



HRU-5331

**HUB serial asynchronous transmission
RS232 or RS485 on 4x RS485,2xRS422**

DS-HRU-5331-v_1.1

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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.

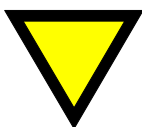
1. Intended use

The HUB HRU-5331 is used to send asynchronous serial RS232 or RS485 serial signals to up to four RS485 branches. It can work in six modes: as HUB RS232 for 4 RS485 lines, HUB RS232 for 2 RS422 lines, HUB RS232 for 2 4-wire RS485 lines or as HUB RS485 for 4 RS485 lines, HUB RS485 for 2 4-wire RS485 lines, HUB RS485 for 2 lines 422. During the conversion of the RS232 to RS485 standard, it does not require any additional signals controlling the direction of transmission. The direction change is automatic. Using the HRU-5331 module, it is possible to build a star-shaped RS485 network. In this way, its structure is simplified and the length of the line is significantly reduced. The transmission of protocols in the upper layers is transparent. HUB simultaneously works as an amplifier (repeater) and separator. The signal after passing through the HUB is regenerated and amplified, allowing the extension of the RS485 bus by another segment. The input, output and power ports are galvanically isolated from each other. Therefore, damage to one part does not transfer to the other.



Advice.

HRU-5331 with standard software is designed for master-slave networks, e.g. Modbus. The master device, which initiates the transmission, and sends data in all branches. Data from the corresponding slave device is only transmitted to the master device.



Advice.

HUB HRU-5331 with special software is intended for Profibus and BACnet networks. In this case, data is exchanged between all branches.

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 module HRU-5331

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
STOP bits	1, 2
Number of RS485 outputs	4
ESD protection for RS232 and RS485 ports	15kV
Isolation between input and output	2.5kV
Isolation between input and power supply	3.0kV
Isolation between output and power supply	3.0kV
Supply voltage	7...35 VDC/ 12...26VAC
Maximum module power without load	700mW
Relative humidity of work	20% ... 95%
Relative humidity storage	20% ... 95%
Working temperature	-30°C ... 65°C
Storage temperature	-40°C ... 70°C
EMC	According to EN-61000-6-1/2/3/4
Overvoltage protection RS485	600W, 15V
Short circuit protection RS485	100mA
Maksymalna liczba urządzeń na jednej linii	Standard 32 devices
IP protection of terminals	IP-20 according to DIN 40050/EC 529
IP protection of housing	IP-43 according to DIN 40050/EC 529
Installation	On DIN rail PN/E-06292 or DIN EN 50 022-35
Weight	116 g
Dimensions with connectors	53 x 108 x 58 mm



Attention!

The number of devices is the maximum number of transceivers that can be connected to the RS485 bus, guaranteeing correct transmission. To be able to work with more gates than the standard 32, the condition must be met that all gates have reduced load capacity on the RS485 line.

2.2. Block diagram

Fig . 2.1 shows the block diagram of the HRU-5331 module. HUB consists of three separated parts, marked as primary - COM1 (connectors 1-5), secondary - COM2 (connectors 10-18) and power supply (connectors 8-9). Data transmission can only take place between the primary and secondary side, never within one part. The master device initiating the transmission can be on either the primary or secondary side. However, when connecting the master device to one of the branches of the secondary side, the other three will be inactive. In this configuration, the HUB will act as a normal converter.



Advice.

It is recommended that the master device initiating the transmission should be on the primary side. Thanks to this it is possible to send queries to four branches at the same time.

From the primary side there are two types of port: RS232 (connectors 3, 4 and 5) and RS485 (connectors 1, 2). These inputs, inside the device, are connected logically, so at a given moment the signal can be fed to only one of them - RS232 or RS485. GND1 ground can be connected to RS232 or RS485. On the secondary side there are four RS485 ports (connectors 10, 11, 12, 13, 15, 16, 17 and 18) representing separate bus branches. Depending on the needs, the user can use one to four ports. GND2 ground (connector 14) can be used to connect the RS485 line screen.



Attention!

If the RS485 port is not used, a line terminator should be attached to it. This eliminates unwanted signals that may induce at its input.

The power supply is supplied through connectors 8, 9 to the power supply module and then transferred independently to the primary and secondary side by means of separating transformers. Data is transmitted between the primary and secondary side using magnetic coupling. Depending on the version, the insulation barrier is 1.5kV, 2.5kV or 3.0kV.

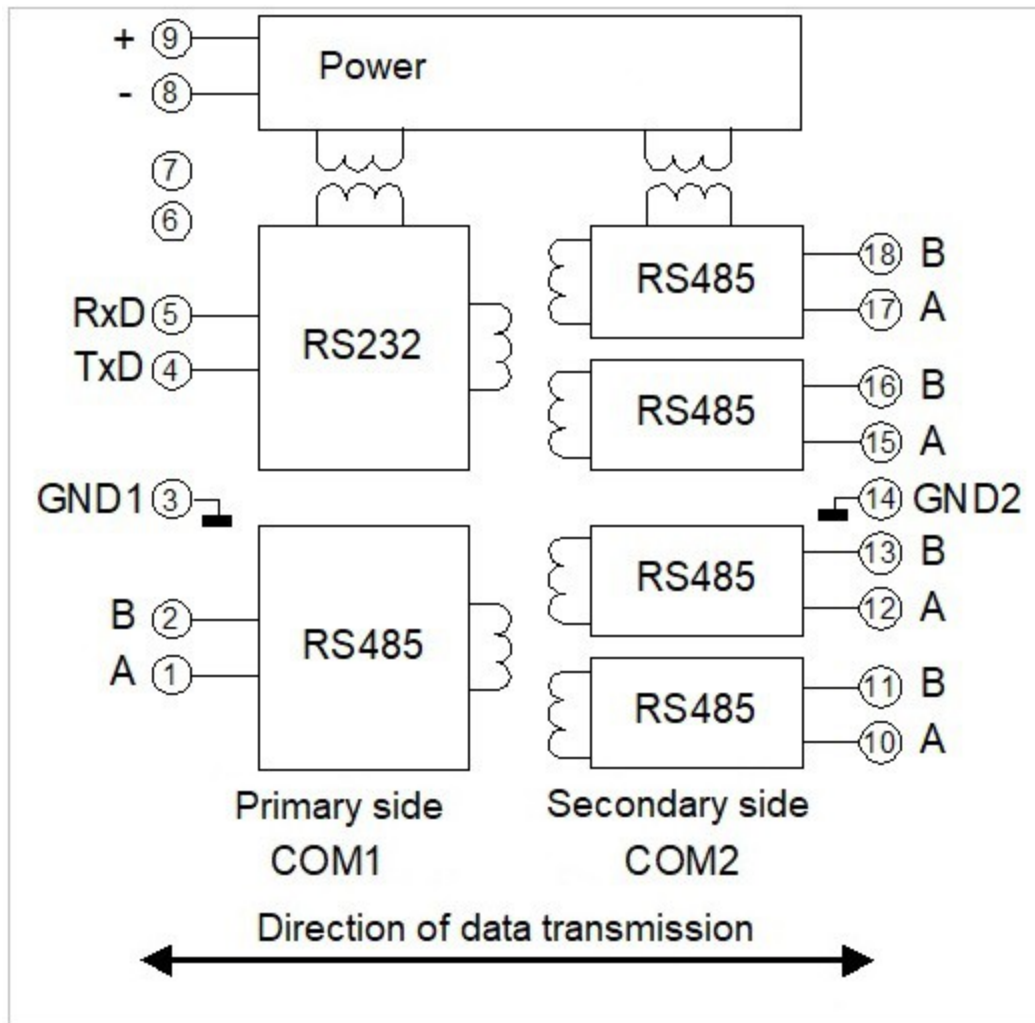
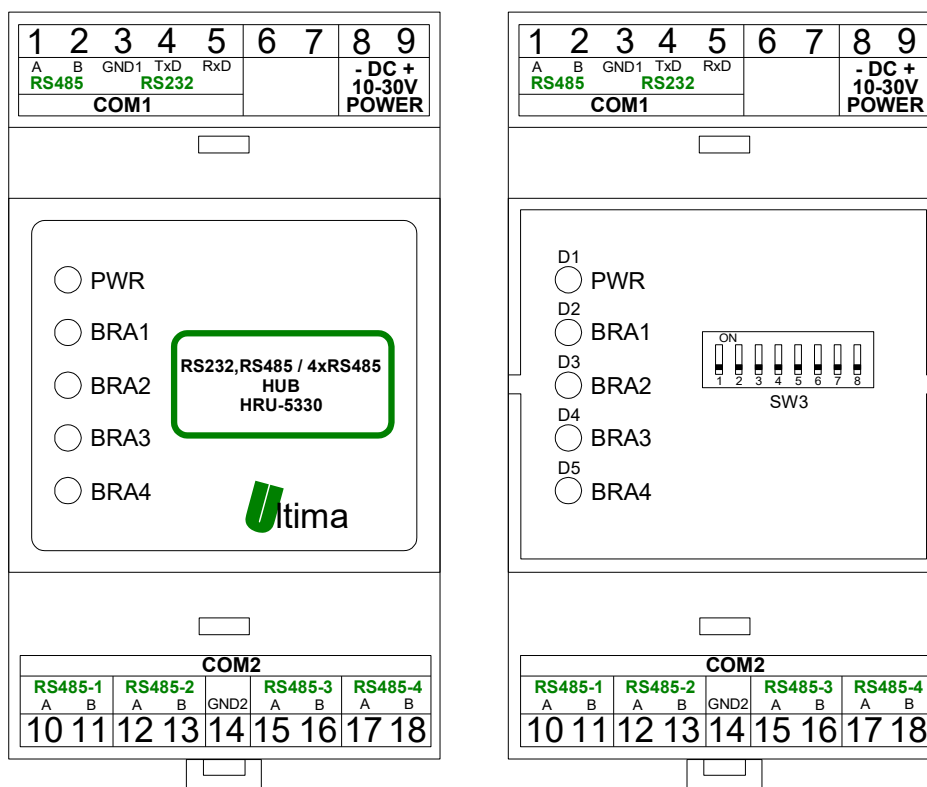


Fig. 2.1 Block diagram of the module HRU-5331

2.3. Description of connectors

The arrangement of connectors on the HRU-5331 module is shown in Fig. 2.2. The meaning of individual connectors is described in Table Tab. 2.2. At the top of the HUB are the RS232 and RS485 connectors on the COM1 port and the power module connectors. Connectors 6 and 7 inside are not connected. In the lower part there are connectors for four branches of the RS485 COM2 port.

Fig. 2.2 Front view of HRU-5331 connectors



Tab. 2.2 Description of connectors on the HRU-5331 module

Connector number	Description
1	A – RS485 (COM1)
2	B – RS485 (COM1)
3	GND1 – RS232 lub RS485 (COM1)
4	TXD – RS232 (COM1)
5	RXD – RS232 (COM1)
6	nie podłączony
7	nie podłączony
8	power –
9	power +
10	A – RS485 (COM2, branch 1)
11	B – RS485 (COM2, branch 1)
12	A – RS485 (COM2, branch 2)
13	B – RS485 (COM2, branch 2)
14	GND2 – RS485 (COM2)
15	A – RS485 (COM2, branch 3)
16	B – RS485 (COM2, branch 3)
17	A – RS485 (COM2, branch 4)
18	B – RS485 (COM2, branch 4)



Attention!

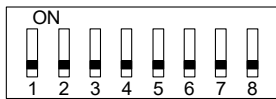
Instead of the marked power polarity, it may happen that HRU-5331 is powered via a rectifier bridge, then the power polarity does not matter.

HRU-5331

On the front plate under the protective cover there is a SW3 dip-switch, used to configure the RS232 and RS485 transmission parameters - speed, word length, parity control and number of STOP bits. The Table Tab. 2.3 contains the meaning of switches SW3 dip switch. Description of configuration is in chapter 4.

Tab. 2.3 Description of the SW3 dip-switch

Switch number	Opis
1, 2, 3, 4	baud rate
5	word length
6	parity check
7	STOP bits
8	-

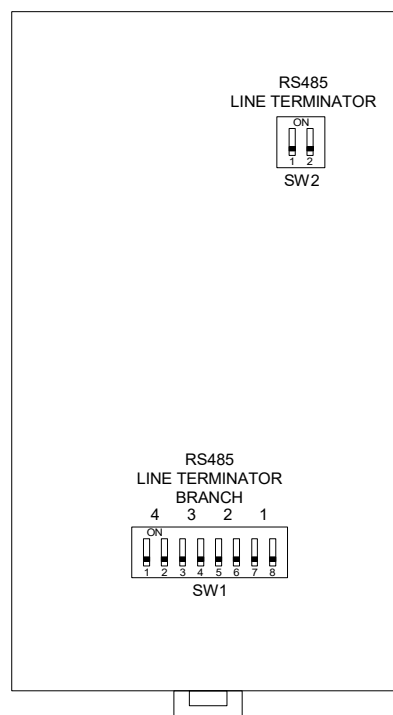


Dip-switch SW3


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

In HUB, the line terminators are located on the motherboard. They are available after removing the housing fastening part (back cover). The COM1 port terminator is connected by the SW2 switch, and the COM2 port by the SW1 switch. The arrangement of terminators is shown in Fig . 2.3, while the meaning of switches in the tables Tab. 2.4 i Tab. 2.5. Description of configuration is in chapter 4.

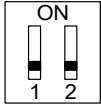
Fig. 2.3 Rear view of HRU-5331 connectors



Tab. 2.4 Description of the SW1 dip-switch

 <p>Dip-switch SW1</p>	Switch number	Description
	1, 2	terminator RS485 (COM2, branch 4)
	3, 4	terminator RS485 (COM2, branch 3)
	5, 6	terminator RS485 (COM2, branch 2)
	7, 8	terminator RS485 (COM2, branch 1)

Tab. 2.5 Description of the SW2 dip-switch

 <p>Dip-switch SW2</p>	Switch number	Description
	1, 2	terminator RS485 (COM1)

2.4. Description of LEDs

There are five signaling LEDs on the front wall of the device. The PWR diode informs about the power supply switched on, while the others determine the transmission direction in individual branches. Description of the LEDs is presented in the table Tab. 2.6. During data transmission, the BRA1 - BRA4 LEDs should blink. The blinking intensity depends on the baud rate and the amount of data being transferred. When data from the COM1 port is being sent to the COM2 port (downlink direction), the D2 - D5 LEDs flash green. However, if the data is being sent from one of the branches of the COM2 port towards the COM1 port (uplink direction), only one of the D2 - D5 diodes blinks indicating the active branch.

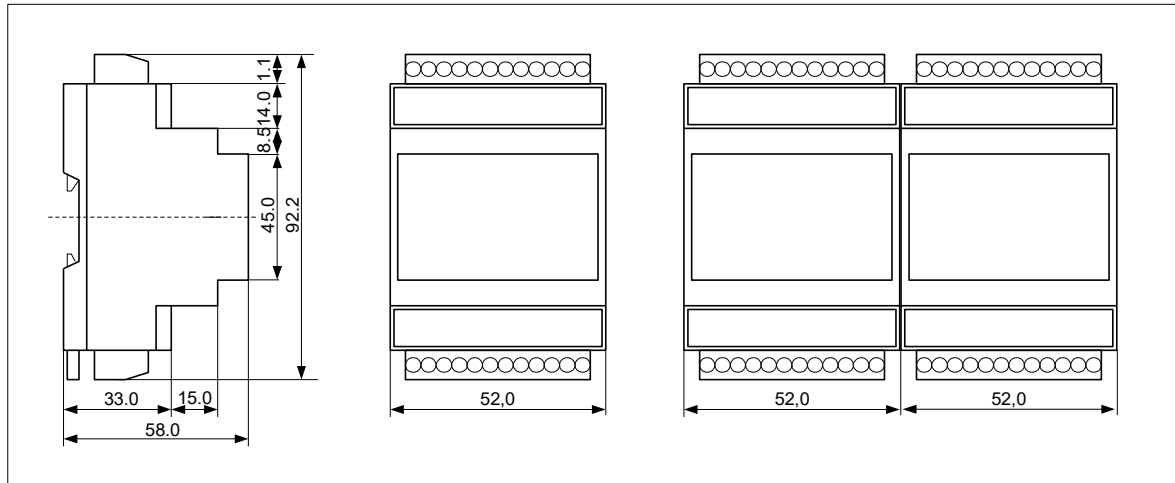
Tab. 2.6 Description of LEDs

LED	Colour of light	Description
PWR	red	Power ON
BRA1	green	Data transfer from COM1 port to branch 1 of COM2 port
BRA1	red	Data transfer from branch 1 of the COM2 port to the COM1 port
BRA2	green	Data transfer from COM1 port to branch 2 of the COM2 port
BRA2	red	Data transfer from branch 2 of the COM2 port to the COM1 port
BRA3	green	Data transfer from COM1 port to branch 3 of COM2 port
BRA3	red	Data transfer from branch 3 of the COM2 port to the COM1 port
BRA4	green	Data transfer from COM1 port to branch 4 of COM2 port
BRA4	red	Data transfer from branch 4 of the COM2 port to the COM1 port

2.5. Dimensions

The dimensions of the HRU-5331 module are shown in the figure Fig. 2.4.

Fig. 2.4 Dimensions of the HRU-5331 module



3. Installation

HUB HRU-5331 enables distribution of signals to up to four RS485 branches. It can be configured in two ways: as a HUB RS232 for 4 RS485 lines or as a RS485 HUB for 4 RS485 lines. In the first case, there is an additional conversion of the RS232 standard to RS485. If the user does not need it, he does not have to use all four branches of RS485. Then, terminate the line terminators in unused branches to avoid generating unwanted signals.

Figure Fig. 3.5 shows the method of connecting the module as a HUB-RS485 separator for 4 RS485 lines, while the figure Fig. 3.6 – konfigurację modułu jako HUB-konwerter RS232 na 4 linie RS485.

Fig. 3.5 Connection way of the HRU-5331 module as a HUB-RS485 to 4x RS485 separator

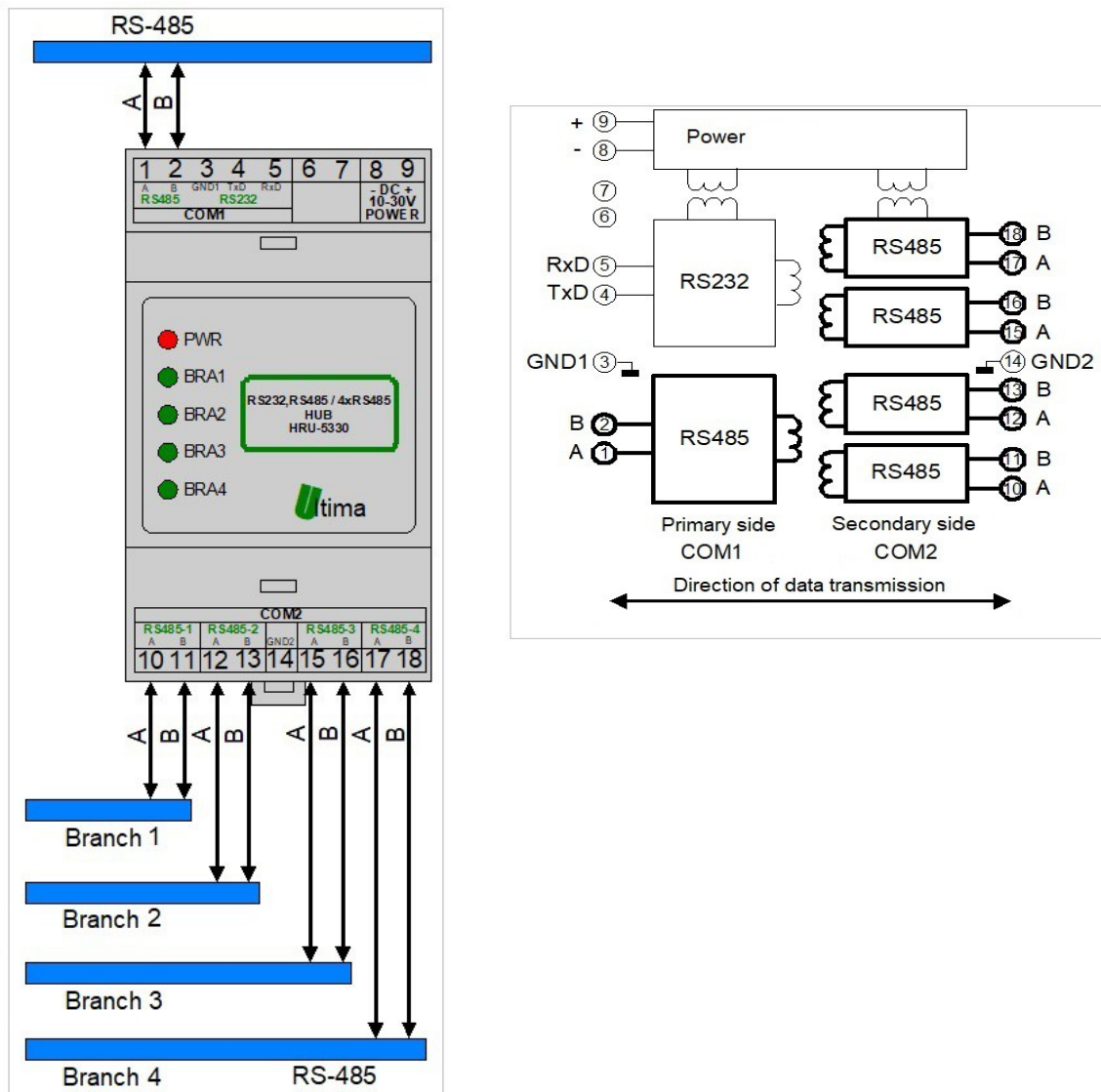
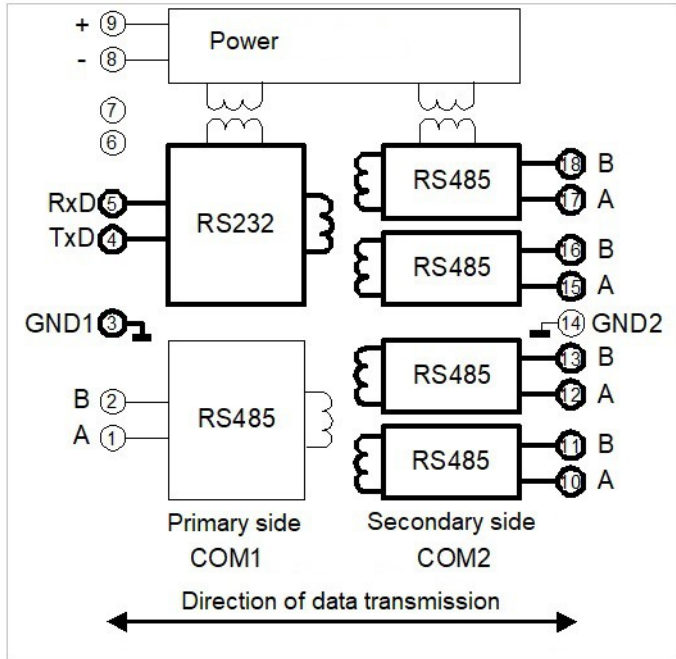
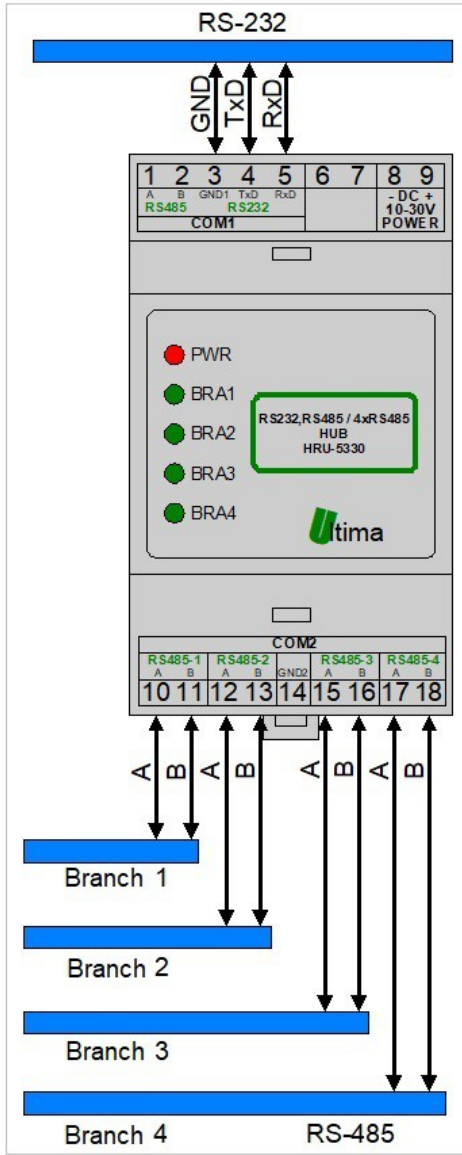


Fig. 3.6 Connection way of the HRU-5331 module as a HUB-RS232 to 4x RS485 converter



4. Setup

Transmission parameters are set using a SW3 dip-switch located on the front panel under a plastic cover. The cover must first be removed, slightly prying up with a flat screwdriver at the slots. The configuration consists in setting:

- baud rate switch 1, 2, 3, 4,
- word length switch 5,
- parity check switch 6,
- bit STOP switch 7.

Switch number 8 is not used. Configuration details are presented in the table Tab. 4.7.

EXAMPLE: The HUB should be set in the configuration: baud rate 9.6kb/s, 8-bit word without check parity , 1 STOP bit.

Dip-switch SW3: 1 2 3 4 5 6 7 8
 Setup: 1 0 0 0 0 1 1 x
 x – any setting

Tab. 4.7 Description of the transmission parameters configuration

Znaczenie ustawień przełącznika SW3: 1 – ON, 0 – OFF										
1	2	3	4	Baud rate	5	word length	6	parity check	7	Number of bit STOP
0	0	0	0	50 b/s	0	8 bitów	0	załączona	0	2 bity
0	0	0	1	75 b/s	1	7 bitów	1	wyłączona	1	1 bit
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 HUB, the line terminators are located on the motherboard. They are available after removing the housing fastening part (back cover). The table Tab. 4.8 shows the configuration of the RS485 branch of the COM2 port, the table Tab. 4.9 shows the method of connection the COM1 port terminator.



Attention!

Switch pair settings 1-2, 3-4, 5-6, 7-8 must be the same i.e. pair must be switch ON or switch OFF. Setting one switch in pair as ON, the other as OFF may cause indefinite states on the line causing malfunction of the device.

The recommended way to terminate the RS485 line is shown in the drawings Fig. 4.7 i Fig. 4.8. In the network configuration only the terminator is ON in the device at the beginning of the RS485 line and in the device at the end of the line - the most distant. Terminators should be OFF in other devices.



Warning!

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

Tab. 4.8 Description of the COM2 port line terminators configuration

Switch SW1: 1 – ON, 0 – OFF															
1	2	Terminator COM2, branch 4		3	4	Terminator COM2, branch 3		5	6	Terminator COM2, gałąź 2		7	8	Terminator COM2, gałąź 1	
0	0	OFF		0	0	OFF		0	0	OFF		0	0	OFF	
1	1	ON		1	1	ON		1	1	ON		1	1	ON	

Tab. 4.9 Description of the COM1 line terminators configuration

Switch SW2: 1 – ON, 0 – OFF		
1	2	Terminator COM1
0	0	OFF
1	1	ON

Fig. 4.7 Way of terminating the RS485 line in a point-to-point configuration

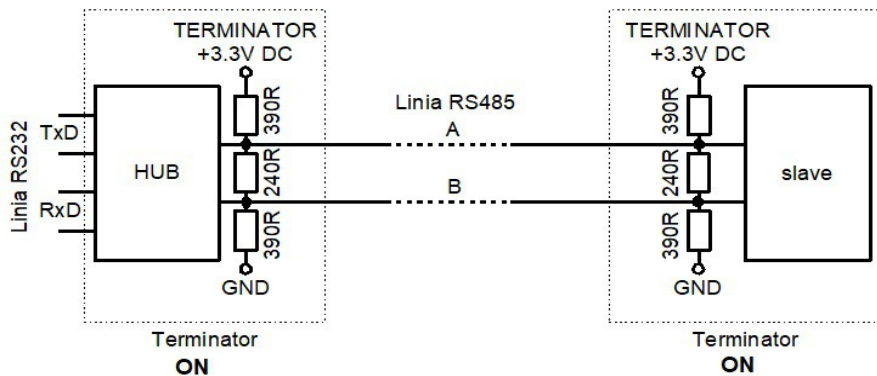
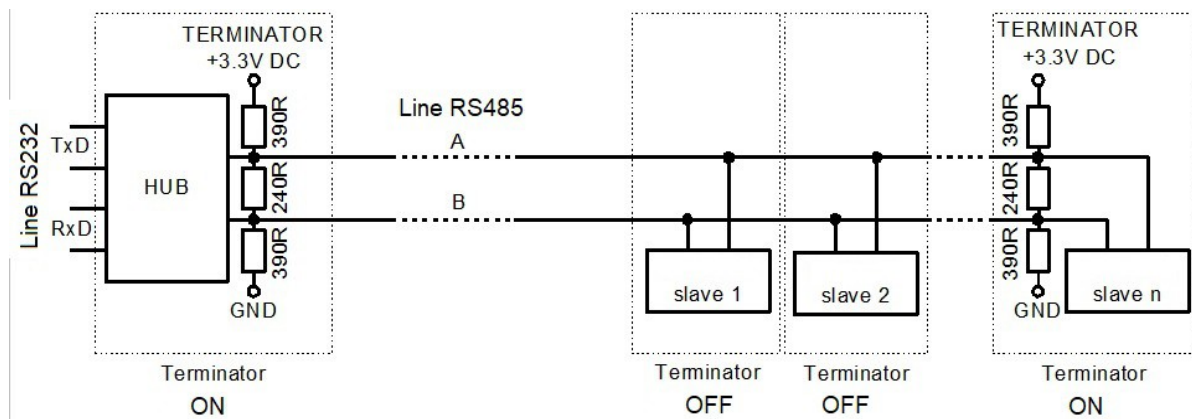


Fig. 4.8 Way of terminating the RS485 line in the network configuration



ORDERING

Symbol	Opis	Nr katalogowy
HRU-5331	32 devices on one line, three-way separation 3,0kV i 2,5kV. . Power supply 8..40 VDC/ 10..28VAC	03-05-02-01-32-00

5. Contact us

Distributor	Manufacturer
<p>ASPAR s.c.</p> <p>ul. Oliwska 112</p> <p>80-209 Chwaszczyno, POLAND</p> <p>Tel. +48 / 58 / 351-39-89 +48 / 58 / 732-71-73</p> <p>ampero@ampero.eu</p> <p>www.ampero.eu</p>	<p>ULTIMA</p> <p>Al. Zwycięstwa 96/98</p> <p>81-451 Gdynia, POLAND</p> <p>Tel./fax. +48 / 58 / 341 16 61</p> <p>Tel. +48 / 58 / 555 71 49</p> <p>ultima@ultima-automatyka.pl</p> <p>www.ultima-automatyka.pl</p>