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EQUOBOX LC1

M-Bus

Adapter/Repeater

User Guide

Rev 3.8

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1. M-BUS OVERVIEW

1.1 DESCRIPTION of the M-Bus System

The M-Bus (Meter Bus) system is a communication protocol compliant with the EN13757-2 standard. The M-Bus System provides the following advantages:

- High level of data transmission security
- Low wiring costs
- Long distances without requiring repeaters
- Large number of central units
- Detection of both battery-powered and mains-powered devices
- Automatic device recognition
- Vast array of systems and components available
- Different types of bus topology: linear, star, and tree

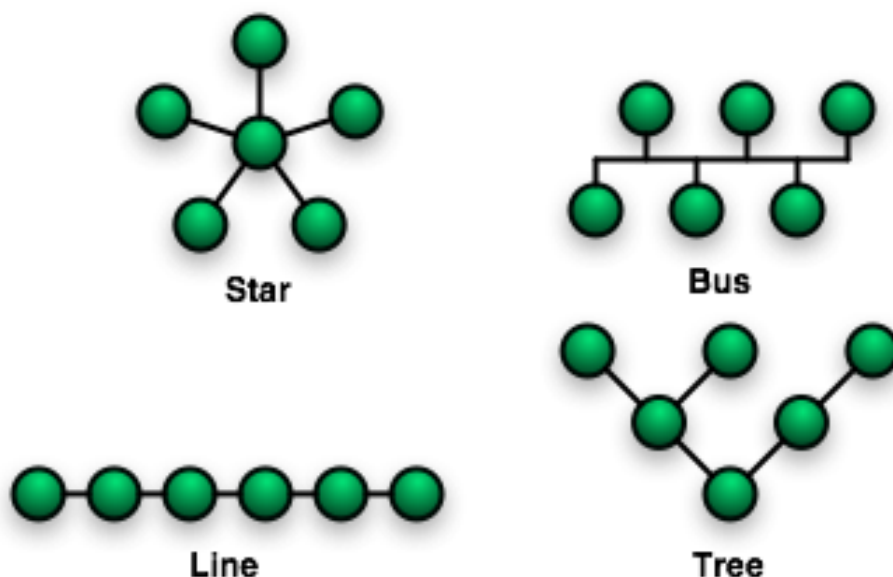


Figure 1 - Bus topologies

1.2 Addressing

The M-Bus uses two types of addressing modes to detect the devices

- Primary address: up to 250 primary addresses can be allocated within an M-Bus system. The primary address is normally allocated while setting up the central units.
- Secondary address: the secondary address consists of 8 bytes and allows the allocation of any number. By default, the secondary address of the devices is the same as the manufacturer serial number. This type of allocation prevents bus conflicts.

1.3 Sizing the M-Bus System

Cable type

- Shielded telephone cable 0.5mm²
- Cable maximum capacitive load: 152 nF/km

If you are using a cable of 0.6mm section halve the maximum length and the number of slaves

Follow the instructions provided in the table to size the M-Bus system

Type of plant	Maximum distance	Overall cable length	Cross-section mm ²	Number of devices (slaves)	Max. transmission rate
Small residential buildings	350 m	1000 m	0.8 mm	250	9600 Baud
Large residential buildings	350 m	4000 m	0.8 mm	250	2400 Baud
				64	9600 Baud
Small complex	1000 m	4000 m	0.8 mm	64	2400 Baud

1.4 BUS signal specifications

M-Bus system	u.m.	Condition	Minimum	Typical	Maximum	Unit of measurement
Number of devices per segment	n	SIN.EQLC1	0		60	
Transmission rate	T	$C_{segment} \leq 382nF$	300	2400	9600 Baud	Bd
Bus voltage	U	IM=0...400mA	12		42	V
Bus Voltage (Master)	U _M	IM=0...400mA	30	40	42	V
Bus Voltage (slave)	U _{S,R}	$I_S \leq 1.5mA$	30		42	V
Bus current	I _{M,V}	SIN.EQLC1	0		90	mA
DC Bus current	I _{M,K}	SIN.EQLC1	130	500	160	mA
Current (slave)	I _{S,R}	US=30...42V	0.75	1.2	1.2	mA
Transmitted current (slave)	I _{S,S}	US=30...42V	11		20	mA

2. SIN.EQLC1 INSTALLATION

2.1 Description of the SIN.EQLC1

SIN.EQLC1 is a unit that reads M-Bus devices in compliance with the EN 13757-2 standard. Up to 60 M-Bus devices (loads) can be connected to each SIN.EQLC1 unit. The SIN.EQLC1 unit can be used in three different ways:

- Master Mode connected to SIN.EQRTU1
- Master Mode connected to the PC via USB using the EQUOBOX TOOLKIT software (SIN.EQSW1)
- Slave/Repeater Mode, inserted into an already existing M-Bus network in order to expand it or repeat the signal



RoHS



2.2 Appearance of the SIN.EQLC1

SIN.EQLC1 looks like a device for mounting on DIN rail. The connectors/LEDs present are listed below:

	A	POWER SUPPLY CONNECTOR (9) - negative pin (-) power supply (24Vac/dc) (8) - positive pin (+) power supply (24Vac/dc)
	B	M-BUS Master CONNECTOR (6) - Pin 1 for connection M-Bus meters (Master mode) (7) - Pin 2 for connection M-Bus meters (Master mode)
	C	M-Bus Slave CONNECTOR (1) - Pin 1 for M-Bus network to extend (Repeater mode) (2) - Pin 2 for M-Bus network to extend (Repeater mode)
	D	CONNECTOR FOR DATALOGGER CONNECTION (3) - Pin A for datalogger connection (SIN.EQRTU1) (4) - Pin B for datalogger connection (SIN.EQRTU1) (5) - Pin C for datalogger connection (SIN.EQRTU1)
	E	CONNECTOR FOR PC CONNECTION MINI-USB-B
	F	STATUS LED Ref. Chap 2.6

Figure 2 - Features and connectors Level Converter (SIN.EQLC1)

2.3 Technical features

ELECTRICAL FEATURES

Rated Voltage	24Vdc +/- 10% (Rev. HW 1.0 or if not specified) 24Vdc +/- 10%, 24Vac (min 20Vac, max 40Vac) 50/60 Hz for HW 2.0 versions
Installation category	Class III
Rated Voltage	3W + (0.07W * number of M-Bus slaves)
Maximum consumption	12W

MECHANICAL FEATURES

Operating temperature range	From -20°C to +55°C
Storage temperature range	From -25°C to +65°C
Dimensions	90x71x62 mm (HxLxD) – DIN
Installation type	35mm DIN bar (EN60715)
Protection rating	IP20 (EN60529)
Connections	M-Bus Slave: to connect as a repeater / extender M-Bus Master: for connection to the M-Bus meters Mini-USB Type B: for connection to the EQUOBOX TOOLKIT software (SIN.EQSW1)

M-BUS SECTION

Reference standard	EN13757-2 (Physical Layer)
Baudrate	Min. 300bps – Max. 9600bps
M-Bus-RS232 isolation	1KV AC
M-Bus-USB isolation	1KV AC
Max. number of M-Bus devices (loads)	60
Max. number of devices that can be connected in cascade mode	N°4
Transmission speed	Minimum: 300bps Typical: 2400bps Maximum: 9600bps
Bus voltage	42V – 30V
Short circuit protection	Yes

2.4 Topology and connection of the M-Bus network

M-Bus technology allows good freedom of choice regarding network topology. It is possible to connect the devices present in the system according to a star, linear, tree topology as seen in 4 and 5. However ring topology (Figure 5 - Ring topology NOT ALLOWED) is not allowed. It is also not necessary to observe any polarity of the bus, thus simplifying installation.

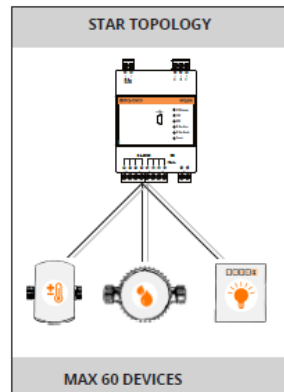


Figure 3 - Star Topology

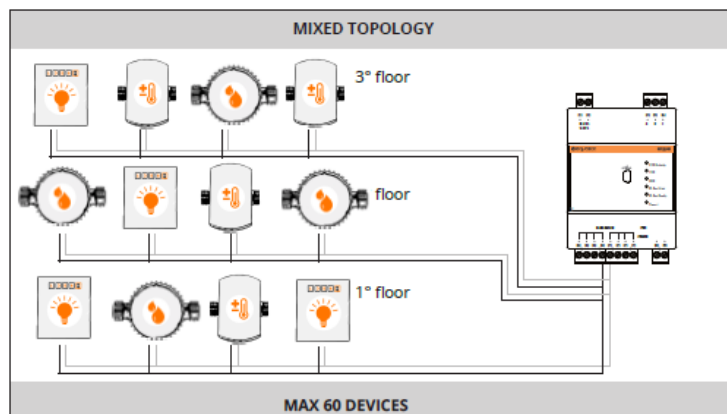


Figure 4 - Mixed Topology

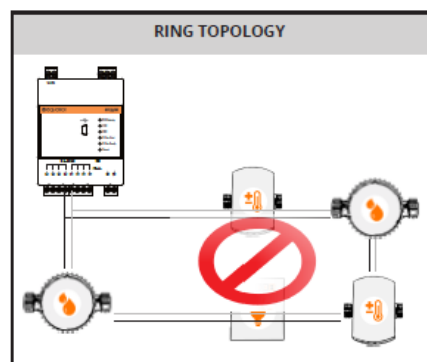


Figure 5 - Ring topology NOT ALLOWED

2.5 SIN.EQLC1 operation modes

SIN.EQLC1 can be used as an M-Bus communication interface for SIN.EQRTU1 datalogger or a PC with EQUOBOX TOOLKIT software (SIN.EQSW1) or as a repeater/extender of an M-Bus network. The table below shows the connection diagrams for the different operation modes.

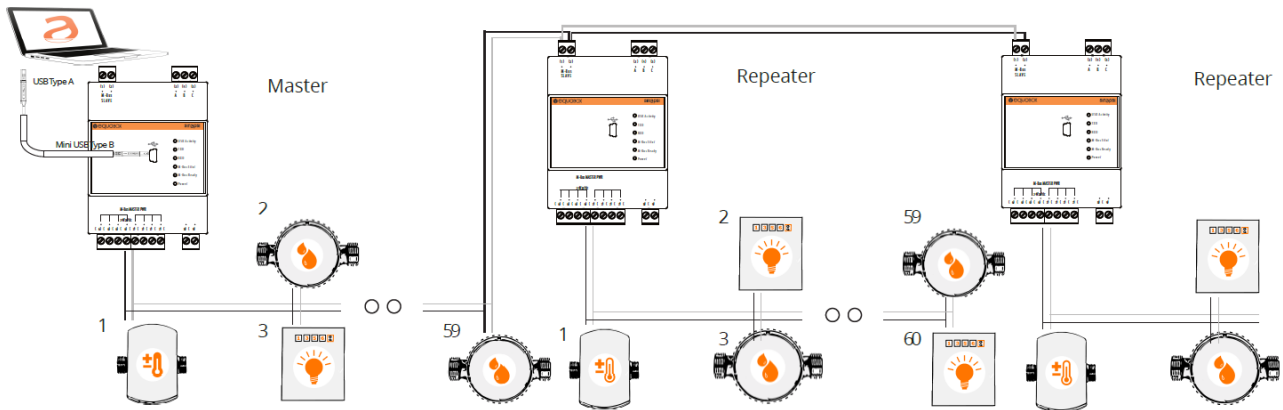


Figure 6 - Connections allowed

2.6 Status LED

There are n ° 6 LEDs present on the SIN.EQLC1 device, which indicate the operating status as shown in the figure:

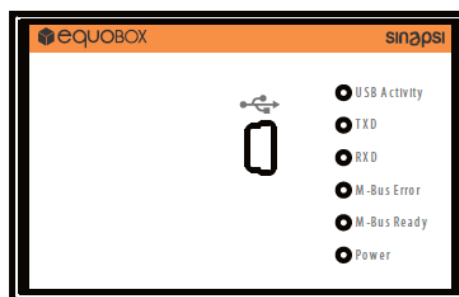


Figure 7 - Status indicators

- USB Activity:
 - 2 blinks → the device is ready to be connected to the PC by means of the mini USB-B cable
 - 5 blinks → PC successfully connected and device correctly recognised by the PC
- TXD: Indicates the status of the data transmission to the M-Bus network connected to terminals (6) and (7)
 - ON → data transmission in progress
 - OFF → no data transmission in progress
- RXD: Indicates the status of the data received by the M-Bus network connected to terminals (6) and (7)
 - ON → data reception in progress
 - OFF → no data reception in progress

- M-Bus error: Indicates whether the BUS current is correct or not
 - ON → BUS overload error (possible short circuit on the M-Bus or excessive number of devices connected)
 - OFF → no errors detected
- M-Bus ready: Indicates that the BUS voltage is correct and that there are no anomalies.
 - ON → The BUS is polarised with enough voltage to allow for proper operation and the LC is ready to transmit data
 - OFF → the BUS voltage is not sufficient to allow for proper operation
- Power: Indicates whether the device is powered
 - ON → The device is powered correctly
 - OFF → The device is not powered correctly

2.7 Device power supply

The sizing of the power supply unit should be performed considering that the M-Bus devices may absorb to 20mA during communication and that in the process of plant commissioning address conflict may occur, this means that several slaves can respond simultaneously to a SIN.EQLC1 request, and then, at that moment, the current absorbed by each slave is added. SIN.EQLC1 limits the maximum current on the M-Bus line to 300mA. We therefore recommend a 24Vac/dc power supply with minimum power of 12W and a tolerance of voltage value as specified in Chap 2.3.

2.8 Firmware update

Through the EQUOBOX TOOLKIT software (SIN.EQSW1), it is possible to check the version of firmware in SIN.EQLC1 and update it if it necessary. Refer to the SIN.EQSW1 user guide for details.