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Implementation of the measurement network for active energy meters LE-01M/LE-03M to RS-485 port

Document Version M1.0

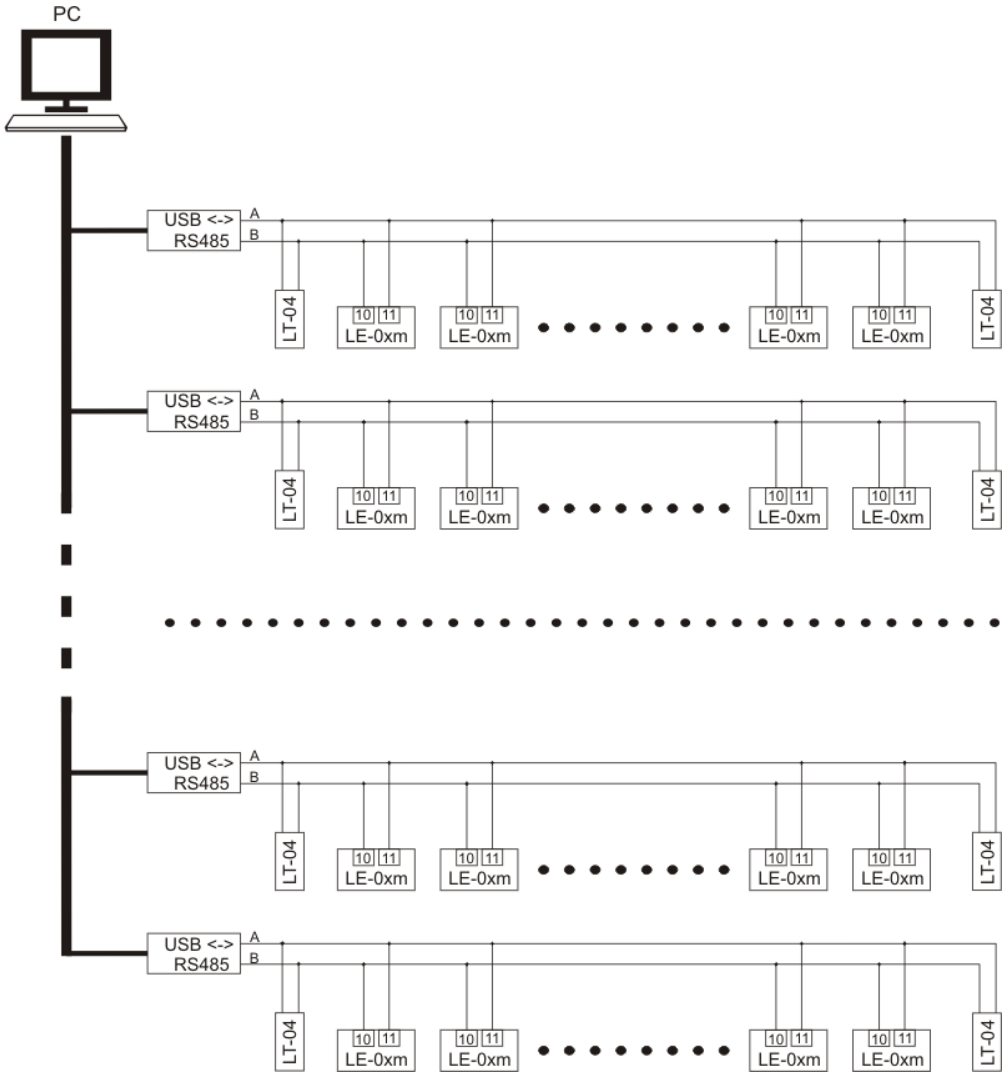
Due to the lack of data on the design and use of all facilities to implement the company's F&F is not responsible for user projects.

MEASURING NETWORK

Network operating in accordance to the Modbus RTU standard can contain up to 245 devices, connected by two wires signal cable. The maximum communication range - 1200m. With a large number of devices can be smaller - 800 ÷ 1000m. **It is important to mount on both ends of the communication lines a termination modules LT-04 (120 Ohm).** When connected to a single line more than 32 devices may be necessary to separate groups of devices (up to 32 pieces) with additional special equipment called repeter.

NETWORK TOPOLOGY

An example of a LE meters network managed by PC:



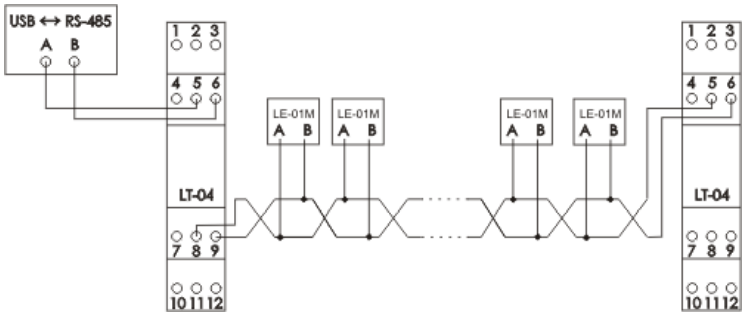
To PC are included USB converters <-> RS485 with the number of planned subnet. At the output of each converter is

mounted termination module LT-04 and signal cable, which are connected in parallel with energy meters. At the end of each signal cable is installed the second module LT-04. It is important that within each subnet will not exceed the maximum number of meters, and that the aggregate length of cable (for each subnet) does not exceed 1000m. If there is no possibility to put of a shorter cable, you can apply additional amplifiers which allows use of virtually cost 2 to 3-fold). The number of subnetworks depends only on the number of available USB ports and application possibilities, which will be on the PC to receive and process data.

TERMINATION MODULES LE-04

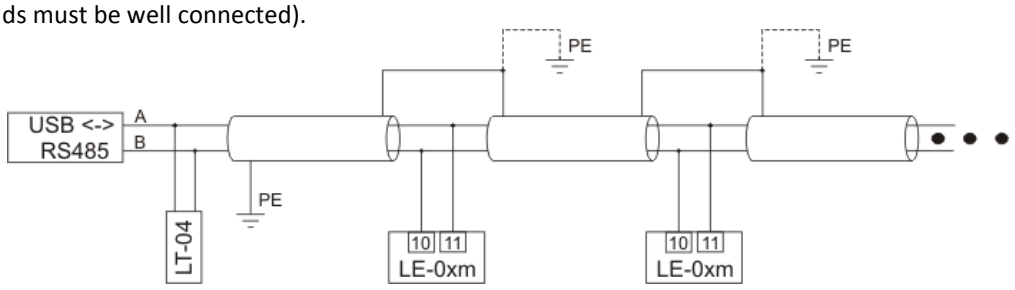
LT-04 module is a product of the standard range of products of F&F company.

Way of trmination of line by LT-04 module:



COMUNICATION CABLE

Very important is the correct selection of the communication cable. For communication with energy meters is used two-wire network which working accordance to the Modbus RTU standard. Because of the large number of devices and network extension **is recommended** to use special communication cables with an impedance of 120 ohms for RS485 interface and introduce a slight delay to the line. Shield of the communication cable at least one side **must be connected to ground and must maintain continuity along the entire length** (it is best to connect to the meter did not infringe the shield, or shields must be well connected).



If the energy meters is some ground connection (low impedance), it is recommended to connect the shield of cable to the PE at each meter.

In case of inability to use specialized cable to RS485 communication should be used the two wire cable in shield with diameter of not less than 0.5mm^2.

COMMUNICATION PARAMETRS

Energy meters LE-0xm communicate in accordance to the Modbus interface and work only as a slave device (slave).

Communication parameters:

- **transmission speed - 9600 bit/s**
- **no parity**
- **word length - 8 bits**
- **stop bits- 1**
- **transmission security - checksum CRC**

Data frame is fully compatible with standard Modbus RTU (described in detail in annex „Modbus_over_serial_line_V1_02.pdf").

COMMUNICATION PROTOCOL

Modbus RTU interface In LE-0xm meters 0xm LE supports the following commands:

CHANGE OF METER ADDRESS

To properly read the indication of meters in the network must first be given a unique network addresses to energy meters.

ATTENTION! Within a single subnet may not be two meters with the same address.

To change the meter address, MASTER device sends an order with the following structure:

0x00 - Present meter address

0x06 - Modbus Command code (command write registers)

0x00

0x06 - The register number, where is stored in the meter address

0x00

0x01 - New meter address (upper and lower byte)

CRC – Checksum CRC (two bytes)

Meter confirmed receiving a command by sending a frame in the same form. Each subsequent command sent to the meter must already contain the new address.

ATTENTION!

1) When you change the meter address must hold down the button 12

2) By default, the meter is set to address 0

3) LE-0xm does not support the orders of broadcast type (address of zero is treated like any other).

READING METER INDICATION

To read the electricity meter to indicate current master device sends a command with the following structure:

0x00 - The address of meter to which the request is sent

0x03 - Modbus Command code (command write registers)

0x00

0x00 – Adress of the first register containing the indication of the energy meter

0x00

0x03 - Number of registers to read

CRC - Checksum CRC (two bytes)

In response, the meter sends a message in the form:

0x00 - Address of the corresponding meter

0x03 - Command code which corresponds to the meter

0x06 - Number of bytes of data communication

0x00 - Meter indication - Byte 1 (example)

0x00 - Meter indication - Byte 2 (example)

0x00 - Meter indication - Byte 3 (example)

0x01 - Meter indication - Byte 4 (example)

0xE8 - Meter indication - Byte 5 (example)

0x48 - Meter indication - Byte 6 (example)

Indication of the meter is stored in consecutive bytem as a hexadecimal number. When converted to decimal form we obtain the result in kWh with precision of 0,1 kWh for meter LE-03M, and with precision of 0.01 kWh for the meter LE-01M.

An example:

$(0x00\ 0x00\ 0x00\ 0x01\ 0xE8\ 0x48)_{16}$ =

$= (125000)_{10}$ = 12500.0 kWh (for meter LE-03m) = 1250.00 kWh (for meter LE-01m)