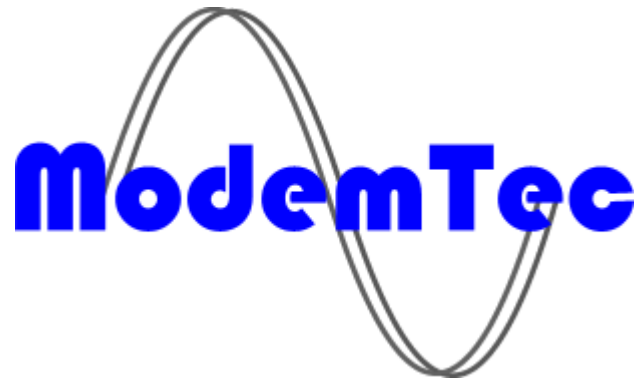


Technical description

MT24

User manual



WARNING



The equipment makes a compact set of the switchboard. Just this set is safe from the point of electrical shock. Therefore do not use other power supplies or circuits than mentioned in this direction

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). The protection itself is IP30.

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 3x230V 50Hz distribution network as an over line transfer unit. It can work in several modes that are set up by the manufacturer according to customer's requirement. The first mode is a three-phase router and a signal amplifier. It enables messages routing among ModemTec PLC modems. It is mainly used for PLC modules communication via distribution transformer or a very low impedance node. It can obviously be used anywhere where the signal is to be branched out into more phases (max. three phases) disregarding phase sequence. Voltage level of 230V AC must be kept however. Even several repeaters in various nodes can be used. Very far-reaching PLC network can be established by means of MT24 series routers including network where a signal must be routed among particular phases. Second mode is a pair communication between two MT24 or MT24 and MT23R. It is a data transmission from one place to another. Any device like PC, programmable automats or other equipment having RS232 communication link can be connected to MT24. A third mode represents a network communication. This mode enables to establish a far-reaching data communication network among one control center and several slave stations.

Operation state

It is a basic function of the equipment. The MT24 monitors the network in this state, evaluates an address and in case of the proper address repeats a message over connected phases all at once with the maximum amplitude. Subsequently it awaits another message reception. MT24 is multidirectional. It can make reception from any phase and transmission over all phases. MT24 can communicate just with PLC modules working on the same communication frequency. In the pair communication mode the MT24 passes immediately data from RS232 RX toward other MT24 pair modem. That one will receive and retransmit them to RS232 output link. In the network communication mode all is conformed to the main control station that distributes data to individual slave stations and possibly responds to their answers.

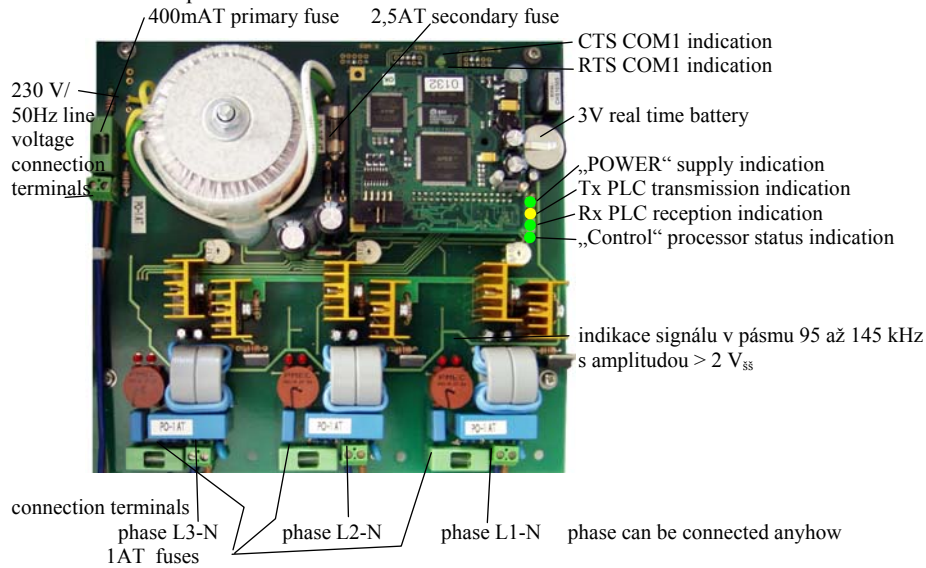
Programming state

It is a state in which equipment parameters are set-up. It consists of computer connection to MT24 module over serial port and its direct programming by means of „RSET-R“ set up software. The description of that can be found in „PLC routers of MT24 series configuration“.

“Beacon” function – see chapter „Other auxiliary function“.

PANEL DESCRIPTION AND ITS SIZE

Main board description:



Indication elements description:

Power supply indication – indicates MT24 connection to 230V line voltage and presence of 19VDC output voltage.

Processor „Control“ status indication– indicates the main board CPU status, when lit, the system is OK

Tx PLC transmission indication – -indicates transmission status from the processor toward MT24 power amplifier– when lit, transmission is on

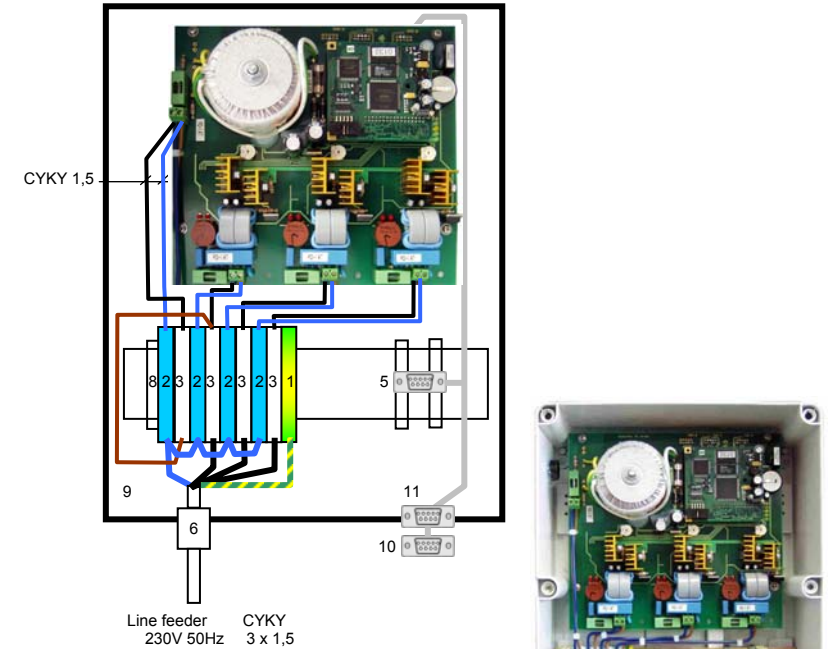
Rx PLC reception indication– indicates processor reception status from the front end MT24 amplifier – when lit, the reception is on

The MT24 main board is placed inside of ABB 00878 box sized 310 x 240 x 110mm with a transparent screw-on lid. IP55protection. After system assembling inside the box the protection becomes a IP30.



BOX INSTALLATION

MT24 module electrical installation basic design:

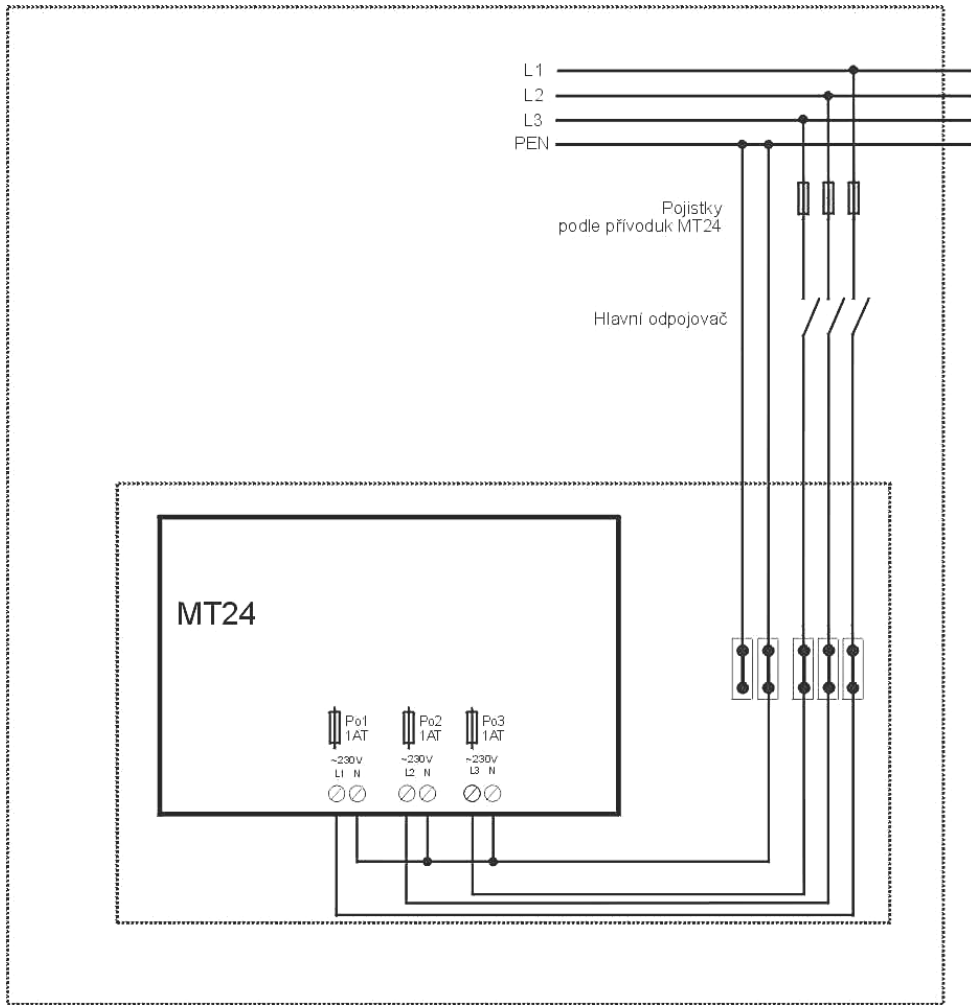


- 1 – WAGO 280-607 protection terminal+ 280-331 terminal
- 2 – WAGO 280-602 blue terminal
- 3 – WAGO 280-612 grey terminals
- 4 – DIN 35 ribbon (length as per box size)
- 5 – Cannon 9 pin RS232 connector for communication with PC– service COM2
- 6 – OBO V-TEC Pg 7 cable outlets and/or leak-proof side box outlets can be used
- 8 – DIN 35 ribbon end stop WAGO 246-116
- 9 – ABB 00 878 box with a transparent screw-on lid, IP55 protection IP55
- 10 – Cannon 9 pin RS232 connector for communication with PC– COM1 to beacon connection
- 11 - Cannon 9 pin RS232 connector for communication with PC– COM0 galvanically isolated – exclusive communication port

Similar parts with equivalent parameters of other manufacturers can be used

Each of phase output terminals can be connected to various phases or even to different networks having up to the voltage of 230VAC.

TN-C 3 x 230V 50Hz PEN voltage system



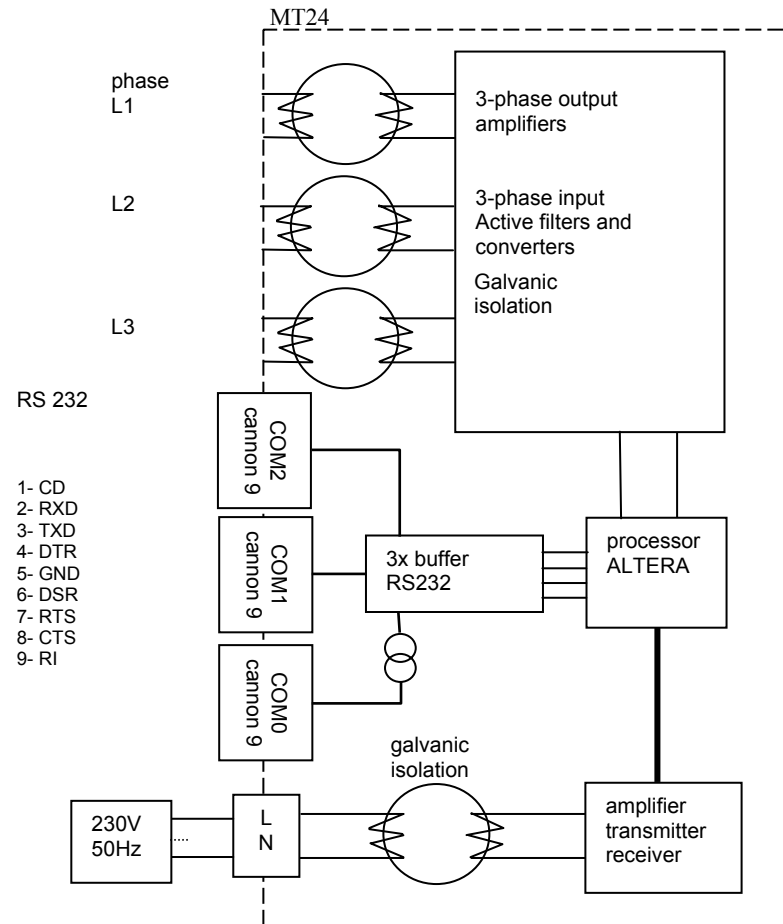
Warning

As the MT24 module is not furnished with any disconnecter a main disconnecter must be connected in its input terminals (3-pole minimum- the protection wire must not be disconnected).

The main disconnecter must easily accessible and properly marked. The MT24 module line as well must be fused by fuses or breaker according to conductor cross-section.

CONNECTION OF INPUT, OUTPUT TERMINALS AND RS232 BUS

The module has three serial RS232 lines. Two of them are dedicated to operation communication with a PC, programmable automat or with other MT24 module. Both use a hardware RTS a CTS control. The line 11 COM0 is completely galvanically isolated from the MT24. The line 10 COM1 is galvanically connected with MT24. Both links route through a Cannon 9pin connector to the outside installation box wall. The third RS232 line COM2 is a simple one without hardware control with no galvanic isolation..



RS 232 serial link serves for MT24 parameters set up. Used 115200 Bd transmission rate does not allow a long interconnection cable (cca 2 m) according to internal cable core parasitic capacity.

Protocol used:

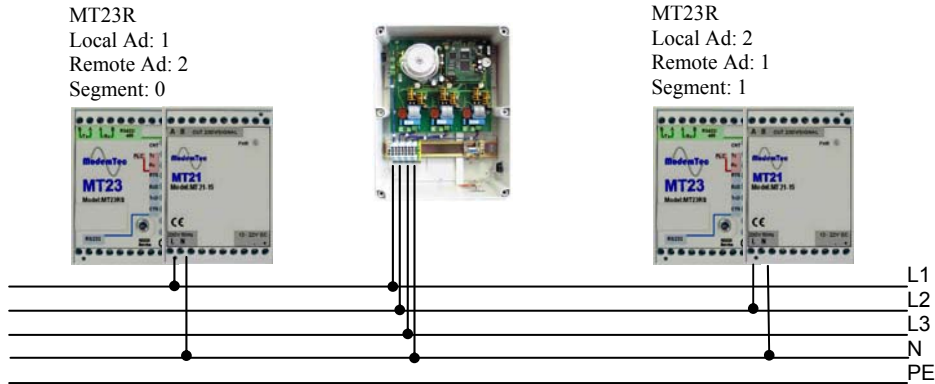
8 bits, no parity, 2 stop bits

REPEATER - SIGNAL AMPLIFIER PRINCIPLE

Mode 1:

ModemTec PLC modems are associated into logic segments in the PLC network. The modems communicate directly inside of individual segments. The communication among the segments runs by means of MT24 series routers.

Example of routing between two MT23R modems:



Routing between two MT23R modems upon different phases

On the picture is a connection of two MT23R connected upon different phases communicating through MT24 router. The first MT23R is located in 0 segment and the other MT23R in 1 segment. Routing table in the MT24 has the following contents:

FROM	TO	SRC SEGMENT	DST SEGMENT
1	1	0	1
2	2	1	0

As far as the router catches a message having a sender address in an interval from-to and sender's segment equals to the src segment column (source segment), the router will change the segment value to the one of dst segment column (destination segment) and will repeat the message. Terminal modems process just such messages which have equal both segment (1) and segment (2) addresses. In order the mechanism is functional each equipment must have assigned a unique address in the course of PLC network.

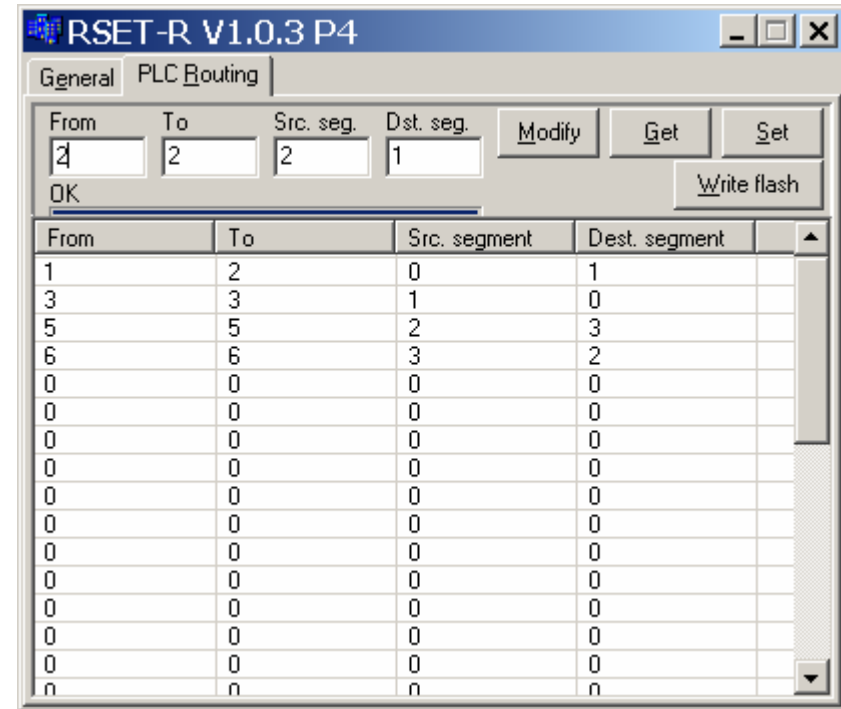
PROGRAMMING STATE

Prior to MT24 module usage a routing table must be set-up.

It is aligned through a RS232 serial port by means of PC and RSET-R set-up software.

Routing procedure in detail is described in the document "PLC MT24 series routers configuration".

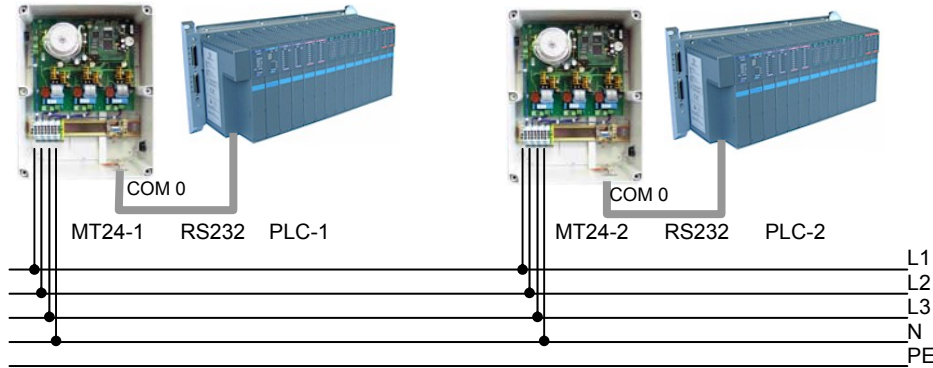
Configuration example in RSET-R:



PAIR MODE PRINCIPLE

Mode 2:

Just two modules can communicate between each other.

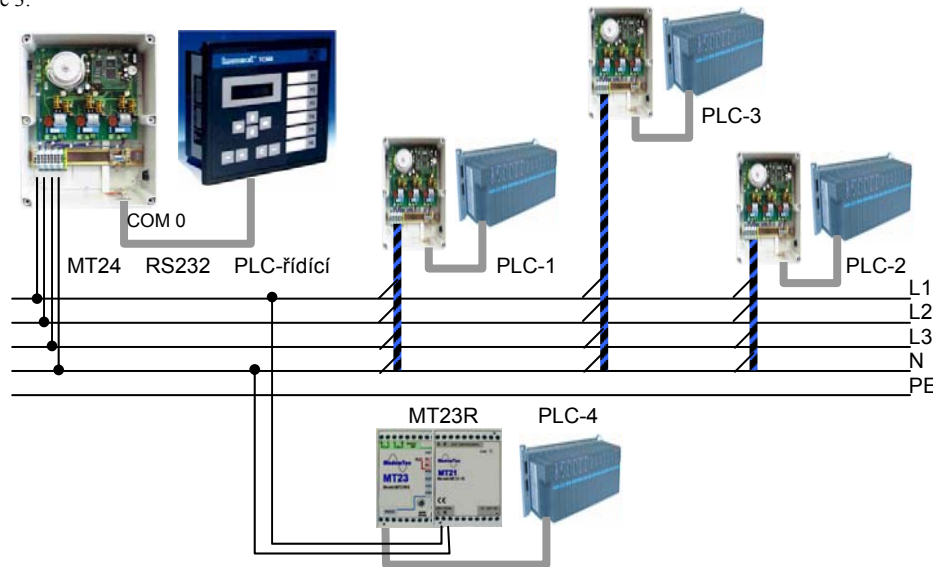


Warning:

Just one pair on a set up transmission frequency can be operated within a circuit of one distribution transformer in this mode. When several pairs should be operated (maximum 3 pairs) then each pair must use different transmission frequency. Frequencies in the range of 95kHz to 145kHz can be used. Manufacturer sets the frequency up according to customer requirement.

NETWORK MODE PRINCIPLE

Mode 3:



To set up the MT24 K modem in modes 2 and 3 a **RSET V1.0.7 P2** ÷ **RSET V1.0.9 P2** software is used.

OPERATION ERRORS

Various error states of the module can arise in the course of operation. Some of basic error states and their trouble shooting are given as follows.

Nr.	Indication LED status	Trouble description	Trouble shooting
1	No LED is lit	modul není napájen	<ul style="list-style-type: none"> - Check all fuses in power leads - Check connection leads for good connection - Learn if the equipment is not disconnected in the control room - Send a module to be serviced
2	CONTROL and POWER is lit other LEDs do not blink	Module does not communicate	<ul style="list-style-type: none"> - Check if the PLC transmission from MT23 is active - Check if the carrier frequency in PLC network e.g., 85 kHz) is same - Check all fuses in communication connection branching - Check connection cables - Check if the equipment is not disconnected in the control room - Send a module to be serviced
3	CONTROL and POWER is lit other LEDs blink sometimes	module communicates sporadically	<ul style="list-style-type: none"> - Learn if the PLC transmission from MT23 is in the set-up mode - Check if the carrier frequency in PLC network e.g., 85 kHz) is same - Check the PLC signal level and noise in connection point
4	CONTROL and POWER is lit other LEDs blink sometimes	module does not communicate with PC	<ul style="list-style-type: none"> - Check if the RS232 cable is properly connected - Communication rate set-up - RS232 data format set-up - Proper usage of RSET-R software - Send a module to be serviced

OTHER AUXILIARY FUNCTIONS

"Beacon" function

System enables very unique and simple communication test. The result of this test may be a map of communication over power line network. The map may enable a design of a final version of modules placement and system expansion or failure analysis simplification in the future.

MT24 modul is furnished by "Beacon" function. By a single plug-in of "Beacon" connector into COM1 RS232 communication port the module will switch over to the state of permanent contacting of MT22, MT23R modules or other ones. So it is possible to prove a communication between two points of power network by means of two modules without any preparation and without a PC. This makes possible to obtain a map of local energy node communication and choose an optimal PLC communication set-up together with customer's requirements.

Also a simple function test of MT24 module can be done by this way. As soon as beacon is inserted in COM1 the module begins blinking – the yellow LED Tx PLC. Even a reception red LED of power input blinks at the same time.

MAIN PARAMETERS

Power supply input:		
Voltage		230 V +10% - 15%
Frequency		50 Hz ± 3%
Input power	- standby	cca 8 VA
	- transmitting	cca 12 VA to 20 VA according to mark-space transmission ratio
Signal inputs individually:		
Voltage connected		0 to ~230 V +10% - 15%
Frequency		0 to 60 Hz
Current at 230V 50Hz		cca 35 mA _{ef} , cos φ = 0
High frequency signal:		
Carrier frequency range		95 kHz ÷ 145 kHz
Amplitude into R _Z = 10Ω		cca 10 V _{ss}
Current		cca 0,8 A _{ss}
Input sensitivity		cca 1 mV
S/N ratio		min 9 dB
Values storage		NE
RS 232 COM2 :		
Connector		cannon 9 male
Transmission rate		115200 Bd
	8-N-1	
Application		data transmission toward PC – service mode
Hardware control		NO
Galvanic isolation		NO
RS 232 COM1 :		
Connector		cannon 9 male
Transmission rate adjustable		300 to 115200 Bd
Data format		8-N-1
Application		data transmission toward PC, PLC
Hardware control		YES
Galvanic isolation		NO
RS 232 COM0 :		
Connector		cannon 9 male
Transmission rate adjustable		300 to 115200 Bd
Data format		8-N-1
Application		data transmission toward PC, PLC
Hardware control		YES
Galvanic isolation		YES
Climate environment		normal
Operation temperature		- 30 °C to + 60 °C
Limit temperature		- 40 °C to + 70 °C
Storage temperature		- 40 °C to + 70 °C
Protection		IP 30
Equipment complies with norms:		ČSN EN 61010-1, ČSN EN 60529, ČSN EN 61000-6-2, ČSN EN 61000-6-3,