Pair of RS-232 / 20mA Interface Converters

ELO E00H, ELO E00J
Operation manual

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   RS-232 Interface connection

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

Signal name	abbrev	TE connector (DB25M)	connector E00H,J(DB25)	transmis.direction	
				DTE	E00H,J
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

To distinguish the active (A) or passive (P) mode we have to know if the converter supplies the loop with the current or expects it from the opposite part. The E00H works in the active mode (supplies the current to both loops), the E00J model works in the passive mode. Both models are designed to the common application.

The current loop connectors are of the RJ11 type. The ELO E00H - ELO E00J interconnection see the figure (cable 1:1).

The transmitters of both models limit the maximum current via the loop to the rated value.
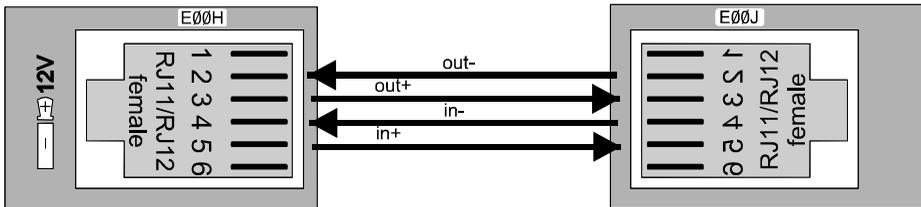
The transmission rate and the link length to be spanned depend on the link parameters particularly on its capacity and resistance. There are only information data of the rate depending upon the cable length. The maximum rate is of 115.2 kbps at the distance of the units of metres and 9600 bps at the distances of the hundreds of metres. The reported values are measured on the twisted pair of 200 Ω resistor and the capacity of 50 nF per km.

3.3 Power supply connection

For their working, both models need to obtain energy from the DTE RS-232 interface. The energy is supplied from the DTR and RTS signals of the optional polarity and from the TxD signal of the negative polarity (in the idle state). The DTE has to have at least one of these signals permanently active. It means it is not allowed to use the sleep mode when it waits for the converter "waking up" activity of the RxD signal.

The E00H model works in the active mode (supplies the transmitting and receiving loop with the current) and needs the other energy source which has to be **isolated to the DTE not to damage the RS-232 and the current loop isolation.** The 12V power supply, E0Q1 model can be of such source.

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 E00H and E00J converters take energy for the RxD from the DTE 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 of the DB25 connector.

4.0   Specifications
4.1   Parameters

Transmitted signals	TxD and RxD
Control signals	are not transmitted
Locally interconnected signals	RTS-CTS, DTR-DSR-DCD
RS-232 interface type and connection	DB25F, DCE
Transmission mode	duplex, four-wire line
	simplex, two-wire line
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	50 bps
Maximum link resistance to be spanned	400 Ω 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	max.10mA summarily, 5mA typically
Transmitting loop current (log.0 / log.1)	20±3mA / 0-1mA,
Current via receiver (log.0 / log.1)	4-25mA / 0-4mA
Permissible over-voltage on the line	the line must not be exposed to the atmospheric discharge influences impulses of 1ms width and input of up to 600VA

4.2   Other

Stocking temperature   - 10° to +50° C
Working temperature   + 5° to +50° C

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 arrestor!

5.0   Testing

The converters can be tested in pairs only. The RJ11 connectors for the current loops connection are connected as with 3.2chapter. When 12V external power supply is connected to E00H the diodes have to light without the converter connection to the RS-232 devices. 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 when the transmission of the low rate in particular.

6.0   Troubleshooting

Symptom	Action
The LED is not alight after installation Converter does not work	Check if the link is connected properly. Check the power supply. Use the test as with 5.0. 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 E00H and ELO E00J. The external power supply of 12V/100mA is ordered separately, supply code is E0Q1.

Note