TRU-5322E

Converter, repeator, separator
RS232, RS485 / RS422, RS485

Table of Contents

Symbols and markings

Advice.

Suggests actions that help solve a problem and / or diagnose it. Their implementation is not mandatory and does not affect the correct functioning of the device.

Attention!

Important information or activity that is important for the proper operation of the device. Its implementation is not mandatory. Its absence will not cause any danger to man and device. The only consequence of not using it may be incorrect operation of the device.

Warning!

Indicates important actions which, if incorrectly carried out, may result in danger to the operator or damage to the device.

General installation and security rules

The device should be installed in accordance with the purpose specified in the documentation. Meeting this condition is the basis for ensuring safety and correct operation of the device. If the device is used improperly or not in accordance with its intended use, it may become a source of danger. The manufacturer is not liable for damages resulting from the use of the device improperly or not in accordance with the intended use. Modifications to the device are not allowed and may become a source of danger.

1. Intended use

The TRU-5322E converter is used to convert RS232 or RS485 asynchronous serial transmission signals to RS422 or RS485. During conversion, it does not require any additional signals controlling the direction of transmission. The direction change is automatic. The transmission of protocols in the upper layers is transparent. The converter simultaneously operates as an amplifier (repeater) and separator. After passing through the converter, the signal is regenerated and amplified, enabling the extension of the RS485, RS422 bus by another segment. The COM1 port (connectors 1-6) is galvanically isolated from the COM2 port (connectors 7-10) and power supply. Therefore, damage to one part does not transfer to the other.

Main use of TRU-5322E:

- matching transmission standards, converter, separator, amplifier (repeater):
    1. converter, separator RS232-RS485,
    2. converter, separator RS485-RS232,
    3. converter, separator RS232-RS422,
    4. converter, separator RS422-RS232,
    5. converter, separator RS485-RS422,
    6. converter, separator RS422-RS485,
    7. repeater, separator RS485-RS485.
- constrction of transmission network with star topology,
- can work as a protector,
- improves the quality and efficiency of transmission (automatic frame forming technology).

FEATURES:

- baud rate from 50b/s to 375 kb/s,
- word length control,
- data flow control (enabled / disabled parity check),
- galvanic isolation between COM1 port and COM2 port and power supply, 2.5kV ,
- supply voltage from 5V to 30V (stabilized)
- low power consumption, up to 700mW
- protection of the RS422 and RS485 lines against surges,
- possibility of flexible connection of terminators of RS422, 485 port lines,
- operating temperature range from -30 ° C to 65 ° C,
- LED indicators of power and data flow.

2. Device parameters

2.1. Technical specifications

The technical parameters of the module are presented in the table Tab. 2.1.

Tab. 2.1 Technical parameters of the TRU-5322E

Parameter	Description
Baud rate	50b/s, 75b/s, 150b/s, 300b/s, 600b/s, 1.2kb/s, 2.4kb/s, 4.8kb/s, 9.6kb/s, 19.2kb/s, 38.4kb/s, 57.6kb/s, 115.2kb/s, 187.5kb/s, 230.4kb/s, 375kb/s
Word Length	7, 8 bits
Parity check	on / off
Number of STOP bits	1, 2
RS232 specification	According to EIA-232E i CCITT v.28
RS232 line support	TxD i RxD
ESD protection RS232	ESD protection according to IEC 1000-4-2 (801.2) +/- 8 kV contact discharge +/- 15 kV air gap discharge
The maximum lengthof the RS232	15m
RS232 connection	Detachable terminals. Wire 0,2...2,5 mm
RS422/RS485 specification	According to EIA/TIA-422 i EIA/TIA-485
Transmission direction control	automatically
ESD protection RS422/RS485	+/-15 kV using the Human Body Model +/- 8 kV contact discharge method specified in IEC 100-4-2 +/- 15 kV air gap discharge
Overvoltage and short-circuit protection of the RS422 / RS485 line	100mA 600W
Terminators for the RS422 / RS485 line	Built-in, Dipswitche
Max. number of devices on one line	32
The maximum length of the RS422 / RS485 line	1200m (for baud rate 9600kb/s)
RS422,RS485 connection	Detachable terminals. Wire 0,2...2,5 mm¸
Supply voltage	7..35VDC
Power consumption	700mW
Galvanic isolation	Between COM1 and COM2 and power supply 2,5kV
Isolation test	2.5 kVrms, 50Hz, 1min 1 kVrms, 50Hz, 1min
Working temperature	-30°C...+65°C
Storage temperature	-40°C...+70°C
Relative humidity of work	20% … 95%
Relative humidity of storage	20% … 95%
IP protection of terminals	IP-20 wg DIN 40050/EC 529
IP protection of housing	IP-43 wg DIN 40050/EC 529
Installation	On DIN rail PN/E-06292 or DIN EN 50 022-35
Weight	116 g
Dimensions with connectors	36 x 108 x 58 mm

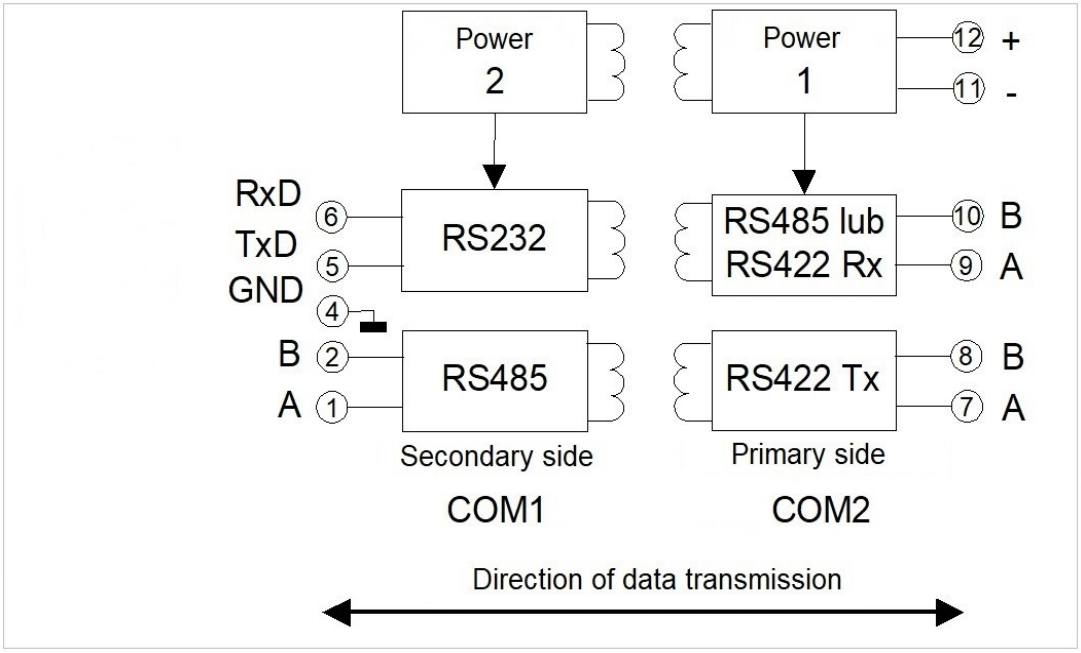
2.2. Block diagram

Fig. 2.1 shows the block diagram of the TRU-5322E. It consists of two separated parts, marked as primary side COM2 (connectors 7-12) and secondary side COM1 (connectors 1-6). Data transmission can only take place between the primary and secondary side, never within one part. Both sides are fully equivalent, i.e. the master device initiating the transmission, can be located either on the primary or secondary side. There are two types of port on the secondary side: RS232 (connectors 4, 5 i 6) and RS485 (connectors 1 i 2). These inputs are logically connected to each other inside the device, which is why at a given moment the signal can be fed to only one of them: RS232 or RS485. On the primary side there are ports RS422 (connectors 7, 8, 9 and 10) and RS485 (connectors 9, 10). The port is selected using the SW1-8 dipswitch located on the front panel, under cover. Power is supplied from the primary side through connectors 11 and 12, and then transferred to the secondary side by means of a separating transformer. Data is transferred between primary and secondary using induction transponders.

Attention!

If the RS485 or RS422 port is not used, the line terminator should be enabled on it. This eliminates unwanted signals that may induce at its input.

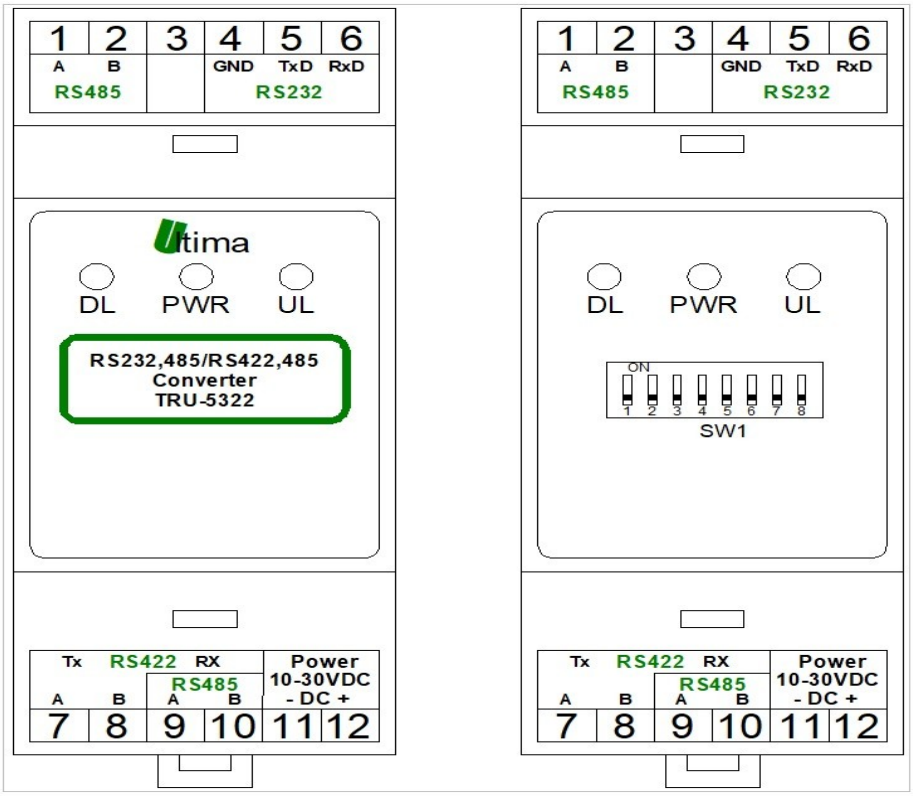
Fig. 2.1 Block diagram of the converter TRU-5322E



2.3. Description of connectors

The location of the TRU-5322E module connectors is shown in the figure Fig. 2.2 The meaning of individual connectors is described in the table Tab. 2.2. At the top of the converter are the RS485 and RS232 connectors of the COM1 port. The connector 3 inside is not connected. In the lower part there are RS422 and RS485 connectors on the COM2 port and power module connectors.

Fig. 2.2 Front view of the TRU-5322E converter connectors

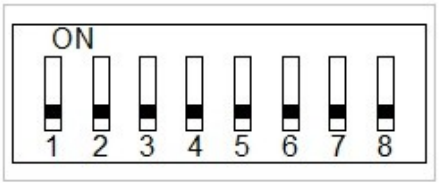


Tab. 2.2 Description of TRU-5322 connectors

Connector number	Description
1	A – RS485 (COM1)
2	B – RS485 (COM1)
3	not connected
4	GND1 – RS232 lub RS485 (COM1)
5	TXD – RS232 (COM1)
6	RXD – RS232 (COM1)
7	A (Tx+) – RS422 (COM2)
8	B (Tx-) – RS422 (COM2)
9	A (Rx+) – RS422 (COM2), A – RS485 (COM2)
10	B (Rx-) – RS422 (COM2), B – RS485 (COM2)
11	power -
12	power+

On the front plate under the protective cover is placed SW1 dip-switch, which is used to configure RS232, RS485, RS422 transmission parameters - baud rate, word length, parity and STOP bit count, type of RS422 or RS485 transmission. Table Tab. 2.3 contains the meaning of SW1 dip-switches.

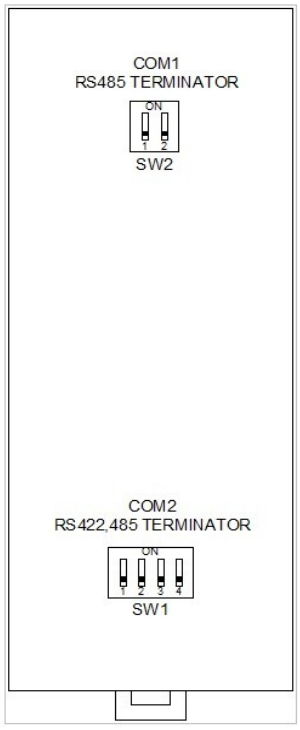
Tab. 2.3 Description of the SW1 dip-switch

	Connector number	Description
 *SW1 dip-switch*	1, 2, 3, 4	Baud rate
	5	word length
	6	Parity check
	7	Number of STOP bits
	8	Type of transmission 485, 422

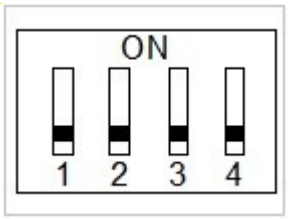
To uniquely determine the level of incoming signals, the RS485, RS422 lines on both sides must be matched. This is done by terminators located in devices equipped with RS485, RS422 ports.

In the converter, the line terminators are located on the motherboard. They are available after removing the housing fastening part (back cover). The COM1 port terminator is activated by the SW2 switch, the COM2 port by the SW1 switch. The arrangement of terminators is shown in the figure Fig. 2.3., meaning of switches in tables Tab. 2.4 i Tab. 2.5.

Fig. 2.3 Rear view of the TRU-5322E converter connectors



Tab. 2.4 Description of the SW1 switch



Dip-switch SW1

Switch number	Description
1, 2	terminator RS422-Rx, RS485 (COM2)
3, 4	terminator RS422-Tx (COM2)

Tab. 2.5 Description of the SW2 switch

Dip-switch SW2

Switch number	Description
1, 2	terminator RS485 (COM1)

2.4. Description of signaling LEDs

There are three signaling LEDs on the front wall of the device. The PWR LED indicates that the power is on , others determine the direction of transmission in individual branches. Description of diode meaning is presented in the table Tab. 2.6. During data transfer, the DL and UL LEDs should blink. The blinking intensity depends on the baud rate and the amount of data being transferred.

Tab. 2.6 Meaning of the signaling diodes

Diode	Color	Description
PWR	red	Power on
DL	green	Data transfer from COM1 port to COM2 port
UL	yellow	Data transfer from COM2 port to COM1 port

Attention!

After connecting the converter to the network, only the red LED (PWR) should be lit in the idle state. LEDs DL and UL should be off. If any of the DL or UL LEDs lights up continuously , it means an error in connecting transmission cables. In this case, check:

– correct connection of A and B cables in RS485,

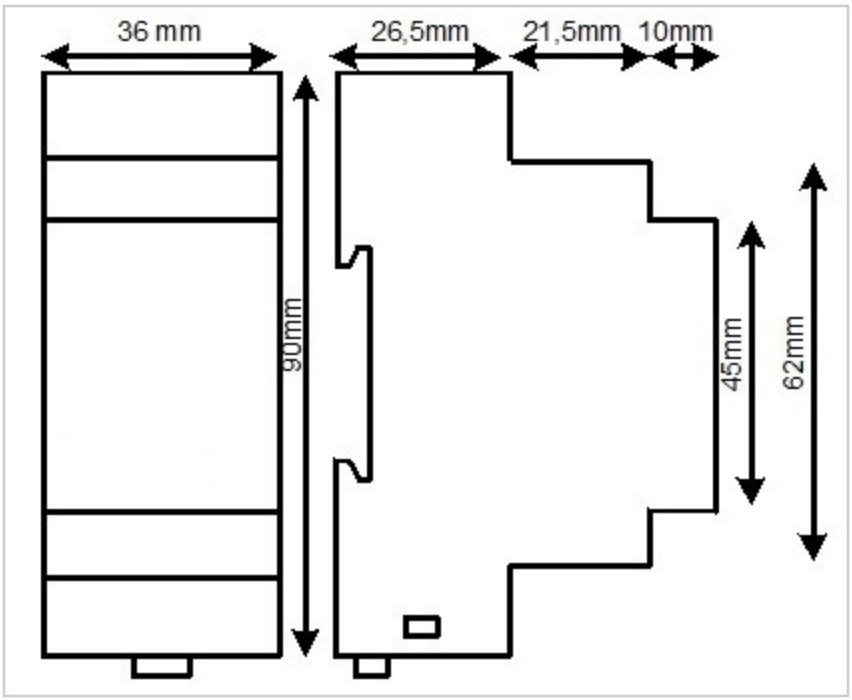
– Is the line terminator (connectors 1 and 2) corresponding to RS485 connected (when using RS232)?

– Is the line terminator (conectors 7 and 8) corresponding to RS422 connected (when using RS485 – COM2)?

2.5. Dimensions

The dimensions of the TRU-5322 module are shown in the figure Fig. 2.4.

Fig. 2.4 Dimensions of TRU-5322



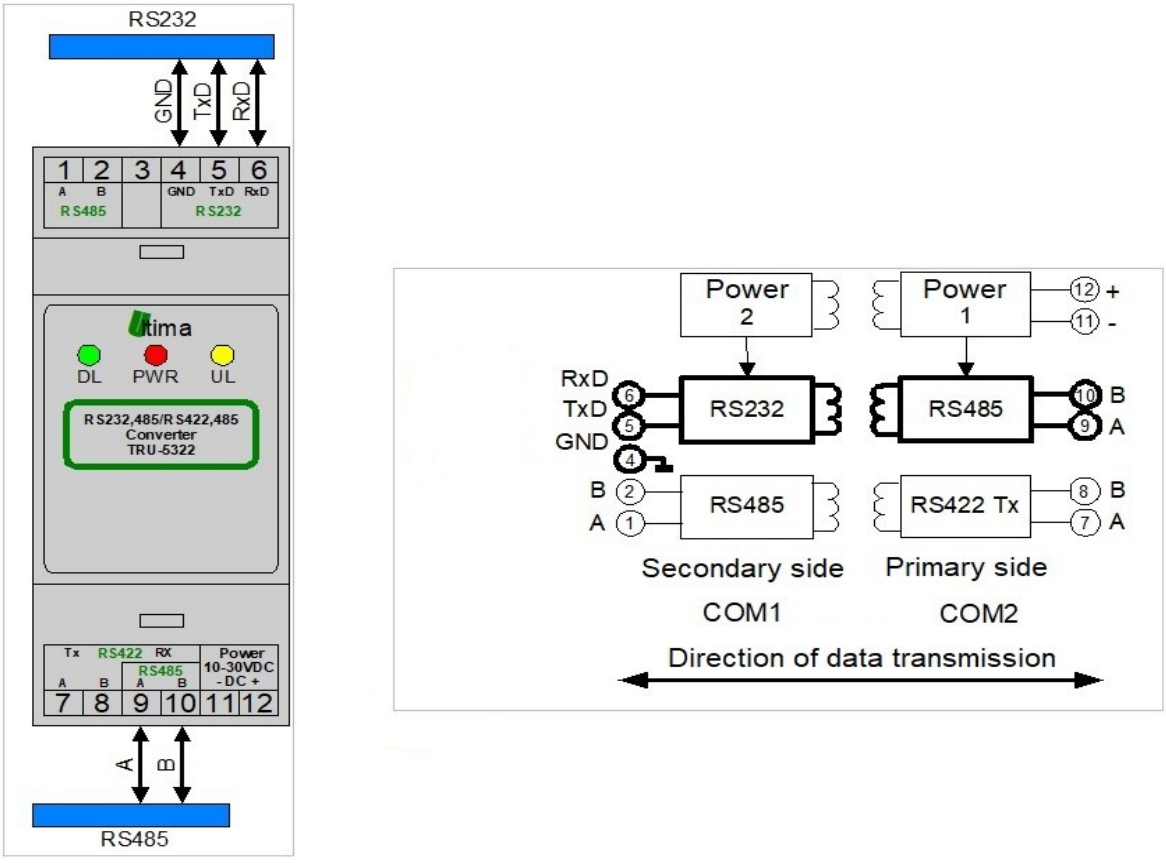
3. Installation

The TRU-5322E converter can be configured in 4 different ways:

- the converter, separator RS232 to RS485 and RS485 to RS232 with connectors 4, 5, 6 used for RS232 (Fig. 3.5),
- the converter, separator RS232 to RS422 and RS422 to RS232 with connectors 4, 5, 6 used for RS232 (Fig. 3.6),
- the converter, separator RS485 to RS422 and RS422 to RS485 (Fig. 3.7),
- the repeater (amplifier), separator RS485 to RS485 (rys. 3.8).

The repeater (amplifier) is used in places where distances between stations exceed 1200m.

Fig. 3.5 The converter, separator RS232 to RS485 and RS485 to RS232 with connectors 4, 5, 6 used for RS232



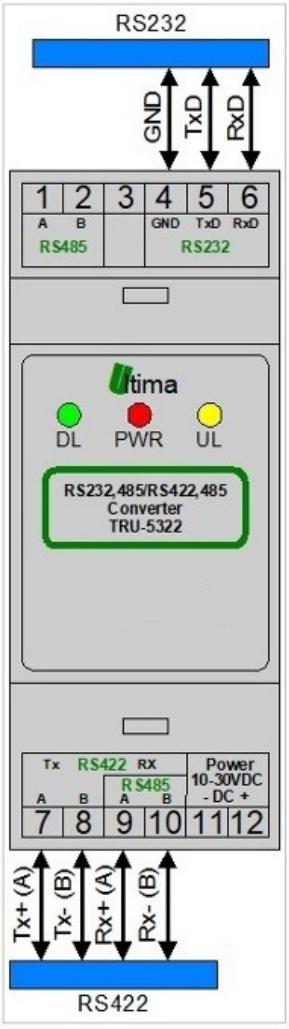
Attention!

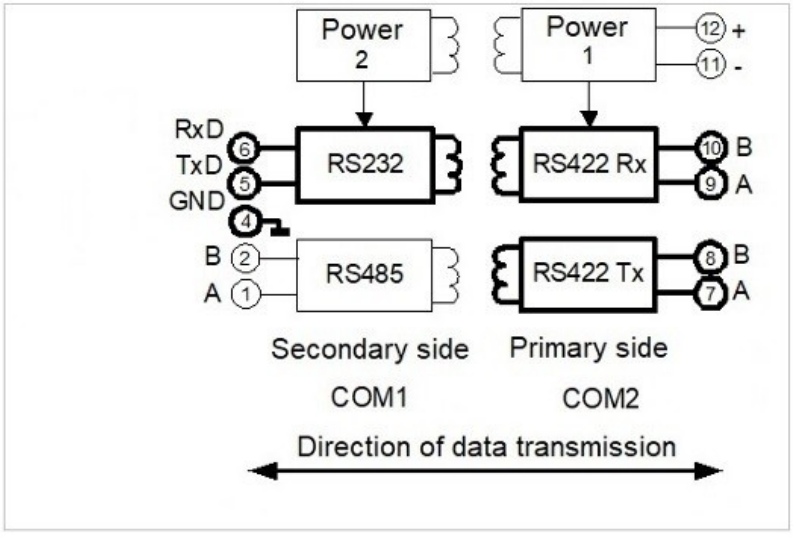
In the RS232 / RS485, RS485 / RS232 configuration, connectors 1 and 2 should not be connected. The RS232 signal should be connected to connectors 4, 5, 6.

The line terminator located on the back border, corresponding to the unconnected RS485 port (1,2 connectors) should be ON (dipswitch positions SW2-1, SW2-2 ON).

The choice of port configuration as RS485 (connectors 9,10) on the primary side is made by means of the SW1 dipswitch located on the front panel, setting the switch from position 8 to OFF (SW1-8 OFF).

Fig. 3.6 The TRU-5322E converter in RS232 to RS422 and RS422 to RS232 configuration, with 4, 5, 6 connectors used for RS232

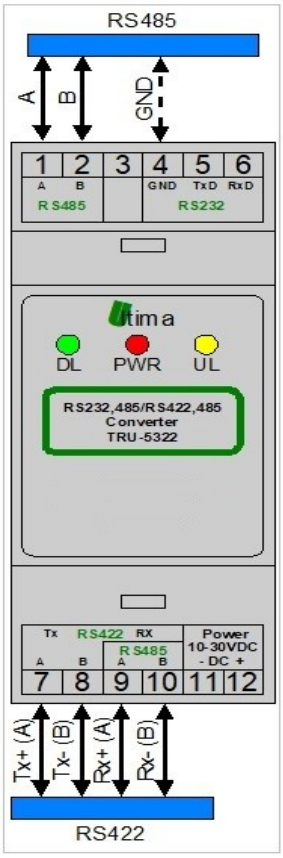


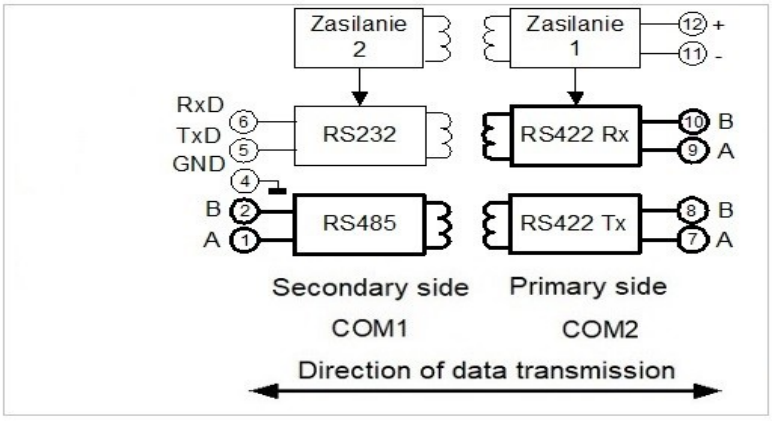


Attention!

1. In the RS232 / RS422, RS422 / RS232 configuration, connectors 1 and 2 should not be connected. The RS232 signal should be connected to connectors 4, 5, 6.
2. The line terminator on the rear panel, corresponding to the unconnected RS485 port (connectors 1, 2) should be ON (SW2-1, SW2-2 ON dipswitch positions).
3. The choice of port configuration as RS422 (connectors 7, 8, 9, 10) on the primary side is made by means of the SW1 dipswitch located on the front panel, setting the switch from position 8 to ON (SW1-8 ON).

Fig. 3.7 The TRU-5322E converter in RS485 to RS422 and RS422 to RS485 configuration

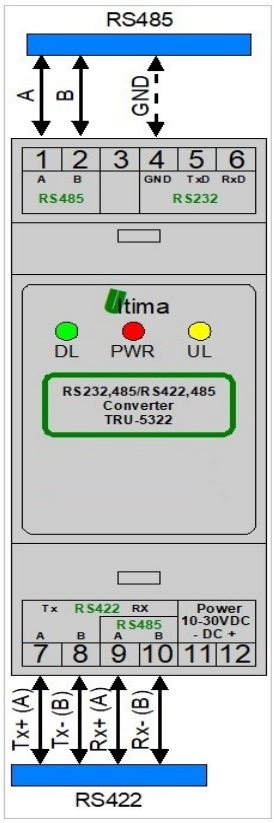


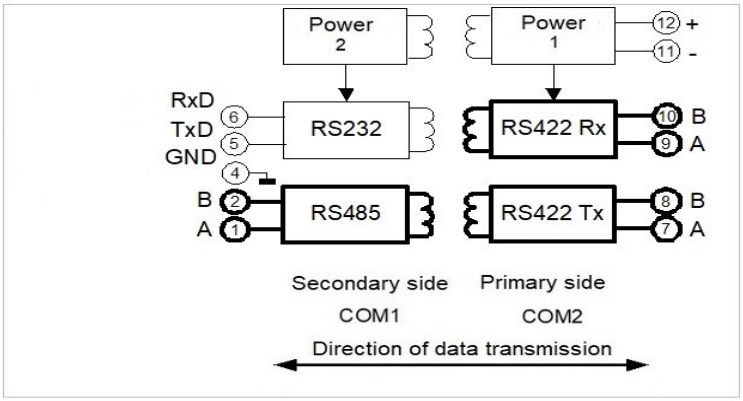


Attention!

1. In the RS485 / RS422, RS422 / RS485 configuration, connectors 4, 5 and 6 should remain unconnected.
2. The choice of port configuration as RS422 (connectors 7, 8, 9 and 10) is made by means of the SW1 dipswitch located on the front panel, setting the switch from position 8 to ON (SW1-8 ON).

Fig. 3.8 The TRU-5322E converter in amplifier configuration, RS485 to RS485 separator





Attention!

1. In the RS485 / RS485 configuration, connectors 5 and 6 should remain unconnected.
2. The configuration of the port as RS485 (connectors 9,10) on the primary side is selected by means of the SW1 dipswitch located on the front panel, setting the switch from position 8 to OFF (SW1-8 OFF).

4. Setup

Transmission parameters are set using dipswicht SW1, located on the front panel under a plastic cover. The cover must first be removed, slightly prying up with a flat screwdriver in the places of the gaps. The configuration consists in setting:

- baud rate switch 1, 2, 3, 4,
- word length switch 5,
- parity check switch 6,
- bit STOP switch 7,
- type of RS on COM2 switch 8.

Configuration details are presented in the table Tab. 4.7.

Advice.

Example: The converter should be set in the configuration: baud rate 9.6kb/s, 8-bit word, without parity check, 1 bit STOP, on the primary side of COM2 as RS485.

Switch SW1: 1 2 3 4 5 6 7 8

Setting: 1 0 0 0 0 1 1 0

Tab. 4.7 Description of the transmission parameters configuration

Switch SW1 on the front panel: 1 – ON, 0 – OFF												
1	**2**	**3**	**4**	**Baud rate**	**5**	**word length**	**6**	**Parity check**	**7**	**Bit STOP**	**8**	**Type of RS**
0	0	0	0	50 b/s	0	8 bits	0	ON	0	2 bits	0	RS485
0	0	0	1	75 b/s	1	7 bits	1	OFF	1	1 bit	1	RS422
0	0	1	0	150 b/s								
0	0	1	1	300 b/s								
0	1	0	0	600 b/s								
0	1	0	1	1.2 kb/s								
0	1	1	0	2.4 kb/s								
0	1	1	1	4.8kb/s								
1	0	0	0	9.6kb/s								
1	0	0	1	19.2 kb/s								
1	0	1	0	38.4 kb/s								
1	0	1	1	57.6 kb/s								
1	1	0	0	115.2 kb/s								
1	1	0	1	187.5 kb/s								
1	1	1	0	230.4 kb/s								
1	1	1	1	375 kb/s								

To match the branches of the RS485 line, connect the line terminators at both ends. In the converter, the line terminators are located on the motherboard. They are available under the back cover. The table Tab. 4.8 shows how to configure the RS485 branch of the COM2 port. In the table Tab. 4.9 is presented the method of connecting the COM1 port terminator.

Attention!

The settings of switches 1-2, 3-4 must be the same, i.e. pair must be either ON or OFF. Setting one switch in pair as ON, the other as OFF may cause indeterminate states on the line causing malfunction of the device.

The recommended way to terminate the RS485 line is shown in the drawings Fig. 4.9 i Fig. 4.10. In the network configuration only the line terminator is ON at the beginning of the RS485 line and at the end of the RS line.

Attention!

For overhead RS485, RS422 lines it is recommended to use additional lightning arresters of the OPR-5320 series to protect devices against lightning.

Tab. 4.8 Description of the COM2 port line terminators configuration

Switch SW1: 1 – ON, 0 – OFF					
1	**2**	**Line terminator COM2, RS422-Rx, RS485**	**3**	**4**	**Line terminator COM2, RS422-Tx**
0	0	OFF	0	0	OFF
1	1	ON	1	1	ON

Tab. 4.9 Description of the COM1 line terminators configuration

Switch SW2: 1 – ON, 0 – OFF		
1	**2**	**Line terminator COM1**
0	0	OFF
1	1	ON

Fig. 4.9 Way of terminating the RS485 line in a point-to-point configuration

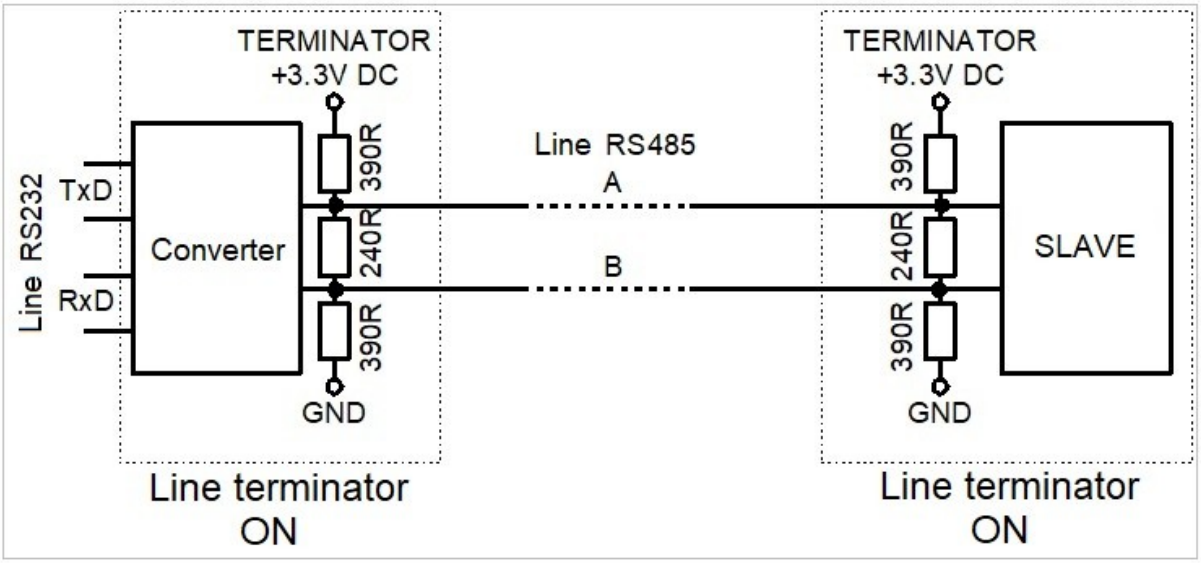
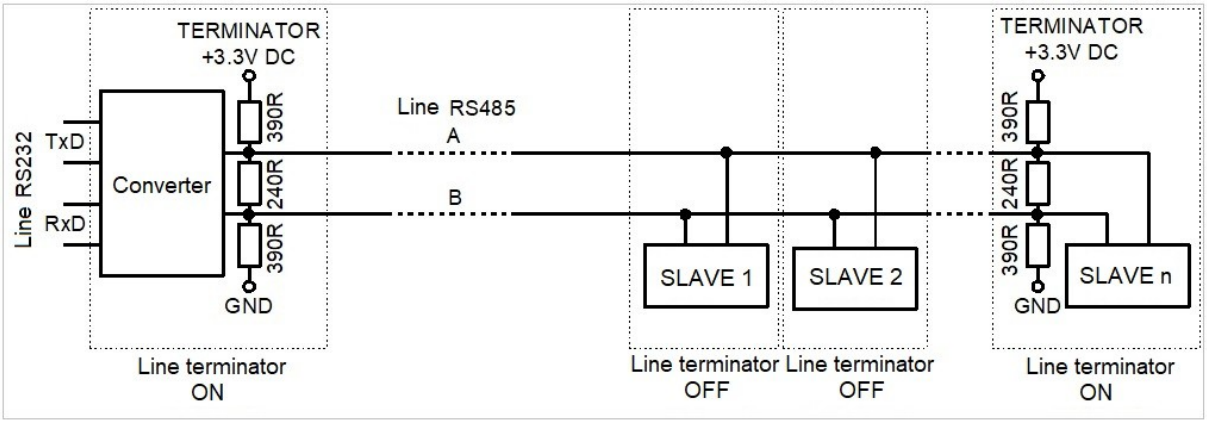


Fig. 4.10 Way of terminating the RS485 line in the network configuration



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