Communication interface converter M-Bus to RS232 - RS232toMBus-4SL

Instructions manual

Version: 2014/1.7-EN

Communication converters of the Base line

RS232toMBus-4SL communication converter

RS232toMBus-4SL is a communication converter intended for connection of devices with the M-Bus industrial bus to control or computer systems for metering data collection using the common RS232 interface. The converter works as a transparent gateway and the transfer of the M-Bus messages is without modifications to their content or transfer rate.

The converter is designed to be used in information technology environments (residential, commercial buildings, offices etc.)

The M-Bus port can accommodate one to four M-Bus slave devices. The interface reaches above standard durability class of overvoltage protection and is immune against failures on the M-Bus line.

The converter provides a comfortably wide range of DC and AC power voltages to accomodate various simple applications. The power port also has a strong protection against overvoltage.

Operation states of the converter are indicated by four LEDs, this makes for an easy readout of the current state of the converter or possible causes of a failure. The LEDs indicate the state of the power supply, M-Bus communication and fail states of the M-Bus line.

Technical parameters

RS232 communication interface	
Communication signals	RxD, TxD, GND
Protections	protection against ±15kV ESD, filters
Connector	connector for wires of up to 2.5 mm^2 cross-section area
Galvanic separation	Without galvanic separation
M-Bus Master communication interface	
Number of connectable devices	1 to 4 SLAVE devices, idle current max. 6mA
Baud rate	300-9600 bps
Protections	- overvoltage protection TVS 600W - overload and short circuit electronic protection on the line, note: the converter is immune against permanent short on the line
Galvanic separation	Without galvanic separation
Connector	connector for wires of up to 2.5 mm^2 cross-section area
Power Supply	
Recommended range of power supply voltages	
DC power supply	8V to 28V
AC power supply	8V to 20V
Protections	overvoltage protection TVS 600W
Power consumption	0.3W to 1W. Depends on M-Bus line load and communication.
Connector	connector for wires of up to 2.5 mm^2 cross-section area
Temperature	
Operating range	0°C to 80°C
Mechanical construction	
Mechanical design	plastic box
Mounting	35mm DIN rail (EN 50022 top hat rail)
Dimensions: height x width x length	56,5 x 17,5 x 97,5mm
Protection classification	IP20
Weight	46g

Layout of connectors and status LEDs

Connectors

- **M-Bus**
  Connector for connecting the M-Bus line with M-Bus slave devices.
- **Power**
  Connector for connecting the power supply.
  Note: The polarity doesn't matter.
- **RS232**
  Connector for connecting the RS232 line.

Status LEDs

Transmit – The status LED is colored green and signifies data transmission on the M-Bus line.

Receive – The status LED is colored yellow and signifies data transmission on the M-Bus line. In case of exceeding the maximum number of devices connected to the M-Bus line the status LED may flash alternately with the *Overload* LED.

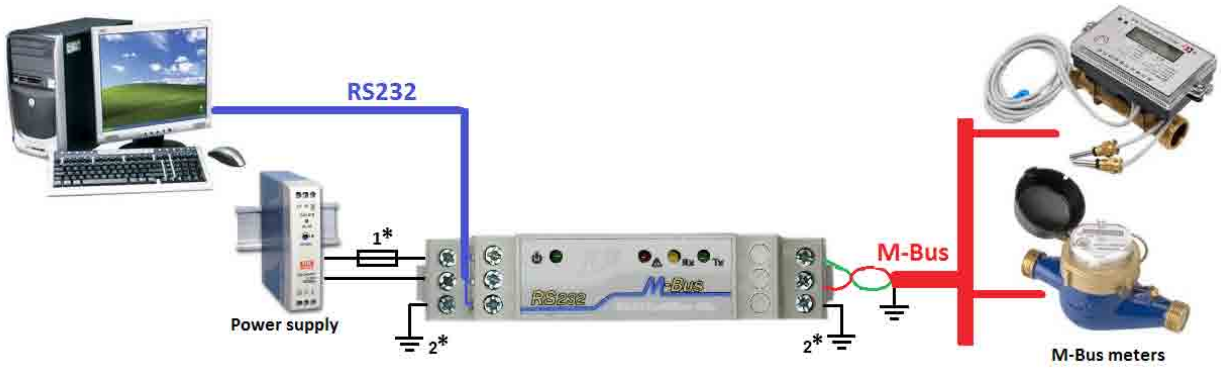
Overload/Short – The status LED is colored red and indicates faulty state of the M-Bus line. Due to protection of the converter the data transmission and reception is stopped in this state.

- **M-Bus line is overloaded**
  If there are more than 5 M-Bus SLAVE devices connected to the M-Bus line the *Overload/Short* status LED will start to flash. If there is a greater overload on the line, more than 7 M-Bus SLAVE devices are connected, the *Receive* and *Overload/Short* status LEDs will flash alternately.
- **There is a short on the M-Bus line**
  If there is a short circuit between the M-Bus wires, the load on the line is less than 500Ω or there is a greater number of M-Bus slave devices connected to the M-Bus line, the converter will interpret such a state as a short circuit on the line. The red *Overload/Short* will be turned on permanently.

*Note:*The default communication mode will be restored immediately after fixing the malfunction.

Power – The status LED is colored green and is turned on if a suitable power supply voltage is connected.

Typical application



Typical wiring of the converter with M-Bus devices, power supply and a RS232 communication line.

- **Power Supply**

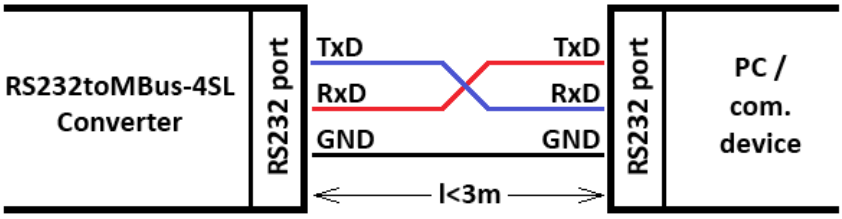
  The recommended range of DC power voltage is 8V to 28V. For AC the recommended voltage range is 8V to 20V. The connection of the power supply uses terminals labeled POWER. Maximum power consumption is 1W and depends on the M-Bus line load and power supply.

  *Note. 1** The use of external fusing is recommended in case of additional power source protection and for example to limit the short circuit current during overvoltage, ...

  *Note. 2** Grounding of the converter is optional. It has galvanic separation from the rest of the signals. It acts as an additional overvoltage protection.

- **RS232 line**

  The RS232 interface uses a three wire connection of the TxD, RxD and GND signals. TxD is an output. Data is transmitted through it and it must be connected to RxD signal of the receiving device / PC. RxD is an input and data is received with it from the PC. The RxD signal must be connected to the TxD signal of the transmitting device / PC. The GND signals must be connected directly between both devices.



RS232 port connection between the converter and PC.

It is recommended to use a shielded cable for the device connection, for example LiYCY 3x0.14mm^2.

When connecting the RS232 line a simple verification is possible using a volt meter. A voltage can be measured between the GND and TxD or RxD signals. The voltage of the TxD signal is in -5V to -12V range depending on the device. TxD signal of the converter is approx. -10V at idle. Voltage on the RxD signal is zero. A negative voltage must appear on both RxD and TxD pins of the converter in a correct connection.

Note: Signal pinouts on a D-SUB 9 pin connector: 2 – RxD, 3 – TxD, 5 – GND.
Signal pinouts on a D-SUB 25 pin connector: 3 – RxD, 2 – TxD, 7 – GND.

Note: The RS232 interface is not suited for environments where a greater overvoltage can carry over to the communication line. It is equipped only with mild overvoltage protections.

- **M-Bus line**

The interface is of M-Bus Master type and allows for connection of up to four M-Bus SLAVE devices. The maximum idle current on the line is 6mA. The interface is protected against overvoltage, overload 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 a high level of protection - Class 4 in the EN 61000-4-5 standard measured on an unshielded cable. The use of a shielded cable further increases the level of protection. The M-Bus line has a galvanic connection to the power and RS232 ports. The use of the converter is recommended only in information technology environments. Mainly due to protection of devices connected to it. The recommended maximum length of the M-Bus line is in the range of tens of meters.

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 connector labeled M-Bus. The connector allows a connection of wires with up to 2.5 mm^2. It is recommended to use a shielded twisted pair cable for the device connection, for example LiYCY 2x0.14mm^2.

A voltmeter and an amp meter is sufficient for a basic electrical check of the M-Bus line. The table contains a summary of verification voltages and currents which can be measured during a check.

M-Bus line	SLAVE device	M-Bus converter
Idle voltage $U_{M\text{-}Bus}$	min. 21V	29V
Idle current $I_{M\text{-}Bus}$	max. 1.5mA	max. 6mA

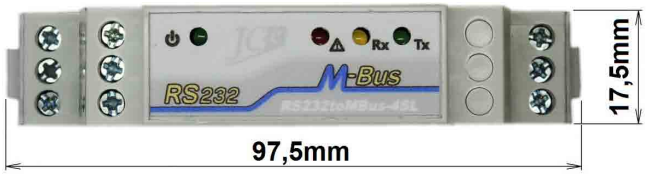
The measurements should be taken in an idle state without ongoing communication and in a state when the converter does not indicate an error on the M-Bus line. The idle voltage on the M-Bus line should be in the 29 to 30V range. The Slave pins of the connected device should have a voltage over 21V which represents the minimal value for a standard M-Bus Slave device (IO-TSS721A). This difference in voltage can be caused by voltage drops on the communication protections and com. line. Using the recommended M-Bus protections and type of wiring guarantees the fulfillment of the minimum voltage requirements.

Maximum current on the line from the converter should be 6mA. Its measured value should roughly correspond to the amount of M-Bus Slave devices times 1.5mA.

The idle current of the Slave device must be measured on the wires which lead directly to the meter and do not continue any further. Current thorough these wires should be smaller or at the very most equal to 1.5mA.

Mechanical parameters of the converter

The converter is built in a standard plastic box designed for mounting on a 35 mm DIN rail. The converter has a very small width of just 17.5mm.



Top view

Side view

EMC compatibility

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

EMC emission tests		
Standard	**Test**	**Level**
EN 55022	Power line - CONDUCTED EMISSIONS 10/150 kHz - 30 MHz	Class B
EN 55022	RADIATED EMISSIONS (Electric Field) 30 MHz - 1000 MHz	Class B

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 61000-4-4	ELECTRICAL FAST TRANSIENT/BURST - Power line	± 4 kV
EN 61000-4-4	ELECTRICAL FAST TRANSIENT/BURST - M-Bus line	± 4 kV
EN 61000-4-5	SURGE IMMUNITY - Power line. Common/differential mode.	± 1kV / ± 0,5kV
EN 61000-4-5	SURGE IMMUNITY - M-Bus line. Cable shielding.	± 4 kV
EN 61000-4-5	SURGE IMMUNITY - M-Bus line. Common/differential mode.*	± 2kV / ± 1kV
EN 61000-4-6	CONDUCTED DISTURBANCES, INDUCED BY RADIO-FREQUENCY FIELDS 0,15MHz - 80 MHZ. Power line and M-Bus line.	3 V

* test carried out at the request of the manufacturer. The M-Bus port has an increased durability against over voltage. Carrying out this type of test is not required with the use of shield cable. Reaching a high level of protection on the M-Bus port also guarantees a very high reliability of the converter. The M-Bus interface often poses the greatest risk of over voltage 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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Manufacturer:

Juraj Čaplický – Elektronika

Address: Bôrická cesta 103, Žilina 010 01, Slovak Republic
Phone: +421 908 854 675
Web: www.prevodniky.sk, www.jc-e.eu
E-mail: service@prevodniky.sk, office@prevodniky.sk