



RS232 <> RS485/422

# UC485

RS232 to RS485 or RS422 line converter  
with isolation



# UC485

## Datasheet

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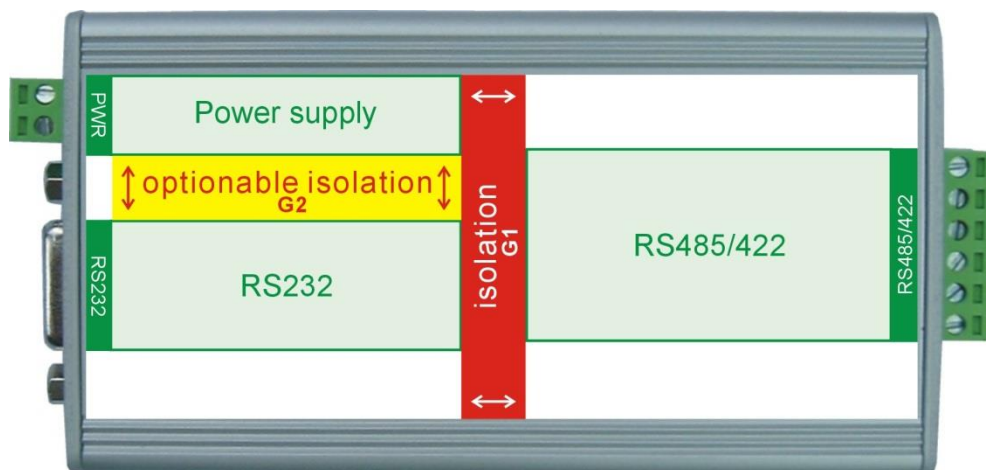


Fig. 1 – Principal diagram of isolation

## DESCRIPTION

The UC485 module converts an RS232 line to RS485 or RS422. The module settings can be set with the aid of switches, as described below. The green LED indicates that the module is ON; the yellow indicators show the RxD and TxD status.

## FEATURES

- Lines can be set: RS485, RS422, and RS422 multimaster
- Transmission speed up to 480 kBd
- Direction control on the RS485 line can be automatic or by DTR signal (whose polarity can be set)
- The RS485/422 line (including the grounding) is completely isolated from RS232 and from the power supply (this isolation is provided as standard for all types)
- Optionally, grounding of the power supply and grounding of the RS232 line can be isolated from each other
- The RS485/RS422 line is over voltage protected
- The ON and data flow statuses are indicated by LED indicators – the unit activation is easy
- A built-in optional termination, including resistors which define the line's idle status
- Power supply 7 to 40 V (depending on the type, also 36 to 75 V or 5 V)
- D-SUB 9 connectors or a slip-on termination board
- Dimensions 105 × 55 × 24 mm, optionally secured to a DIN strip

## INSTALLING OPTIONS

### Holder:

- Without a DIN rail holder (*standard*)
- With a DIN rail holder

### RS485/422 connection:

- D-SUB 9M (*type UC485C*)
- Slip-on terminal board (*type UC485S*)

### Power supply:

- 7 to 40 V <sup>1</sup> (*standard configuration*)
- 5 V ±10% <sup>1,2</sup>
- 4.5 V ±10% <sup>2,3</sup>
- 9 V ±10% <sup>2,3</sup>
- 18 V to 36 V <sup>2,3</sup>
- 36 V to 75 V <sup>2,3</sup>



Fig. 2 – UC485S

Please do not hesitate to contact us if you have specific requirements for the UC485 module's configuration and functionality.

<sup>1</sup> The RS485/422 line (including the grounding) is completely conductively separated from RS232 and from the power supply (G1 separation cf. Fig. 1). The power supply and the RS232 line have common grounding.

<sup>2</sup> The time limit for delivery of this configuration is between one and three weeks.

<sup>3</sup> The RS232 line's grounding is conductively separated from the power supply's grounding (cf. Fig. 1 to see the G2 separation).

**TECHNICAL PARAMETERS**

**General**

- Power supply voltage .....7 V to 40 V (optionally, 4.5 – 75 V) with protection from polarity reversal
- Power supply connector .....Slip-on connector board
- Isolation .....1,000 V
- Maximum transmission speed .....480 kBd
- Operating temperature.....-20 °C to +70 °C

**RS485/422:**

- Terminal resistors ..... 120 Ω
- Resistors which define the idle status..... 680 Ω
- Maximum number of connected devices ....31
- Voltage overprotection.....yes, 12 V bipolar transil diodes
- UC485C connection .....D-SUB 9M
- UC485S .....slip-on connector board

**RS232:**

- Voltage overprotection..... 15 kV
- Connection .....D-SUB 9M

**Connector pins**

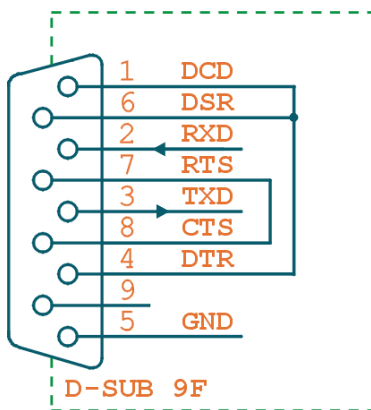


Fig. 3 – RS232 pins

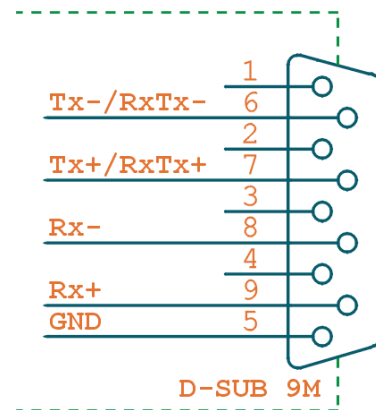


Fig. 4 - RS485/422 pins on UC485C



Fig. 5 – Power supply connector



Fig. 6 – RS485/422 pins on UC485S

Pin	Description
1	U <sub>OUT</sub> (5V/15mA)
2	GND
3	Tx+/RxTx+
4	Tx-/RxTx-
5	Rx+
6	Rx-

## SETTINGS

### Modes

The communication modes are set by switches on the front panel.



Fig. 7 – Front panel switches, module UC485 (they are all OFF in this figure)

	SW3	SW4	SW7	SW8	Mode
RS485	OFF	ON	OFF	OFF	Automatic control When transmitting data from RS232 to RS485, the converter is automatically switched to transmission. Upon completion of the transmission, it is switched to receipt after a short delay. The duration of this delay can be set according to Table 2 on page 8.
	OFF	OFF	OFF	ON	DTR control Transmission to the RS485 line is controlled by positive polarity of the DTR signal on the RS232 line.
	OFF	OFF	ON	OFF	$\overline{\text{DTR}}$ control Transmission to the RS485 line is controlled by negative polarity of the DTR signal on the RS232 line.
RS422	ON	OFF	OFF	OFF	Standard RS422 Bidirectional ("full duplex") communication; the output line driver is connected all the time.
RS422 Multimaster	ON	ON	OFF	OFF	Automatic control – multimaster When transmitting data from RS232 to RS422, the converter is automatically switched to transmission. Upon completion of the transmission, it is disconnected after a short delay. The duration of this delay can be set according to Table 2 on page 8.
	ON	OFF	OFF	ON	DTR control – multimaster Transmission to the RS422 line is controlled by positive polarity of the DTR signal on the RS232 line.
	ON	OFF	ON	OFF	$\overline{\text{DTR}}$ control – multimaster Transmission to the RS422 line is controlled by negative polarity of the DTR signal on the RS232 line.

Table 1 – Settings of the communication line modes

## Line termination and idle mode

### TERM485

This device connects the impedance termination of the RS485 or RS422 line on the transmitter's side. It prevents signal from reflection at the line ends. These resistors should be connected at both ends of the communication line.

### TERM422

This device connects the impedance termination of the RS422 line on the receiver's side. It prevents signal from reflection at the line ends. These resistors should be connected at both ends of the communication line.

### BIAS485

This device connects the resistors which define the idle mode of the RS485 or RS422 line on the transmitter's side. They determine the idle-status levels of the communication line. (More detailed information can be found in the section "Idle mode" on page 10.)

## Automatic control settings

When automatic (time) control is used for the RS485 or RS422 line, the value T of the time delay can be set, for which the driver remains switched to transmission.

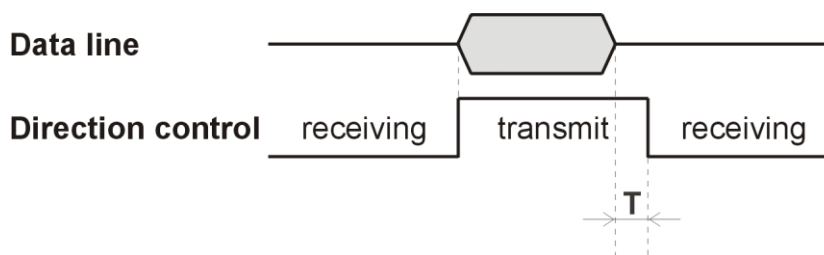


Fig. 8 – Time delay for which the driver remains switched to transmission

The default value of this delay is 460  $\mu$ s; it can be changed using jumpers inside of the module.

First open the module case. Unscrew the two screws (opposite to each other) on the module case's bottom side, loosen the screws on the top lid, and tilt the top lid out.

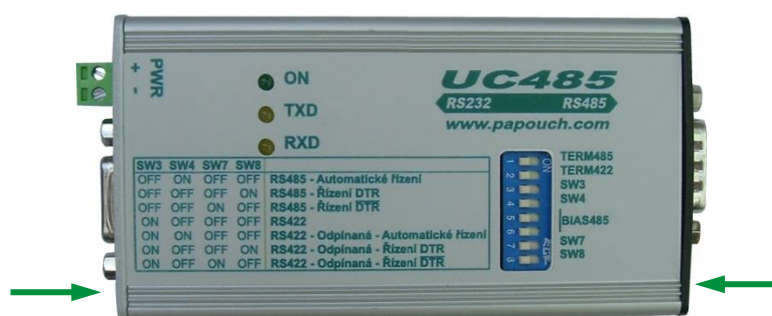


Fig. 9 – Locations of the screws securing the top lid

There are four jumpers inside.

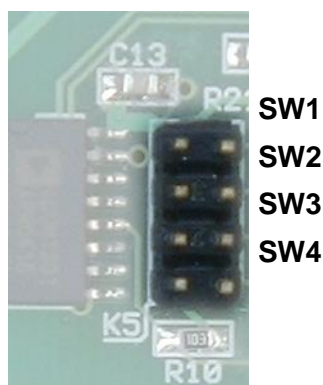


Fig. 10 – Jumpers for setting the time delay value

The jumpers' configuration defines the time delay value  $T$ . The default value of this delay is  $460\ \mu\text{s}$ ; it can be changed using jumpers inside of the module. The configurations and their meanings are shown in the Table below.

SW1	SW2	SW3	SW4	Delay value	Recommended for speed
OFF	OFF	OFF	OFF	1.9 ms	< 19,200 Bd
ON	OFF	OFF	OFF	460 $\mu\text{s}$	19,200 or 38,400 Bd (factory default)
OFF	ON	OFF	OFF	140 $\mu\text{s}$	57,600 or 115,200 Bd
OFF	OFF	ON	OFF	33 $\mu\text{s}$	
OFF	OFF	OFF	ON	9 $\mu\text{s}$	
OFF	OFF	ON	ON	7 $\mu\text{s}$	

Table 2 – Time delay value setting



## Installation for the RS485/422 line

The following steps are used for the UC485 converter installation for communication on an RS485 line:

- 1) Set the switches SW3 through SW8 according to Table 1 on page 6.
- 2) Connect the RS485 wires to the D-SUB 9M connector according to Table 3. (Cf. the connector diagram on page 5.)

Wire	D-SUB 9M pin	Slip-on connector	Comment
RxTx+ (A)	7	3	↔
RxTx- (B)	6	4	↔
SGND	5	2	grounding of signal

Table 3 – RS485 line connection

- 3) Connect the RS232 wires to the D-SUB 9F connector according to Table 4 using an uncrossed cable.

Wire	UC485 D-SUB 9F	RS232 connection on PC		Comment
		D-SUB 9	D-SUB 25	
TxD	3	3	2	Data transmitted from a PC
RxD	2	2	3	Data received to a PC
GND	5	5	7	grounding of signal
DTR <sup>4</sup> or RTS	4	4	20	direction control
		7	4	

Table 4 – RS485 line connection

- 4) If the converter is at a line endpoint, the termination resistors should to be connected by a TERM485. Switches consider connection of resistors which define the idle status.
- 5) Connect to the power supply.

<sup>1</sup> The DTR or RTS signal is only used within modes with the DTR line control. The mode settings are described on page 6 under "Modes".

**Idle mode**

When communicating on the RS485 line or the RS422 multimaster line, there may be a no-transmission status (all lines are in the receiving mode). In this case, the status of the line is undefined and it is extremely sensitive to any induced voltage (interference), which is deemed incoming signals. Therefore an idle mode should be defined by connecting suitable resistors to a line. If the line is long, the best point is at the UC485 end-of-line modules or equipment.

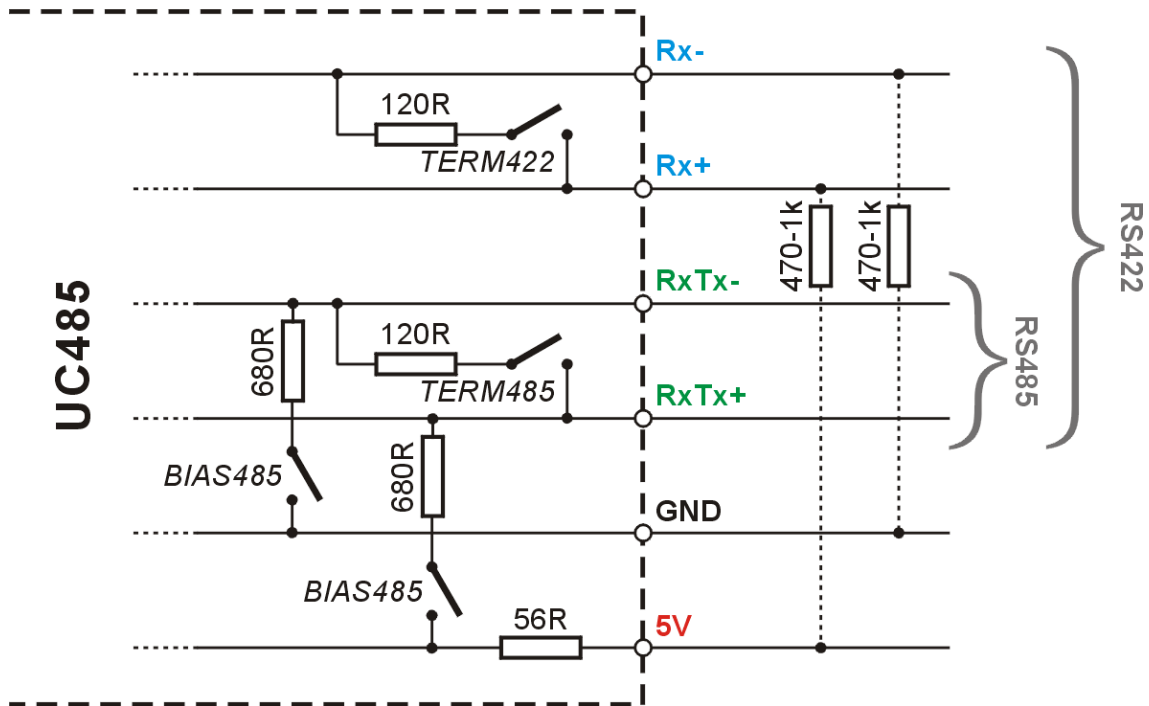


Fig. 11 – Connection of resistors which define the idle mode

With the UC485 converter, built-in resistors can be used, connected by the BIAS485 switches; or the resistors may be connected directly to the RS485 connector (cf. Fig. 11). For long lines, the resistor values should be higher and the termination should be connected simultaneously. SGND can also be used for connection of the cable shielding contact.

## Installation for the RS422 line

The following steps are used for the UC485 converter installation for communication between two devices on an RS422 line:

- 1) Set the switches SW3 through SW8 according to Table 1 on page 6.
- 2) Connect the RS422 leads to the D-SUB 9M connector according to Table 5 (a drawing of the connectors is on page 5).

Wire	D-SUB 9M pin	Slip-on connector board	Comment
Tx+ (A)	7	3	←
Tx- (B)	6	4	←
Rx+ (A')	9	5	→
Rx- (B')	8	6	→
SGND	5	2	grounding of signal

Table 5 – RS422 line connection

- 3) Connect the RS232 leads to the D-SUB 9F connector according to Table 6 using an uncrossed cable.

Wire	UC485 D-SUB 9F	RS232 connection to PC		Comment
		D-SUB 9	D-SUB 25	
TxD	3	3	2	Data transmitted from a PC
RxD	2	2	3	Data received to a PC
GND	5	5	7	grounding of signal
DTR <u>or</u> RTS <sup>5</sup>	4	4	20	disconnection of exciter
		7	4	

Table 6 – RS232 line connection

- 4) If the converter is at a line endpoint, the termination resistors are to be connected by the TERM422. For the multimaster mode, consider connection of resistors which define the idle status.
- 5) Connect to the power supply.

<sup>5</sup> The DTR or RTS signal is only used within modes with the DTR line control. The mode settings are described on page 6 under "Modes".

**RS232 line extension**

By using two UC485, you can extend an RS232 line to a distance of up to 1,200 m.<sup>6</sup>

- 1) Connect the RS232 line and the power supply to the UC485 converters on both ends.
- 2) Both converters should be set to the RS422 mode according to the above-mentioned instructions.
- 3) Connect the cable between the converters according to Table 7 (a drawing of the connectors is on page 5).

<b>UC485 (UC485S)</b>	<b>Opposite UC485 (UC485S)</b>
7 (3)	9 (5)
6 (4)	8 (6)
9 (5)	7 (3)
8 (6)	6 (4)

*Table 7 – RS232 extension line connection*

<sup>6</sup> An RS232 line can also be extended with the aid of a special LD232 set.

## RS485 AND RS422 LINES

An RS485 line consists of a pair of wires, denoted by symbols RxTx+ and RxTx-<sup>7</sup>, preferably by a twisted pair. In the idle mode, the RxTx+ wire's potential is more positive than that of RxTx-. The topology is a stem line with short branches. Impedance termination devices should be connected at both ends of the stem line. The RS485 line is a half-duplex bus: data is sent and received on the same wires. Therefore the communication direction must be switched between transmission and receipt.

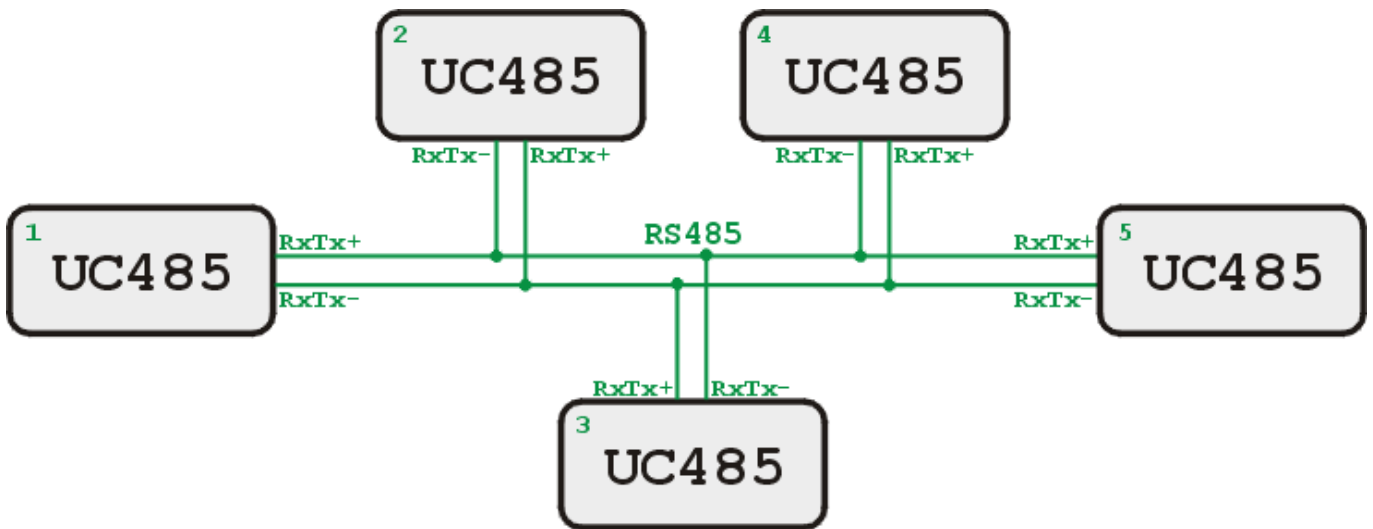


Fig. 12 – An example of a system with an RS485 line interconnection. Termination is connected in Modules 1 and 5.

The DTR signal of the RS232 line can be used for the direction control, or automatic (time) control can be used.



Fig. 13 – An example of a system with an RS422 line interconnection. Termination is connected in both modules.

<sup>7</sup> Notation A (for RxTx+) and B (for RxTx-) is sometimes used.

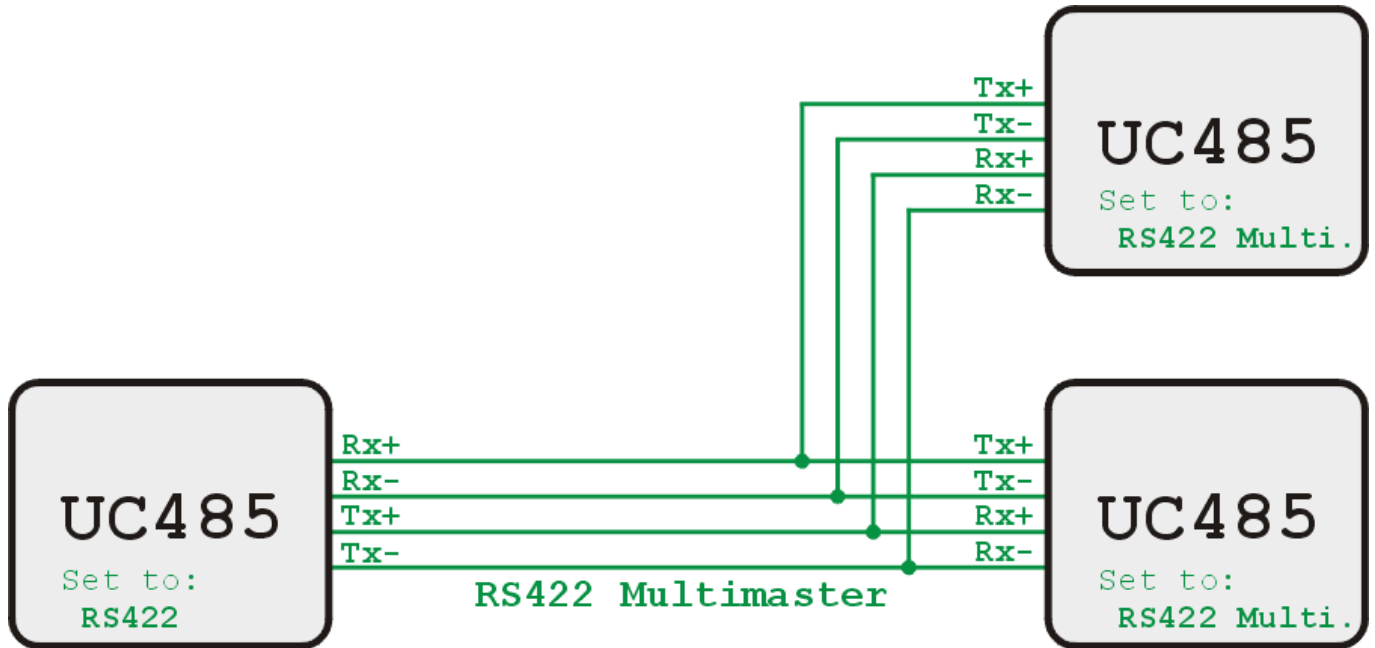


Fig. 14 – An example of a system with an RS422 line interconnection in the multimaster mode.

An RS422 line consists of two symmetric pairs of conductors. It is duplex line and directly substitutes the RxD and TxD signals of the RS232 lines; one pair is used for data receipt, the other pair for transmission. The transmission conductors are denoted by symbols Tx+ and Tx-; the receipt pair are denoted Rx+ and Rx-. In the idle mode, the + wire's potential is more positive than the - wire. Impedance terminations are connected to the line endpoints. An RS422 line can have branches; in this case, transmitters must be disconnected – mode Multimaster must be set according Table 1.

## POSSIBLE PROBLEMS DURING INSTALLATION

### **Recognising RxTx+ and RxTx- conductors:**

In the idle mode of an RS485 (RS422) line, the RxTx+ conductor's potential is more positive than that of RxTx-. Before measuring, we must ensure that the equipment at the other endpoint is a transmitter and either idle or sending data with a very low frequency of occurrence. If the polarity of the RxTx+ and RxTx- conductors is correct, the yellow RxD indicator must be on when data is transmitted (test it when the control signal is off and the "positive control signal during transmission" option is set).

### **Even though the power supply is switched on, the green indicator is off:**

Make sure that power supply is on, the power supply voltage is accordant with converter installing option and polarity is not reversed.

### **The RxD remains on even if no data is being transmitted:**

There may be several causes of this defect:

- The RxTx+ and RxTx- conductors of the RS485 line may be mutually interchanged.
- An impedance termination on the receiver side is connected, but there are no resistors which would define the line's idle mode.
- The impedance termination is connected to the module. On the opposite side, resistors are connected which define the line's idle mode. However, the line or one of its wires is broken.

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