

# Communication interface converter M-Bus to RS485 – RS485toMBus-XL

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Instructions manual

Version: 2020/1.4-EN

Communication converters of the XL line



## RS485toM-Bus-XL communication converter

RS485toM-Bus-XL communication converters are durable converters of the M-Bus industrial communication bus to the common serial interfaces RS485. They are intended for connection of measuring devices with M-Bus interface to control/computer systems for data collection and processing. The converters convert signals from one communication interface to the other directly without any need for setting up the communication parameters or modifications to the transferred messages.

Depending on model the M-Bus port has a connection capacity for 45, 80, 120 or 190 M-Bus slave devices. The interface has the highest rating of surge protection and is resilient to failures on the M-Bus line.

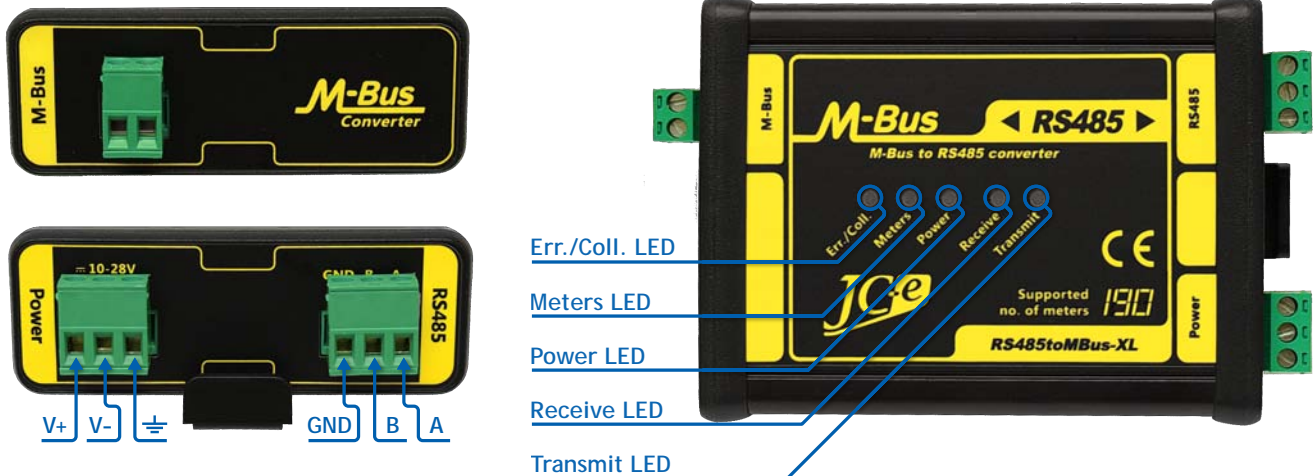
The states of M-Bus line and the converter are evaluated and monitored by a processor. Error states are indicated by status LEDs which simplify identification of the converter's current state and possible causes of a malfunction. The LEDs indicate functionality of the converter, power source state, M-Bus line loading and possible error states on the line.

The converter works at a standard level of DC voltages with polarity reversal protection.

### Technical parameters

Komunikačné rozhranie RS485	
Communication signals	A (+ Tx/Rx), B (- Tx/Rx), GND
Protections	>1kV from power supply, 1kV from M-Bus line
Galvanic separation	overvoltage protection TVS 600W
Connector	plug-in connector for wires of up to 2.5 mm <sup>2</sup> cross-section area
M-Bus Master communication interface	
Number of attachable devices	four versions: 1 to 45, 80, 120, 190 M-Bus slave devices
Baud rate	300 - 9600 bps
Protection	- overvoltage protection TVS 1500W - electronic protection against overloads, short circuit and external voltage on the line. Time of recovery to normal operation within 1 second.
Galvanic separation	1kV from power supply, 1kV from RS232
Connector	plug-in connector for wires of up to 2.5 mm <sup>2</sup> cross-section area
Power Supply	
Recommended range of power supply voltages	
DC power supply	12V to 30V. Model XL190 20V to 30V.
Maximum limits of supply voltage - permanent operation at these voltages is not recommended	
Minimum DC voltage	11V - min. voltage required for converter operation
Maximum DC voltage	31V - at higher the overvoltage protection starts to activate
Protection	overvoltage protection TVS 1500W
Power consumption	0.85W to 15W depends on converter model and number of M-Bus devices
Connector	plug-in connector for wires of up to 2.5 mm <sup>2</sup> cross-section area
Temperature	
Operating range	-40°C to 70°C
Mechanical construction	
Mechanical design	aluminium box
Mounting	DIN rail 35 mm (EN 50022 top hat rail)
Dimensions: H x W x L	38 x 81.5 x 107 mm without connectors, 38 x 81.5 x 125 mm with connectors
Protection classification	IP40
Weight	220g (XL45, XL80) 240g (XL120, XL190)

## Layout of connectors and status LEDs



### Connectors

- **M-Bus** – Plug-in connector for connecting the M-Bus line with M-Bus slave devices.
- **Power** – Plug-in connector for connecting the DC power supply.  
V+ positive pole, V- negative pole,  $\perp$  earth ground.
- **RS232** – Plug-in connector for connecting the RS485 line.  
GND RS485 Ground, A RS485 line A, B RS485 line B.

### Status LEDs

#### **i** Operational states indication

LED	State
<b>Power LED</b> turned on	Converter and power supply is alright.
<b>Transmit LED</b> flashing	Data is transmitted to the M-Bus line.
<b>Receive LED</b> flashing	Data is received from the M-Bus line.
<b>Meters LED</b> turned on	Load on M-Bus line. Meters are connected to the line.
<b>Meters LED</b> turned off	Disconnected M-Bus line. No meters are connected to the line.
<b>Meters LED</b> fast flashing	Max. amount of meters on M-Bus line reached (2 meters tolerance).

#### **!** Malfunction states indication

LED	State
<b>Power LED</b> flashing	Internal converter error.
<b>Power LED</b> flashing + turned on <b>Err./Coll. LED</b>	External voltage on M-Bus line or Internal converter error.
<b>Err./Coll. LED</b> flashing or turned on	Converter overload - too many meters, short on the M-Bus line or capacitive overload on M-Bus line (C of line >5 $\mu$ F). When turning on the power - capacitive overload on M-Bus line (C of line >1 $\mu$ F). Increased capacitance may be caused by meters during power up. Capacitance can afterwards fall below 1 $\mu$ F.
<b>Err./Coll. LED</b> turned on for a short while	During data reception - flashing <b>Receive LED</b> . Communication collision. Simultaneous reply from multiple meters. During data transmission - flashing <b>Transmit LED</b> . An error occurs during transmission (incorrect voltages on the M-Bus line). Internal converter error or capacitive overload on M-Bus line.

## Typical application



Typical wiring of the converter with M-Bus devices, power supply and a RS485 communication line.

### • Power Supply

The recommended range of DC power supply voltage is 12V to 30V. The connection of the power supply voltage uses a plug-in connector labeled POWER. Maximum power consumption is 15W and depends on the load on the M-Bus line and converter model.

*Note 1\** The use of external current protection is advised for additional protection of the power supply and to limit the short circuit current during overvoltage.

### • RS485 line

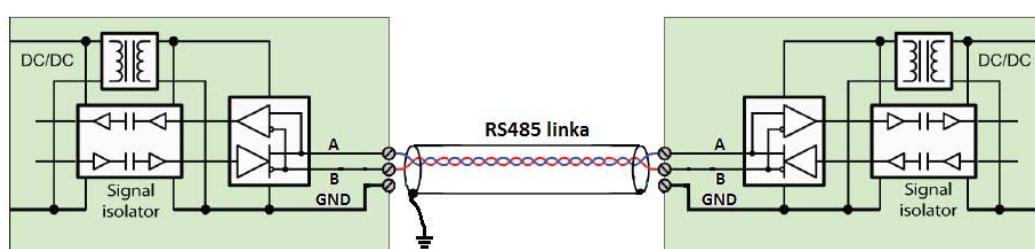
The connection of the RS485 line uses a plug-in connector labeled RS-485. The RS485 port has a galvanic separation from the power source port and M-Bus line. Supported communication speeds are identical to the M-Bus line. From 300 to 9600bps. Switching between transmission and reception is automatic based on the reception of messages on the M-Bus line.

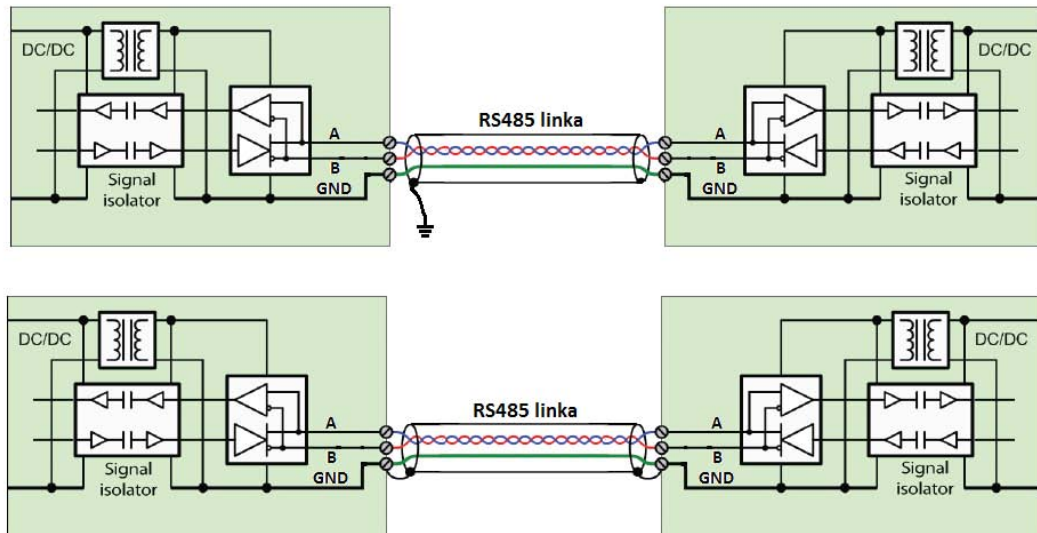
The RS485 interface uses data wires labeled as A and B. Signal A is sometimes referred to as +Tx/Rx and signal B as -Tx/Rx.

The interface of the converter does not contain a 120Ω terminating resistor between the A and B terminals. In case of a longer line distance it is recommended to add a terminating resistor to the last converter between the A and B terminals.

The GND pin is the ground of the RS485 line and the internal TVS protections connect to it. It is not necessary to connect the GND signal. But in order to improve the interference resistance of the line in case of electrical potential variation between two RS485 devices, it is recommended to connect their GND pins.

It is recommended to use a shielded twisted pair cable in the construction of the communication line. In case of connection of the GND signals it is recommended to use an additional internal wire of the cable. The shielding of the cable should be grounded preferably at the entry point of the switchgear cabinet especially by long or outdoor lines. If the line is short and within one room or within a switch gear cabinet it is possible to connect one end of the cable shielding to the GND pin. The other end of the shielding should remain open. These are generic guidelines and their suitability as well as the use of additional overvoltage protections needs to be considered according to the given application.





Recommended ways of connecting the converter to the RS485 line.

### • M-Bus line

The interface is of M-Bus Master type and depending on converter model allows for connection of 45 (67,5mA), 80 (120mA), 120 (180mA) or 190 (285mA) M-Bus SLAVE devices. Note: The brackets show the maximum idle current. The interface is protected against overvoltage, overload, external voltage and short circuit on the line. It is recommended to use a shielded twisted pair cable in the construction of the communication line. The shielding of the cable should be grounded preferably at the entry point of the switchgear cabinet. The M-Bus port is rated at the highest level of protection - Class 5 according to the EN 61000-4-5 standard measured on an unshielded cable. The use of a shielded cable further increases the level of protection. The use of additional rough overvoltage protection is recommended only on the LPZ0A-LPZ1 interface on a building entry point of the M-Bus line.

The communication speed ranges from 300bps to 9600bps. Even parity with one stop bit and 8 bit data word is used as standard.

The connection of the M-Bus line uses a plug-in connector labeled M-Bus. The connector allows a connection of wires with up to 2.5 mm<sup>2</sup> cross-section area. It is recommended to use a shielded twisted pair cable for example J-YStY for the connection of the meters.

Suitable types of cables for connecting the M-Bus devices.

- Indoor environments - LiYCY 2x0.14mm<sup>2</sup> up to a distance of 100m, LiYCY 2x0.25mm<sup>2</sup> up to 200m.
- Outdoor/indoor environments - J-YStY 1\*2\*0.6mm up to 200m, J-YStY 1\*2\*0.8mm up to 400m.

The distances can be longer for a smaller amount of SLAVE devices but the capacitance of the M-Bus line must be below 1uF.

A voltmeter and an amp meter is sufficient for a basic electrical check of the M-Bus line. The measurements should be taken in an idle state without an ongoing communication and in a state when the converter does not indicate an error on the M-Bus line. The idle voltage on the M-Bus line should be in the 31 to 35V range.

Maximum current on the line from the converter should be depending on the model 67.5mA (XL45), 120mA (XL80), 180mA (XL120) or 285mA (XL190). Its measured value should roughly correspond to the amount of M-Bus Slave devices times 1.5mA.



## Mechanical parameters of the converter

The converter is made from a robust aluminium box which ensures excellent mechanical durability, enhanced interference resistance and improved heat dissipation from the converter to the environment. The converter is designed to be mounted on a 35 mm DIN rail (EN 50022 top hat rail).



Top view



Side view with DIN rail attached

## EMC compatibility

EMC compatibility of the M-Bus converter has been tested according to the following industrial environment standards in an accredited laboratory

### EMC emission tests

Standard	Test	Level
EN 55011	Power line - CONDUCTED EMISSIONS 10/150 kHz - 30 MHz	Class A
EN 55011	RADIATED EMISSIONS (Electric Field) 30 MHz - 1000 MHz	Class A

### EMC immunity tests

Standard	Test	Level
EN 61000-4-2	ELECTROSTATIC DISCHARGE (ESD) - Contact discharge	± 4kV
EN 61000-4-2	ELECTROSTATIC DISCHARGE (ESD) - Air discharge	± 8kV
EN 61000-4-3	RADIATED RADIO-FREQUENCY ELECTROMAG. FIELD 80MHz - 1GHz	10 V/m
EN 61000-4-3	RADIATED RADIO-FREQUENCY ELECTROMAG. FIELD 1.4GHz - 2GHz	10 V/m
EN 61000-4-3	RADIATED RADIO-FREQUENCY ELECTROMAG. FIELD 2GHz - 2.7GHz	3 V/m
EN 61000-4-4	ELECTRICAL FAST TRANSIENT/BURST - Power line	± 4 kV
EN 61000-4-4	ELECTRICAL FAST TRANSIENT/BURST - M-Bus line, RS485 line	± 4 kV
EN 61000-4-5	SURGE IMMUNITY - Power line. Common/differential mode.	± 1kV / ± 500 V
EN 61000-4-5	SURGE IMMUNITY - M-Bus line, RS485 line. Cable shielding.	± 4 kV
EN 61000-4-5	SURGE IMMUNITY - M-Bus line. Common/differential mode.*	± 4kV / ± 2kV
EN 61000-4-6	CONDUCTED DISTURBANCES, INDUCED BY RADIO-FREQUENCY FIELDS 0,15MHz - 80 MHZ. M-Bus line.	10 V

\* test carried out at the request of the manufacturer. The M-Bus port of the converter achieves the highest level of overvoltage protection according to the EN 61000-4-5 standard. Carrying out this type of test is not required with the use of shield cable. Reaching the highest level of protection on the M-Bus port also guarantees the highest achievable reliability of the converter. The M-Bus interface often poses the greatest risk of overvoltage and the ensuing destruction of the converter.

## Handling of electronic waste

- A non-functional, discarded electronic device must be handed to a proper collection authority.
- The electronic device must be separated from unsorted communal waste.
- Failure to handle the scrapped electronic device according the mentioned guidelines may cause negative impact on the environment and human health.
- Handing the old device to a proper collection authority will warrant the recovery of useful materials with which you contribute to their repeated use after recycling.
- All information in this paragraph is represented by the following symbol present on every electronic device.
- The purpose of this symbol is to guarantee the retrieval and separate collection of e-waste. These types of devices cannot be disposed into unsorted communal waste.



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