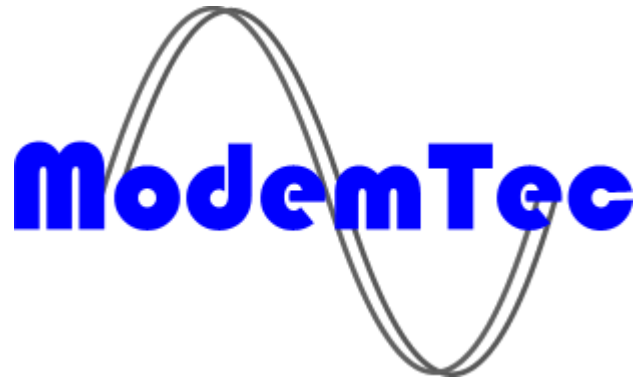


Technical description

MT23-B (M-bus master)



WARNING



The equipment makes a set of two basic modules – MT21 power and link module and MT23-B „master M-bus“ module. This setup only is safe from the point of electrical shock. This is the reason for not using other power supplies or connections except presented in this manual.

The equipment is continuously powered from 230V/50Hz network. From this reason any manipulation with the cabinet, leads or parts inside requires extensive care and can be executed just by an authorized person (§6).

The equipment is sufficiently covered just in an IP65 installation box against water and high dampness (IP65 – dust proof, water jetting resistant).

Do not place the equipment necessarily in close vicinity of heat sources (heat guns, hot air equipment, etc.).



The equipment will work reliably just in an environment given in this service manual. Any arbitrary changes of operation and servicing can cause equipment function deterioration or destruction.

GENERAL INSTRUCTIONS – GENERAL DESCRIPTION

It is intended for using within LV 230V/50Hz distribution network as a data transfer unit from M-bus for local data reading and further processing in a PC by way of supervising MT23R PLC module and/or MT23-B (Mbus – slave module). The system acts as an intelligent M-bus extension toward 230V distribution network. MT23-B is equipped as a master M-bus for control and powering of max. 10 controlled units up to total length of 500 m. Even an MT24 three-phase repeater can be used when necessary, which amplifies signals in PLC network and distributes them over all three-phase leads of 230V network. The module complies with ČSN EN 60870-5 (for communications) and ČSN EN 1434-3 (for M-bus).

Operation state

It is a basic function of the equipment. In this state the module realize M-bus data transition over power network to and from units installed into master. It is necessary to realize that the application of MT23-B with master MT23R modules or MT23-B slave *does not make data conversion from general format to an M-bus protocol*, but just interposes a communication over 230V distribution network. From this reason some application software intended must be used for communication over M-bus.

Programming state

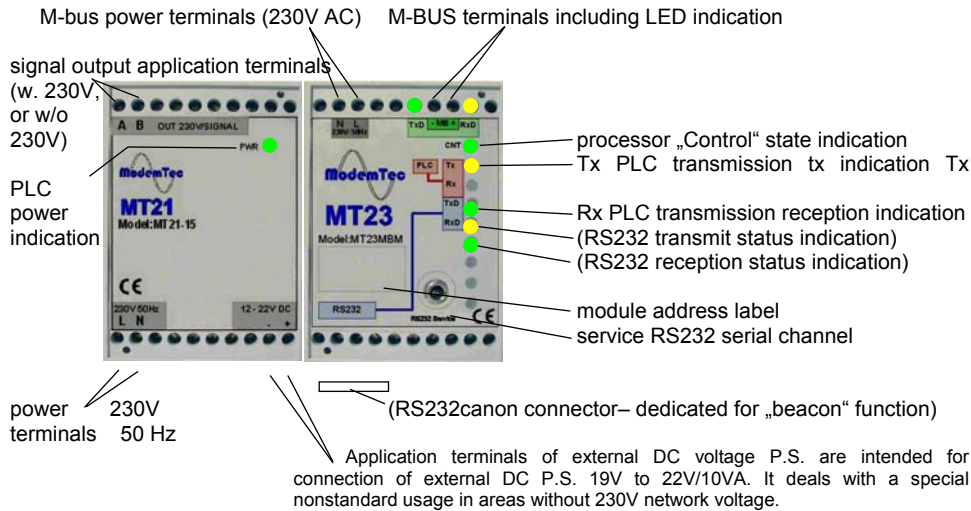
It is a state in which equipment parameters are set-up. It consists of computer connection to MT23-B module via serial port and its direct programming by means of RSET program, which is an integral part of the supply.

"Beacon" function

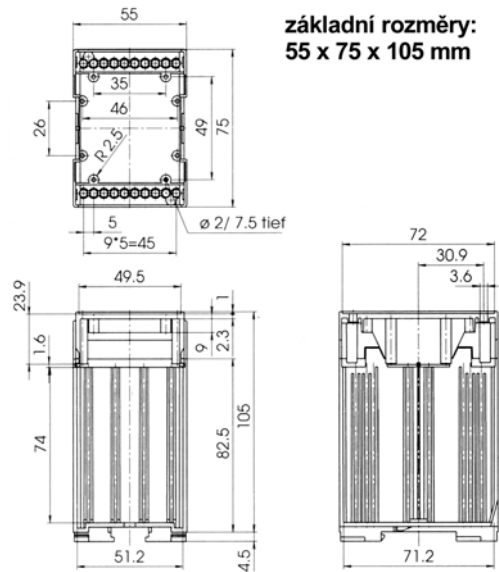
The system enables to do an unique and very simple test of communication. A result of this test can be a map of communication over local power network. The map can be used at designing a final version of modules placement and in future to easier system extension or to make failure analysis easier. MT23-B module is provided with a „BEACON“ function. The module will be switched over to a state of continual monitoring of the MT23R (MBs) module by means of simple insertion of the “Beacon” connector. In such a way a communication test between two points of power network can be done by means of two modules without any preparation and without PC. So the map of communication of a local power node can be obtained and together with customer's requirements an optimal PLC communication can be selected.

PANEL DESCRIPTION AND ITS SIZE

The equipment is embedded inside of Bopla CN 55 AK boxes enabling attachment on DIN35 strip.



Bopla CN 55 AK:
mat.: ABS



The output can be combined with the voltage of 230V or without the voltage. The selection is hardware realized by means of internal terminals in MT21 P.S. When 230V voltage is allowed the other modules must have this voltage disconnected. Beware of inter-phase short circuits or undesirable two different systems connection.

Description of indication elements:

Power indication – indication of MT21 connection to 230V network and 19VDC output voltage presence

Processor „Control“ state indication – CPU motherboard state indication, when lit – system is OK

Tx transmission indication– indicates a state of transmission from processor toward MT21 source unit power amplifier – when lit the transmission is active

Rx reception indication– indicates a state of reception toward processor from MT21 front-end amplifier MT21 – when lit the reception is active

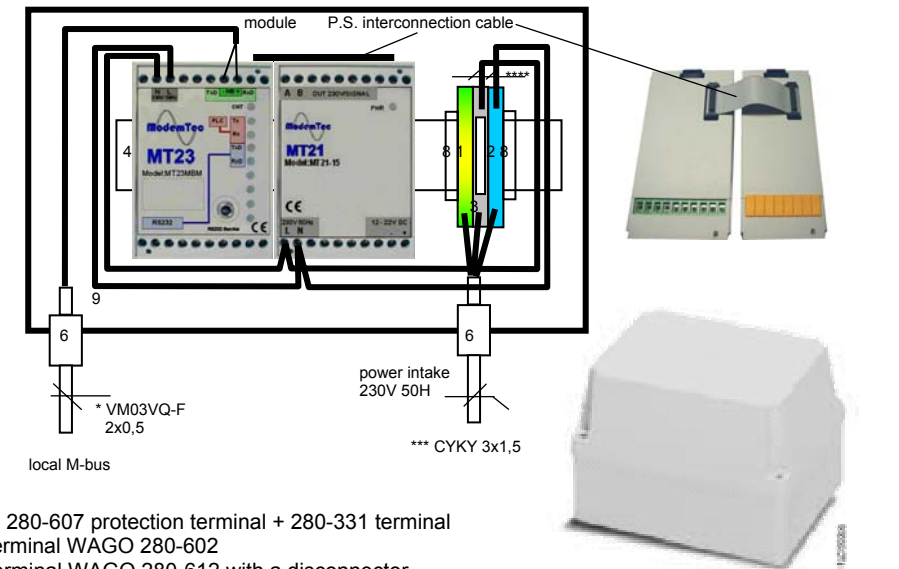
Transmission toward M-bus state indication – indicates a state of transmit output toward M-bus, ie as this LED blinks anyhow transmission toward M-bus is active

Reception from M-bus state indication – indicates a state of reception input from M-bus. As this LED blinks anyhow or is lit, data reception from M-bus is active

Signal application output terminals w 230V or w/o 230V serve to a special use of modules in a nonstandard connection on an individual, unloaded communication cable (with no load but other PLC communication modules).

POWER CONNECTION

M-bus module electrical installation design:



- 1 –WAGO 280-607 protection terminal + 280-331 terminal
- 2 – blue terminal WAGO 280-602
- 3 – gray terminal WAGO 280-612 with a disconnector or eventually 281-511 fuse holder
- 4 – DIN 35 strip (as per the box length)
- 6 –OBO V-TEC Pg 7 cable bushings or side box wall tight opening usage
- 8 –WAGO 246-116 DIN 35 strip end shoe
- 9 –ABB 00 860 box with a high cover, IP55 protection or ABB 12 808 with IP65 protection

- * - power lead H05VV-F 2 x 0,75 (or 2 x 1 as per bus length and number of controlled positions)
- *** - power lead as per which breaker is used for intake
 - fuse, breaker 6A – wire 3x1
 - fuse, breaker 10A – wire 3x1,5
 - fuse, breaker 16A – wire 3x2,5
- **** - use one of power cable wires

Similar elements of other manufacturers with equivalent parameters can be used.

MT21 power supply location (left, right) is unsubstantial from the point of intake conductors interaction.

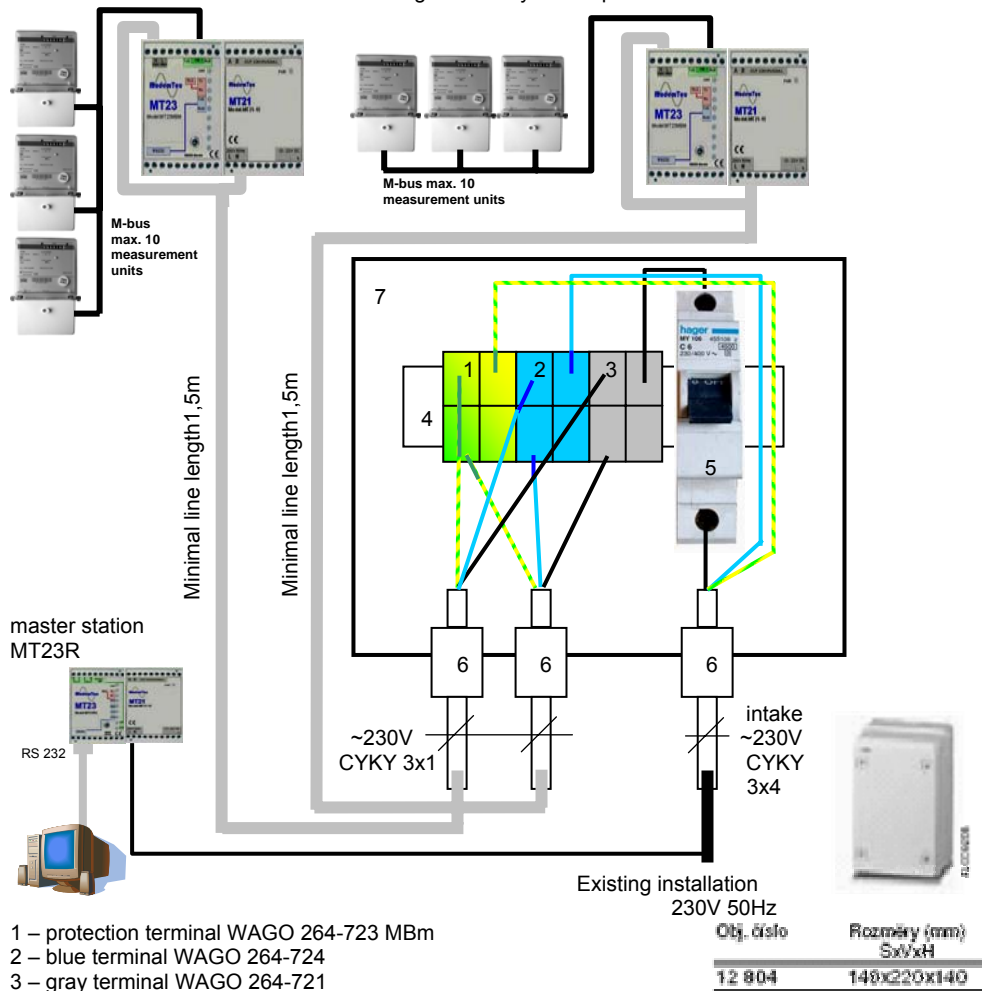
M-bus input terminals are interchangeable (symmetric).

VM03VQ-F 2 x 0,5 cable- two-wire classical cable with a plastic polyurethane sheath type TPU, 0,5mm Cu core. It is intended for use in damp and wet environment. A moderate mechanical and high abrasion (dragging and scraping) stress are allowed. Real line resistance is max. 39 Ohm/km. Allowed environment temperature is -20°C to +70°C.

H05VV-F 2 x 0,75 cable, for short and unpretentious lines as far as mechanical effect are concerned real line resistance max. 26 Ohm/km, environment temperature is -15°C to +70°C.

Both cables can be used up to 500m for 10 measurement units on M-bus.

MT23-B modules electrical installation design in vicinity of one power node:



- 1 – protection terminal WAGO 264-723 MBm
- 2 – blue terminal WAGO 264-724
- 3 – gray terminal WAGO 264-721
- 4 – DIN 35 strip
- 5 – 6A (HAGER MY106 C6) breaker
- 6 - OBO V-TEC Pg 7 cable bushings or side box wall tight opening usage
- 7 – ABB 12 804 box, IP65 protection, w x h x d (140 x 220 x 140)

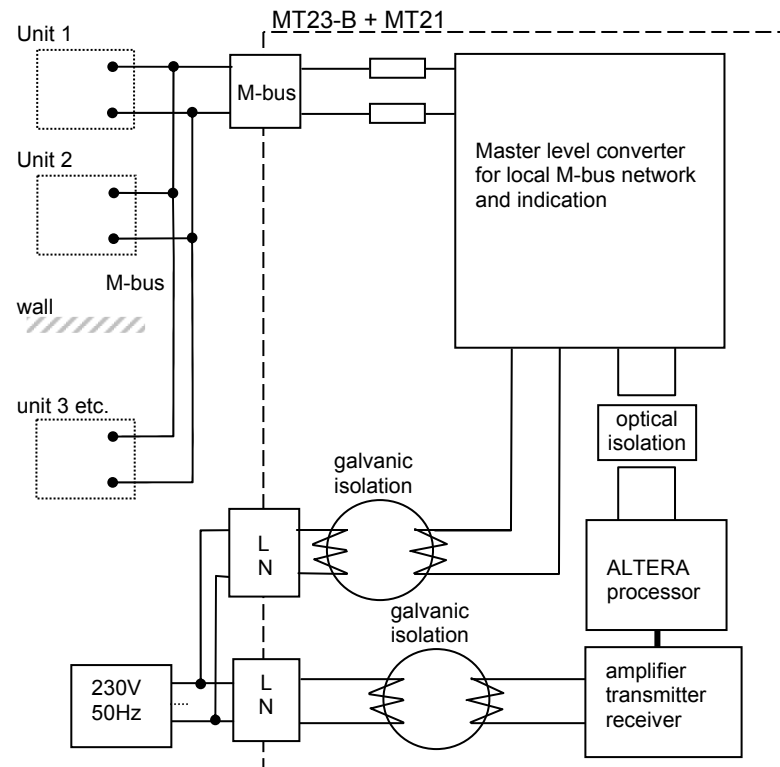
Similar elements of other manufacturers with equivalent parameters can be used.

During individual modules connection to the 230V distribution network principles of using wires of certain minimal cross-section must be followed. An impedance loop of breaker reliable cut-off by a short circuit current must not be changed. Otherwise the onwards line must be fused by a new breaker with an appropriate cut-off current (see the picture).

- fuse, breaker 6A – wire 3x1
- fuse, breaker 10A – wire 3x1,
- fuse, breaker 16A – wire 3x2,5

CONNECTION OF M-BUS TO THE MODULE

30V level converter to M-bus is designed for small number of units control (max.10 units). Total current consumption during stand-by mode must not exceed 15 mA. The converter is equipped with short circuit and over-voltage protection; it does not have a balancing circuit. It is fully galvanically isolated from the control unit.



The M-bus converter is continuously current overloadable. After overload or short circuit vanishing the converter returns back to a normal operation state.

Screw terminals up to wire of 2,5 mm² cross-section are used for all wires connection. M-bus is galvanically isolated from the MT23-B control unit itself. Output voltage on M-bus terminals can be in the range of cca +41V to +34V when loaded.

PROGRAMING STATE

Prior to PLC MT23-B module usage its several parameters must be set-up. They are set-up via RS232 service port from PC by means of RSET setup program.

The following parameters are set-up:

Local address – module address set up in the course of PLC network.

Remote address – remote module address set up in the course of PLC network.

Interface – RS232, RS422, RS485 communication channel selection. No set up.

Baudrate – communication rate set up of the selected channel in the range of 300 ÷ 115200 bit/s in the standard raster. The rate must be set up with regard of PLC transfer transmission rate in connection with a buffer capacity and amount of data transferred.

Parity – parity set up. Fixed set up „EVEN“

RX Timeout – time interface, by means of which the modem evaluates an end of datagram.

HS Timeout - Handshake Timeout - time, during which the modem waits for a confirmation (HS) packet from the opposite modem before a repetition transmission starts.

Rec. Timeout - Receive timeout - time, during which the modem waits for another packet from the opposite modem. If it does not arrive, the communication is finished (modem either waits for data completion in the following repetition and/or for a new datagram).

Retransmissions - Number of repetitions after handshake timeout expiration. Maximum number of datagrams sent out to the opposite modem during one transaction is 1 + Retransmission

Rem:

Slave modem is a modem, which answers a query in transaction query – answer.

Datagram is one complete message among terminal equipments connected to the modems.

Packet is a part of the datagram.

For maximum one-way transmission time calculation stands the following:

$T=36\text{ms}$ for 22 bytes of data

$T_{\text{local_modem_max}}(\text{ms})=(T_{\text{lm}}+\text{HS_Timeout_lm})\cdot(\text{Retransmissions_lm}+1)$ (local modem)

$T_{\text{remote_modem_max}}(\text{ms})=(T_{\text{rm}}+\text{HS_Timeout_rm})\cdot(\text{Retransmissions_rm}+1)$ (remote modem)

Recommended polling interval (e.g. for Modbus master):

$T_{\text{polling}}(\text{ms}) \geq (T_{\text{local_modem}} + T_{\text{remote_modem}}) \cdot 1.2$

For the following see RSET program description.

Communication protocols can be found on <http://www.modemtec.cz/protocol>.

OPERATION ERRORS

The MT23-B module supports just the operation on-line mode. It answers queries from master PLC MT23R and PC in a real time.

Various module error conditions can arise during operation. Further described are some of basic error conditions with the solution how to get rid of the error.

No.	Indication LED status	Malfunction description	Malfunction elimination
1	no LED is lit	No power on module	<ul style="list-style-type: none">- check the power supply – whether green LED lights- check the interconnection flat cable between module and power supply- have the module repaired
2	M-bus lineRx/D LED evenly blinks	overload, short circuit on M-bus	<ul style="list-style-type: none">- disconnect M-bus leads (if the LED stops blinking)- check the M-bus , clear the short circuit, replace defective measuring unit

OPERATION STATE

M-bus:

M-bus converter power supply	~ 230V ±10% 50Hz
Input power	1,9 VA
application	local data reading transfer over M-bus
number of connection points (n)	10 measurement units
max. bus length	500m
communication rate	300 Bd ÷ 9600 Bd
communication restoring time after P.S. failure	≤ 1 s (valid even for bus overload removal)
Voltage on M-bus terminals:	
Mark level ($U_{MU,M}$)	≥ +34V (with cca 10 measurement units)
Space level ($U_{MU,S}$)	≤ +22V
Internal measuring resistor (R_M)	68 Ω
Scanned current of measurement units:	
Mark level (I_M)	0 ±1,5 mA per unit
Space level (I_S)	18 ± 20 mA
Decision current at overload	≥ 60 mA
Overload to normal change over	automatic

Module:

External power voltage U_n	+ 15V to +19V
Power current consumption	cca 0,13 A
- standby	
- transmission	cca 0,7A

Climate environment	normal
Operation temperature	-20 °C to +60 °C
Limit temperature	-30 °C to +70 °C
Storage temperature	-40 °C to +80 °C

Safety class II

Complies with norms: ČSN EN 61010-1,
ČSN EN 60529, ČSN EN 61000-6-2,
ČSN EN 61000-6-3, ČSN EN 60870-5,
ČSN EN 1434-3