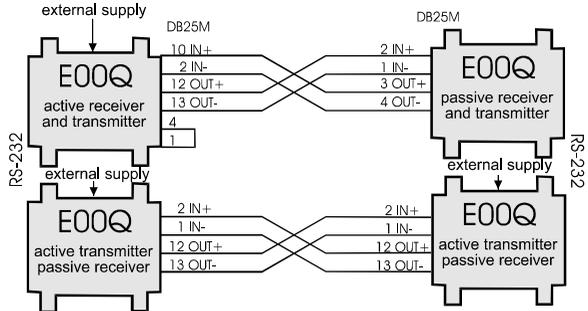
Transm	receiver	loop connector connection				connect
		IN+	IN-	OUT+	OUT-	
P	P	2	1	3	4	-
A	P	2	1	12	13	-
A	A	10	2	12	13	1- 4

### 3.4 Power supply connection

While working, the converter uses two power supplies **isolated to each other not to damage the RS-232 and the current loop isolation**. One source supplies the RS-232 interface of the converter the other supplies the transmitting and/or receiving loop of 20mA current.

#### The loop supply

The external power supply of 12V typically is necessary to be used if the transmitter or receiver operates in the (A) active mode. It is connected via the connector on the converter side or to the link connector – the positive terminal on 12-contact and the negative terminal on 4-contact.



The converter of the passive transmitter and receiver does not need any external power supply. There is the advantage to take such configuration when one converter has the active transmitter and receiver and the other is in the passive mode. Then only one external power supply on the active converter side is applied (see the Fig.).

#### RS-232 supply

The converter transmits the RxD signal to the TE. To supply the RxD, the energy of some of TxD, RTS and DTR signals from the TE (or their combination) is used, the polarity is optional in principle. The automatic TxD signal is used when in duplex operation mode and while transmitting in simplex. While receiving in simplex operation the missing TxD can be possibly replaced by DTR or RTS of the optional polarity (according to the TE connector signals).

### Special cases of RS-232 supply

The signal source is sometimes too soft or of too low open-circuit voltage level so the RxD generated level does not reach the values under the standard and the TE does not interpret the RxD properly. If the TxD signal source is soft the TE is necessary to dispose at least one of DTR, RTS signals. If the TxD off-load is of low level the DTR or RTS of the positive polarity are needed. There is the advantage to take DTR and RTS signals of the opposite polarity if it is possible.

### Problems of the battery-powered devices

The battery-powered devices switch off their RS-232 interface to save the energy and switch on only in case of RxD active signal. Since the ELO E00Q converter takes energy for the RxD from the TE interface (and it is switched off) the stalemate situation can be solved only via the DC external power supply of 9V placed between 4-7 (or 20-7) contacts.

## 4.0 Specifications

### 4.1 Parameters

Transmitted signal	TxD and RxD,
Control signals	are not transmitted, RTS-CTS DTR-DSR-DCD are interconnected locally
RS-232 interface type and connection	DB25F, DCE
Transmission mode	duplex, four-wire line simplex, two-wire line
Power supply	works without the power supply
Minimum RS-232 signals of DTE for duplex	TxD, RxD, GND,
Minimum RS-232 signals of DTE for simplex	TxD and GND or RxD and GND and DTR or RTS
Maximum data rate	115 200 bps
Minimum data rate	1 200 bps
Maximum link resistance to be spanned	400 $\Omega$ with 24V supply
Supply	external DC supply of 9-24V/50mA (necessary for the transmitter or receiver active mode only)
Isolation voltage between interfaces	max. 3kV for 1 sec

Power take-off from TxD, DTR,

RTS signals

Transmitting loop current (log.0 / log.1)

Current via receiver (log.0 / log.1)

Permissible over-voltage on the line

max. 10mA summarily, 5mA typically

20±3mA / 0-1mA,

4-25mA / 0-4mA

the line must not be exposed to the atmospheric discharge influences (II to III category)

under the ČSN 33 0420 standard impulses of 1ms width and input of up to 600VA

- 10° to +50° C

+ 5° to +50° C

Stocking temperatures

Working temperatures

## 4.2 Other

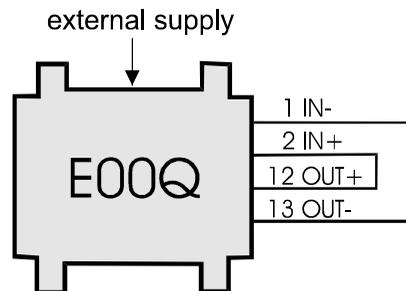
### **!!CAUTION!!**

Unless otherwise specified on the product, as for permissible over-voltage, it can be used in the environments where lightning over-voltage is not necessary to be considered.

Converters' connection to the lines exposed to the atmospheric electricity influences is prohibited unless separate line protection is carried out e.g. via the very fast lightning arrester!

## 5.0 Testing

The current loop connector is connected as with the figure. When 12V external power supply is connected the diodes have to light without the converter connection to the RS-232 device. When the RS-232 end device is connected to the communication programme (e.g. PC of the Hyper-terminal programme) the diodes start to blink. This effect is observable especially when the transmission of the low rate. In case of the negative result of the test (and good supply) the converter is defective and it is recommended to be send to the manufacturer directly or via the dealer.



## 6.0 Troubleshooting

Symptom	Action
The LED is not alight after installation	Check if the link is connected properly. Check the power supply. Check the mode selection accuracy. Use the test as with 5.0.
Converter does not work	Check RS-232 connection.
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 E00Q. The external power supply of 12V / 100mA is ordered separately, supply code is E0Q1.

## **Note**

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