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17.12.2013
MO26-(25,40,63,80,100,120)-12-MC_Rev3

AC SEMICONDUCTOR RELAY MO26-XXX-12-MC

USER'S MANUAL

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1 APPLICATION

AC semiconductor relay is intended for:

- for three phase voltage smooth sending;
- for customers emergency turn off at loosing at any of supply phases and at appearance of external failure signal.

2 BASIC PARAMETERS AND EXPLOITATION MODES

Table 1 – Table of basic parameters

Parameter name		Unit			
Output voltage maximum rise time		s	99		
Output voltage minimum rise time		s	1		
Time set discrete		s	1		
Control input current		mA	40		
Control input voltage (AC or DC)		min	10		
		max	30		
Control voltage at «Emergency» input		min	5		
		max	30		
Status outputs of relay state: - voltage		max	30		
		max	20		
Starter control output (bypass)		AC	max	V	400
		current	max	mA	300
Possibility of state display, parameters change and interface control by RS485					

Maximum commutated current: 25, 40, 63, 80, 100, 120 A depending on modification.

Table 2 – Maximum permissible exploitation modes

Relay name	Maximum pick voltage at output in closed state, Upick, V	RMS commutated current, Icom, A		RMS commutated voltage value, Ucom, V		Commutated pulse current Icom. pulse*, A	Input voltage at turn on state, Uin, V	Input voltage at turn off state Uin.off, V	Increasing critical speed of output		Temperature work operation T, °C		Junction temperature Tj**, °C		
		min	max	min	max				voltage dU / dt, V / us	current, dI / dt, A / us	min	max			
	max	min	max	min	max	max	t	min	max	max	max	min	max	max	
MO26-25-12-MK	± 1200	0,2	25	~ 30	~ 630	200	10	≈ 10	≈ 30	≈ 2	500	160	-40	+85	+125
MO26-40-12-MK			40			300									
MO26-63-12-MK			63			750									
MO26-80-12-MK			80			960									
MO26-100-12-MK			100			1250									
MO26-120-12-MK			120			1600									

* active value of I com. pulse must not exceed I com.

** modules are designed to operate at assemblies with coolers that maintain junction temperature that doesn't exceed maximum.

ATTENTION!

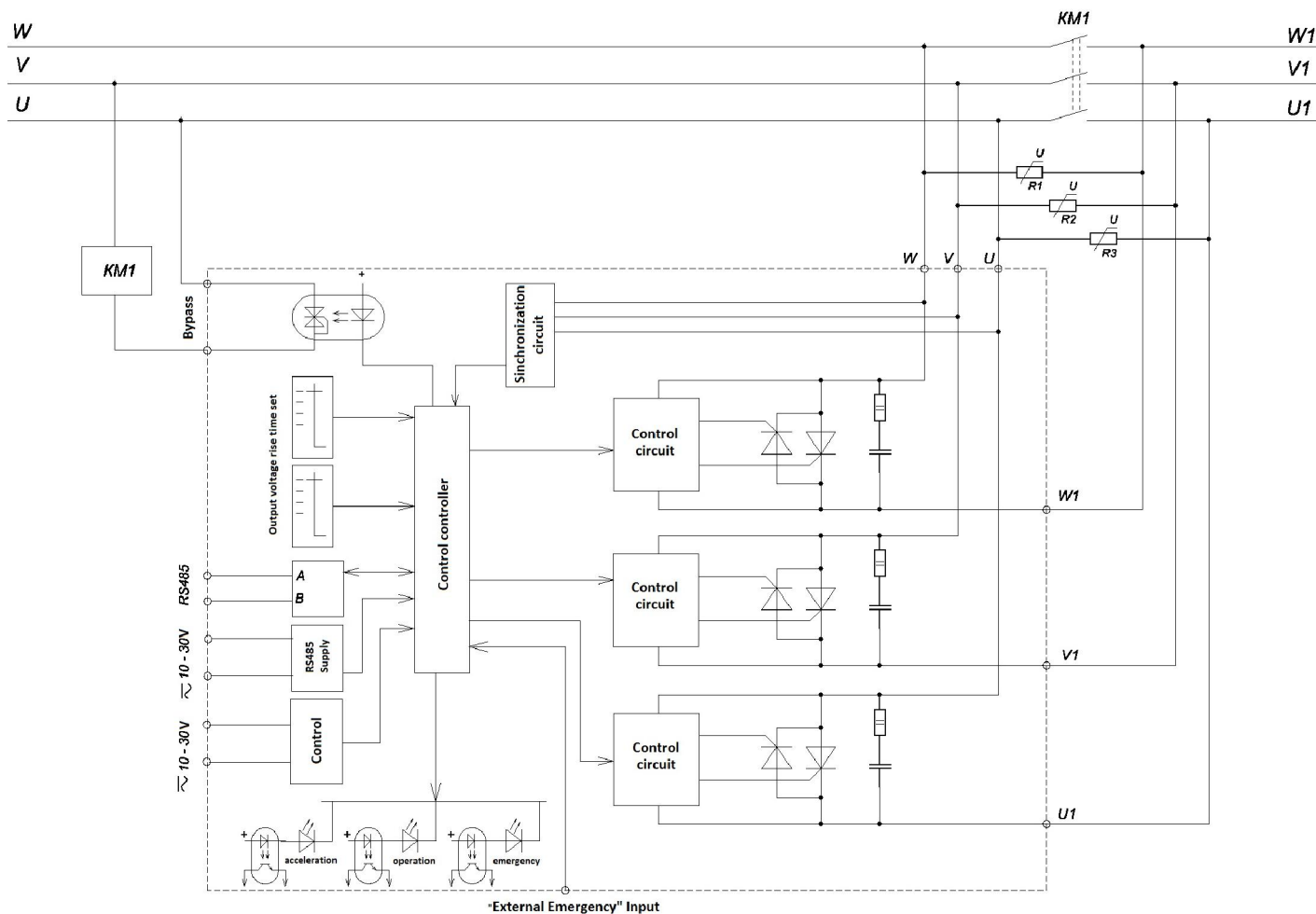
Semiconductor relay doesn't provide the function of current protection. During the exploitation the maximum commutated current should not exceed the datasheet value. At breaking of that rule the semiconductor relay can be broken.

In this case the manufacturer disclaims liability regarding the guarantee repair.

For protection of electric circuits at exceeding of maximum current value we recommend use the semiconductor relay MO26-MC together with microprocessor device of current protection PSM200-MC.

3 PRINCIPLES OF OPERATION

Electrical structure scheme of relay is shown at Picture 1.



Picture 1- Electrical structure circuit

After sending of control voltage the power thyristors will open smoothly. Time for the thyristors will completely open is set by code switching. At ending of the thyristor opening process the starter KM1 turns on (bypass mode). Thyristors after starter turn on don't close; closed contacts decrease current through thyristors.

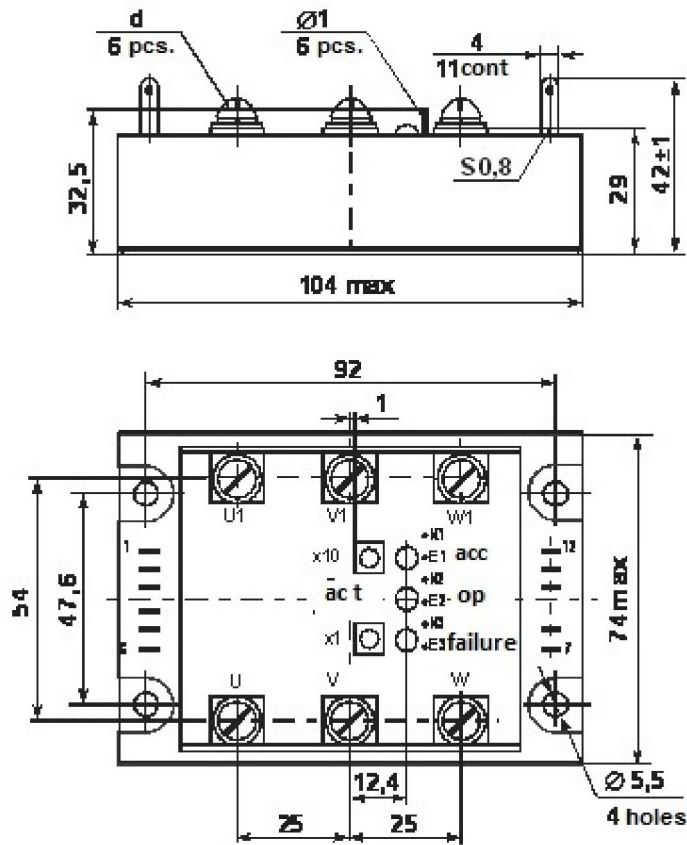
Semiconductor relay turn off by setting off of control voltage. Also relay turn off can occur at emergency situation, this loosing of supply phase or from external signal at input «External emergency».

4 STRUCTURE OF MO26-XXX-12-MC

Solid state AC relay is represented on Picture 2. Power contacts positioned on both sides are intended for three phase supply circuit and load circuit connection. Control circuits are connected to pin contacts. Two code switches are situated on the panel of the device intended for output voltage rise time set. They set: the first one-tens of seconds, the second one- units of seconds.

Near the code switch 3 LED indicators are situated which show the status of the device.

Green LED "RISE" lights in the process of rising, green LED "WORK" lights after the rising is finished. Red LED "EMERGENCY" signalizes about the purpose of MO26-XXX-12-MC switch off while emergency. If the LED lights the purpose of switching off is absence of one of supplying phases. If LED twinkles very often it means that external emergency signal came from MPT (current excess and current asymmetry between the phases). If the LED twinkles seldom it means that the purpose of emergency is MO26-XXX-12-MC radiator overheating more than 90°C.

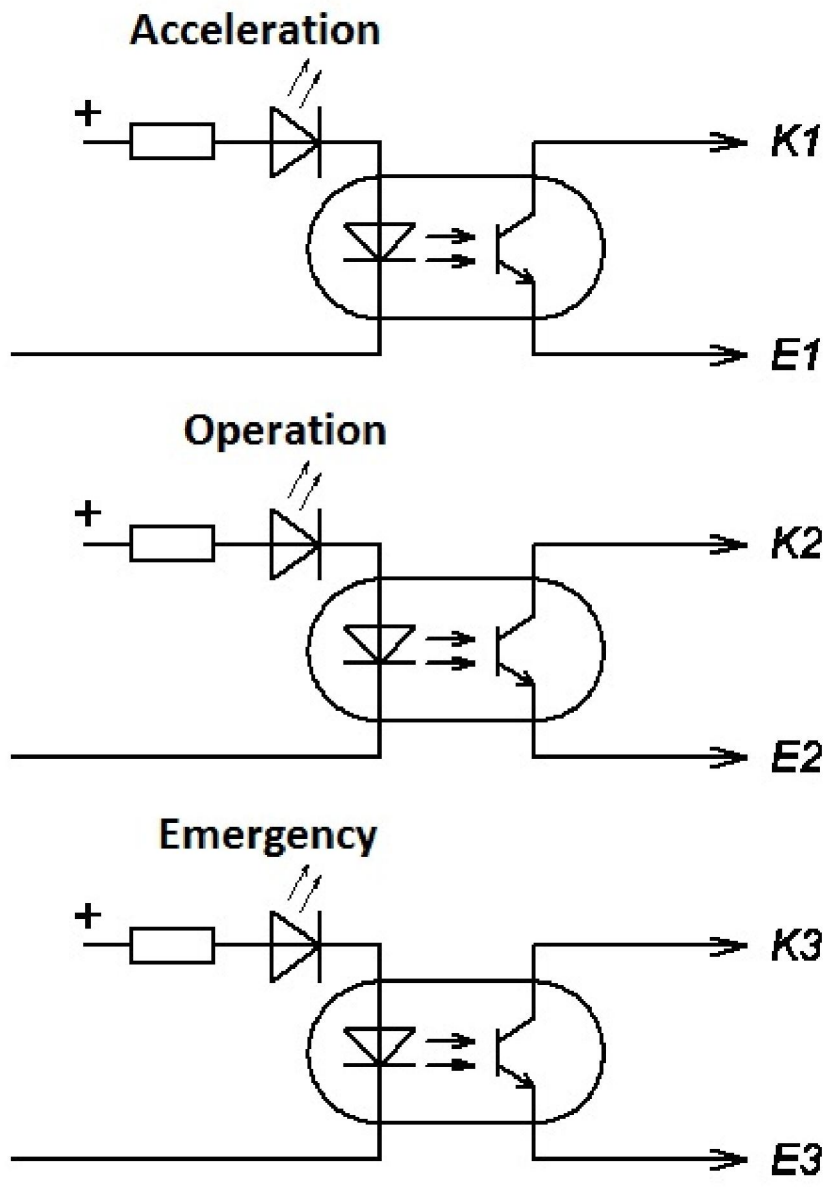


Picture 2 – Device appearance

d – M5 for $I_{com} = 25, 40, 63, 80$ A;

d – M6 for $I_{com} = 100, 120$ A

When relay condition distance control is required there are status outputs near LED on the housing. On Picture 3 a principal circuit of output circuits for additional equipment is represented. Status outputs load capacity: current not more than 20mA and voltage not more than 30V.

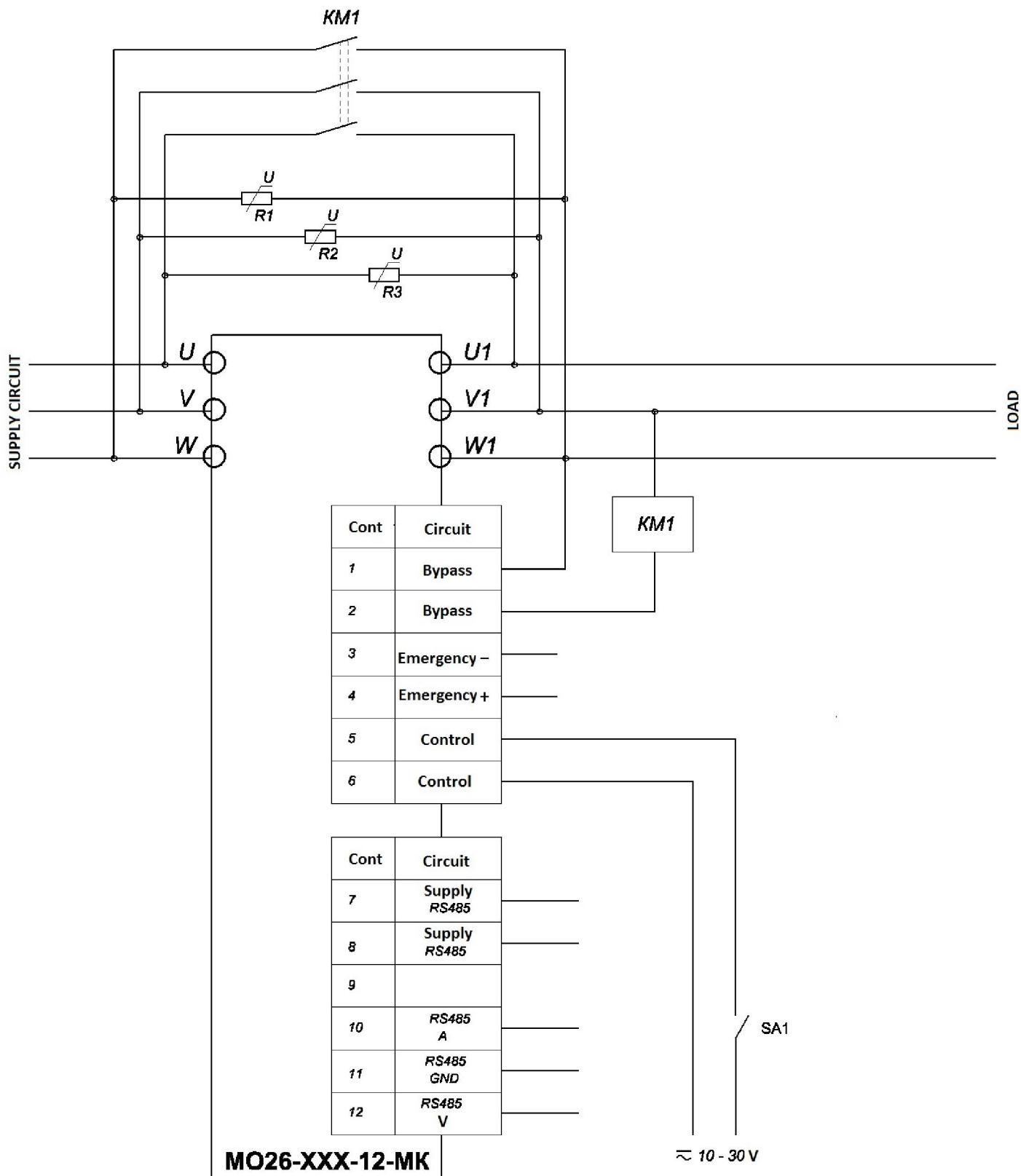


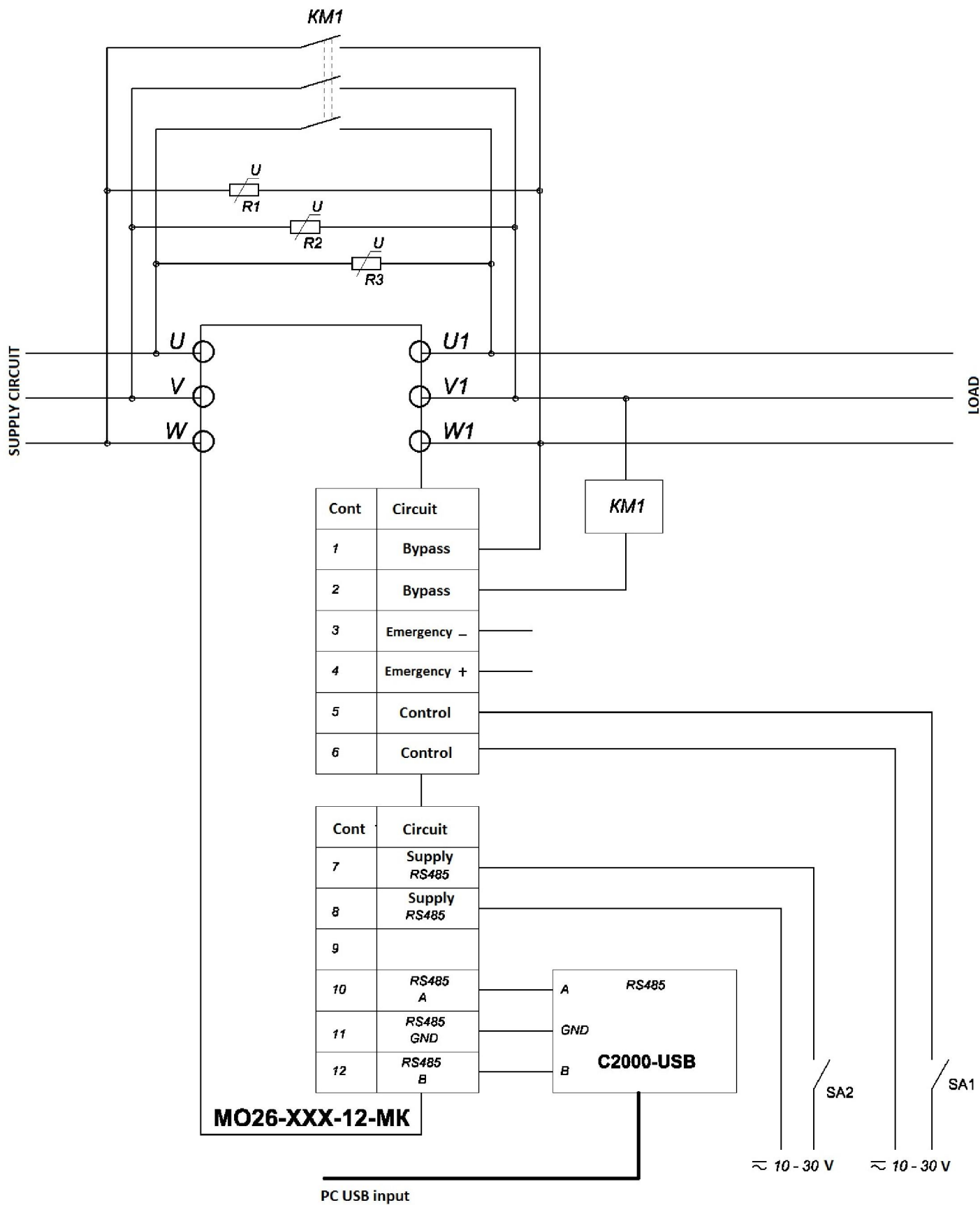
Picture 3 – Principal circuit of state signals

5 PREPARATION FOR OPERATION

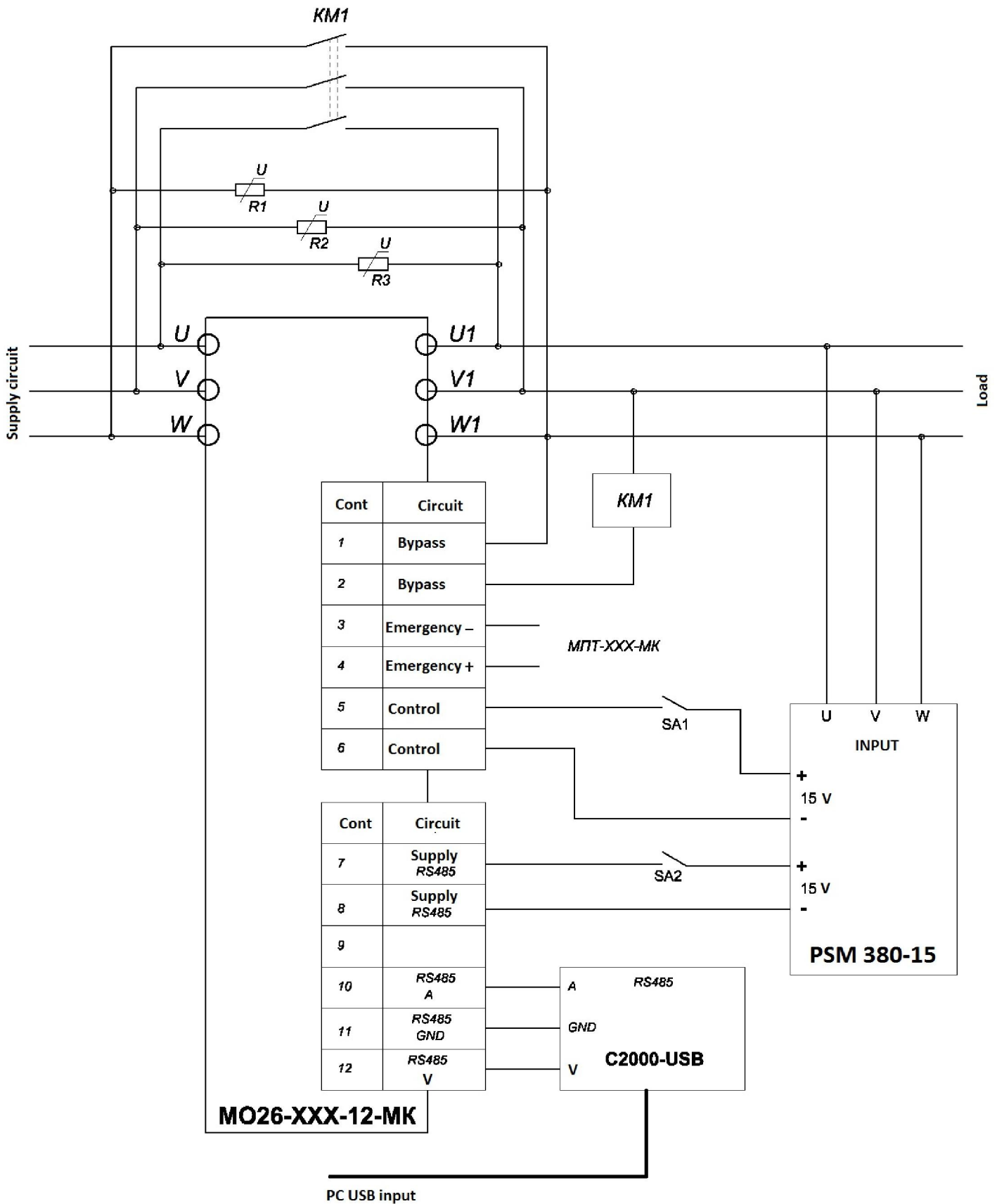
For correct work of semiconductor relay is necessary to assemble the circuit like at Picture 4.1 – 4.3. Connection scheme is chosen regarding the supply variant.

Picture 4.1 – Connection scheme MO26-XXX-12-MC





Picture 4.2 – Connection scheme MO26-XXX-12-MC-01



Picture 4.3 – Connection scheme MO26-XXX-12-MK-02

Electromagnetic contactor for “by-pass” mode realization is connected with the contacts “1” and “2”. In this case control from power thyristors are not removed. This is realized in order to simplify solid state relay control and enable the customer to use the relay without magnetic starter and without additional commutations producing. Output signal “emergency” from device MPT are connected with the contacts “3” and “4” while simultaneous usage. MPT – a microprocessor device of current protection. Simultaneous usage of these devices in full range of commutated currents enables to set maximum rate of its value. Control voltage from 5 to 30V

can be provided from additional protection devices to the contacts “3” and “4” “EMERGENCY” if necessary. In case when input “EMERGENCY” is not used contacts “3” and “4” should be closed together.

Contacts “5” and “6” are used for MO26-XXX-12-MC switch on/off. AC or DC voltage from 10 to 30V should be supplied to these contacts for relay switch on. For this purpose two channel low- power galvanically isolated DC voltage source PSM 380-15 is offered. The source can operate from both 3 phases and 2 phases of supply voltage. Solid state is switched off by control voltage removal from contact “5” and “6”.

For solid state relay power elements protection from high - voltage impulses break- down which appear due to inductive and capacity load it is needed to install protection elements parallel to input and output by each phase. As protection elements it is offered to use varistors CH2-1, CH2-2 or similar. Varistors limitation voltage is identified by the formula:

$$U_{cl.} = U_{sup.(rms.)} \cdot \sqrt{2} \cdot 1.1$$

$U_{cl.}$ - classified varistor voltage

$U_{sup.(rms.)}$ - root-means-square supply voltage.

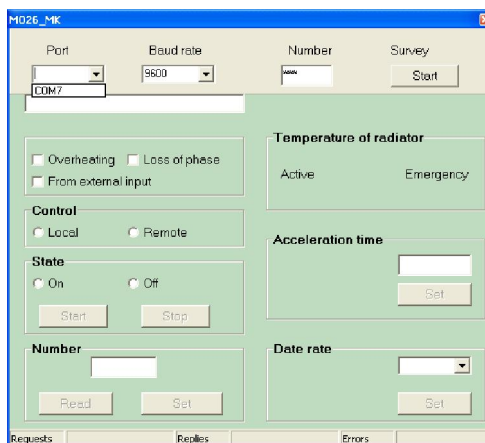
6 INTERFACE OF RS485

For the visual status display, operational change of settings and control the MO26-XXX-12-MC relay has possibility to contact the control program with help of RS485 interface. Before the control program start is necessary to connect the interface converter regarding to Picture 3. While program debugging was used converter RS485/USB, product type C2000-USB. Other converters can be used also.

The software for installing on your computer – according to the information at site www.electrum-av.com in section Information/Software.

Send the supply voltage of 10 to 30 V to the contacts 7 and 8 (Picture 3). It's recommended to use serial device MIP 380-15 that is produced by us.

Run the program, it will appear the window of solid-state relay control program in accordance with Picture 5.



Picture 5 – Control program of DC solid-state relay

In the beginning is necessary to choose the port.

Click the left mouse button to arrow with «Port» inscription. There will appear the available ports list. Choose the port which where interface converter is connected to. It is COM7 in our case.

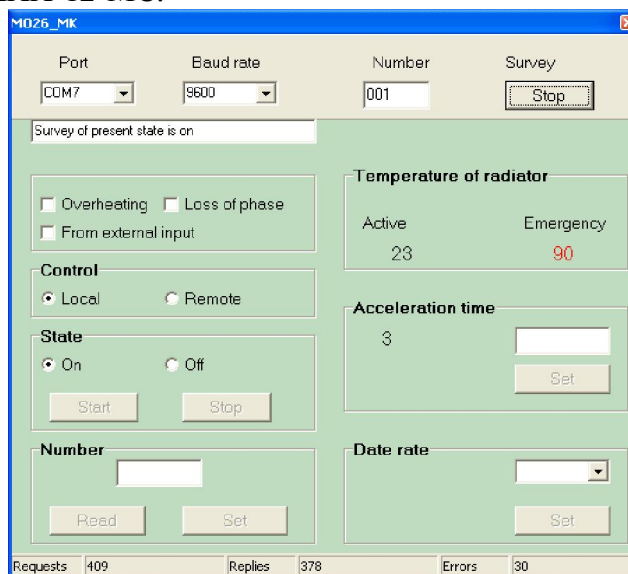
Then is necessary to set exchange rate and relay number (MO26-XXX-12-MC number) which is necessary to be connected with. In the supplied relays MO26-XXXX-12-MC by default is written – speed 9600 and number 001. During the program description will be listed all possible variants of conversation with menu.

The relay number is written in energy independent memory area and is necessary for marking of concrete relay that is necessary to be contacted. At request answers that relay which number matches to number in window «Number». For definition of previously set number is necessary to chose the port, set speed and click the left button of mouse in the field «Number» (in the left down angle of program) to button «Read». Program will start select all possible numbers and send request to relay. As relay number and sent number match, relay will answer and this number will be reflected in window of «Number» field. During the contact with menu there will be given hints that are necessary to implement.

In this case if program interrogate all necessary numbers (relay number can have value from 001 up to 255) and didn't receive reply from relay the program will offer to change the speed of interrogations and will

read number one more time. Speed of interrogation can be 2400, 4800, 9600 or 19200. Also relay can not answer in case of wrong connection with interface, at absence of power supply on contacts 7 and 8 of control jack or at failure of the relay. Relay responded at concrete speed and sent its number. Enter this data in appropriate field and press «Start» button in top right corner of menu window.

If something I not set or set incorrectly then program will show what you need to do. If the entry is correct and in presence of connection with relay in window of the program showed on Picture 6 is shown information about state of MO26-XXX-12-MC.



Picture 6 – Information about state of MO26-XXX-12-MK

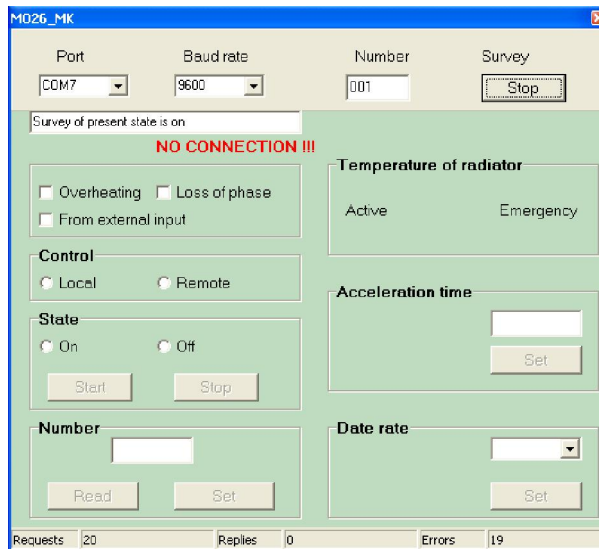
Program window must contain:

- 1 Interrogation of relay state – is on. Lower line shows how many requests were sent to relay and how many answers were received without reply (errors).
- 2 Relay state – on.
- 3 Control – local.
- 4 Radiator temperature – 30 °C.
- 5 Acceleration time (set by code switchers) 3 s.

Pay attention: in this state of solid state relay many programs are inactive; their operation in present moment is forbidden. Local control forbids turn off relay and change acceleration time. Local control forbids to switch off the relay and to change the acceleration time. At local control turn on/ off of the device provides by voltage supply and voltage removing from contacts 5 and 6 of control connector. If stop the interrogation by pushing the «Stop» button will be possible to change the relay number and exchange rate. If in the input window type new number and push button «Set», then number of MO26-XXX-12-MC will be changed. Then click the button «Read» and will appear a new relay number in input window.

RS485 interface allows connecting all relays that are used in technological process; for correct communication with each of them the relay numbers must not match. After changing of the number and after interrogation renewal by pushing «Start» button, relay will not respond. To restore connection with relay is necessary to input new changed number of relay in «Number» line in the top of the program.

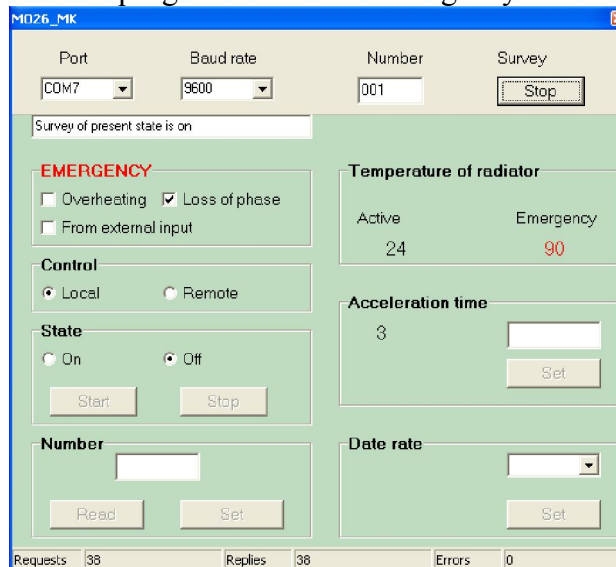
If necessary exchange rate also can be changed by choosing of necessary value in input window of «Speed» area and click «Set» button. Necessarily in increasing of interface speed appears at big number of connected relays to one line for reduction of common interrogation time. Reduce the interface speed is necessary at unstable connection with relay because of connection line deterioration or because of significant removal of interrogated relays. Remember that connection of relay will not be until the new, changed exchange rate is not selected in the «Speed» line in the top of the program. If relay doesn't response then screen displays the following information – see Picture 7.



Picture 7

Under the state line appear inscription «No connection» and in down part requests are in progress and no replies from relay. Reasons of such state were observed before.

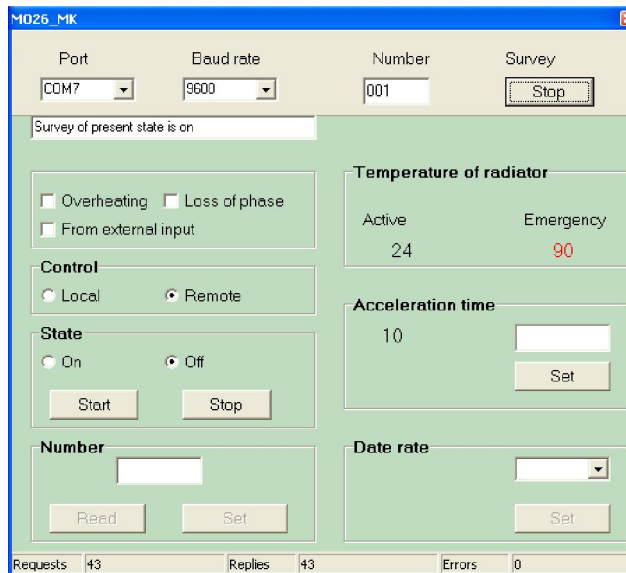
On Picture 8 was shown view of program window at emergency turn-off.



Picture 8 – Program of window at emergency turn-off

At disappearance of supply phase, at exceeding of radiator temperature out of limit or at impact of emergency external signal of MO26-XXX-12-MC turns off and shows information about failure reason. «Emergency» inscription periodically twinkle for attracting attention. To recover the device operation possibly by short control voltage take off (contacts 5 and 6 of control socket), after eliminating of emergency turn off cause!

Interface operation would not be full if there would be no possibility of semiconductor relay remote turn on/off. To make this possibility real is necessary to transfer MO26-XXX-12-MC in remote control. For this we must set the acceleration time with help of code switchers that equals to zero. At turn on the program window will have view in accordance with Picture 9.



Picture 9 – Program window at remote control

To these functions that were observed added the possibility of remote acceleration time change.

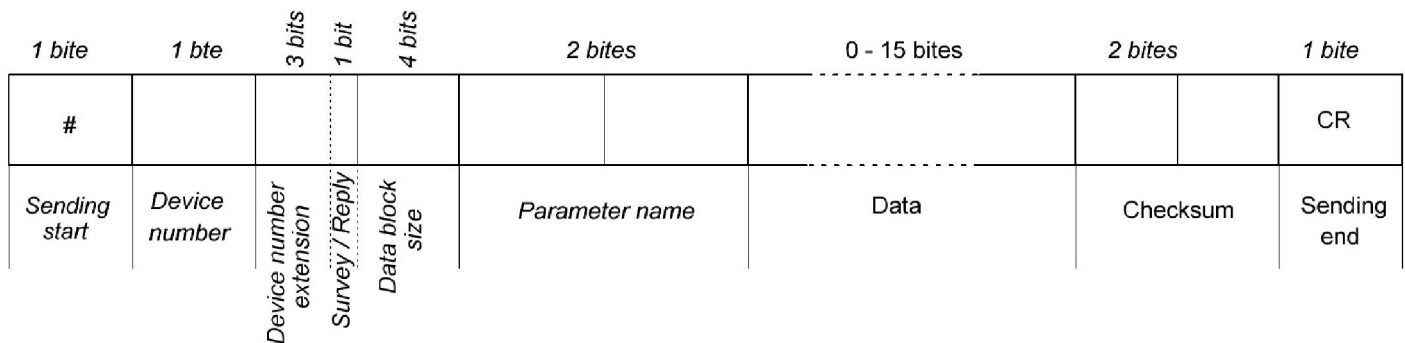
Necessary value type-in input line «Acceleration time» and press button «Set» (the button is active). New value enroll in relay and displays in «Acceleration time» field. Recording is done in energy dependent memory and at turning on of relay is saving. State control buttons are also active. Turn on the selected relay by clicking «Start» button and turn off by clicking the «Stop» button.

At appearance of emergency the MO26-XXX-12-MC turns off and monitor will display the emergency reason. «Start» turn on control button will be inactive up you will restart the relay. It is possible to restart the relay as before – by switching control voltage or remotely (previously understand the reason of emergency appearance!). For remote restart is necessary to input the value of time in type-in line (that was set before or any other from 1 to 99) and click the button «Set». In selected relay will be entered new acceleration time with subsequent restart.

7 INTERCONNECT PROTOCOL

For connection organization between MO26-XXX-12-MC and control program is necessary to use standard interconnect protocol that is used by leading manufacturers. The fulfillment of this condition will allow user to combine devices of different manufacturers in united system of technological control process during design of own control programs.

EXCHANGE VIEW



Quick reference of packet assembly

Device name – this is number of MO26-XXX-12-MC written down in energy dependent memory area. The device number in our case can have value from 1 to 255.

Request/response – low tetrad bit is used, 1 –request/ 0 – relay response. Three high bit are not used.

Data block size – can have value 0 -15.

Parameter name – two bytes of the parameter name.

Data – in present area of line are the data s of selected relay parameter.

Further on from specified above data is checking sum and adds to line (the size of checking sum is 2 bytes).

Line with data and with checking sum is recoded to ASCII code and to code received adds the markers of beginning and ending of signal. Formed packet is transmitted by interface of RS485 to relay. Relay in its turn receives transmitted packet, recodes from ASCII code to binary code, and detects the packet originator, which info is necessary from him. As in the previous example the MO26-XXX-12-MC forms reply packet and transmit it to PC.

In the Table 3 are put parameters codes at request from PC and responses from MO26-XXX-12-MC. Codes parameters view is shown in original binary code. Pay attention: active is PC, relay responses at its requests. At emergency appearance the load will turn off and information will display only after request.

Table 3 – Codes of parameters

PARAMETERS CODES

Parameter name	Sending direction	Device number	Survey / Reply	Block data size	Parameter name	Data
Phase current A	Survey from PC	\$01	\$01	\$00	\$0001	Current of phase A
	Device reply		\$00	\$02		
Phase current B	Survey from PC	\$01	\$01	\$00	\$0002	Current of phase B
	Device reply		\$00	\$02		
Phase current C	Survey from PC	\$01	\$01	\$00	\$0003	Current of phase C
	Device reply		\$00	\$02		
Starter On / Off	Survey from PC	\$01	\$01	\$00	\$0004	Starter condition character \$00- off / \$01- on
	Device reply		\$00	\$01		
Control Local Remote	Survey from PC	\$01	\$01	\$00	\$0005	Control character \$00- local / \$01- remote
	Device reply		\$00	\$01		
Failure Interphase difference	Survey from PC	\$01	\$01	\$00	\$0006	Failure character - 1 bite / \$01- failure Failure current of Phase-A / Phase-B / Phase-C
	Device reply		\$00	\$07		
Failure Maximum current	Survey from PC	\$01	\$01	\$00	\$0007	Failure character - 1 bite / \$01- failure Failure current of Phase-A / Phase-B / Phase-C
	Device reply		\$00	\$07		
Protection current Read	Survey from PC	\$01	\$01	\$00	\$0008	Protection current value
	Device reply		\$00	\$01		
Protection current Set	Survey from PC	\$01	\$01	\$01	\$0009	New protection current value
	Device reply	—	—	—	—	No reply
Starter Start	Survey from PC	\$01	\$01	\$00	\$000A	No reply
	Device reply	—	—	—	—	
Starter Stop	Survey from PC	\$01	\$01	\$00	\$000B	No reply
	Device reply	—	—	—	—	
Read number	Survey from PC	\$01	\$01	\$01	\$000C	Numbers from \$01 to \$FF + 1 after each survey, until device reply
	Device reply		\$00	\$01		Number of MPT 200MK
Set number	Survey from PC	\$01	\$01	\$01	\$000D	New number of MPT 200MK
	Device reply	—	—	—	—	No reply
Change exchange rate	Survey from PC	\$01	\$01	\$02	\$000E	Exchange rate code \$01DF - 2048/ \$00EF - 4800/ \$0077 - 9600/ \$003B - 19200
	Device reply	—	—	—	—	No reply

8 METAL CONTENT IN THE PRODUCT

Semiconductor DC relay utilization (melting, burial, resale) is done in accordance with Russian Federation Acts: 22 August 2004 #122-F3 «About saving of atmospheric air», from 10 January 2003 # 15-F3 «About production wastes and consumption», and also other Russian and regional, order rules and other executions of the law.

9 UTILIZATION RECOMMENDATIONS

In semiconductor AC relay contains metals:

Copper..... gr

Brass... .. gr