DRIVERS OF THREE-PHASE REGULATED RECTIFIER
3phCRD-A1-400, 3phCRD -A2-400, 3phCRD -A3-400, 3phCRD -A4-400, 3phCRD -A5-400, 3phCRD -B1-400, 3phCRD -B2-400, 3phCRD -B3-400, 3phCRD -B4-400, 3phCRD -B5-400
TECHNICAL DESCRIPTION

A driver of three-phase regulated rectifier (3phCRD-400) is intended to control by three-phase thyristor-diode bridge in three-phase regulated rectifier. The driver is intended to operate in circuits of three-phase AC with frequency 400 Hz, with linear voltage 200 ÷ 430 V.

In the 3phCRD-400 is used a vertical-pulse method to adjust the rectified voltage; at this method adjusting of the value of rectified voltage on load is performed by changing the duration of thyristors on-state.

Functional circuit of 3phCRD-400 is shown on Figure 1.

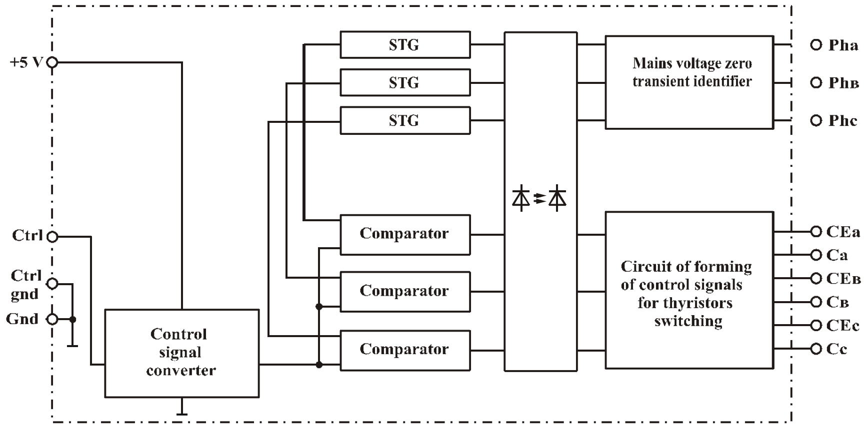
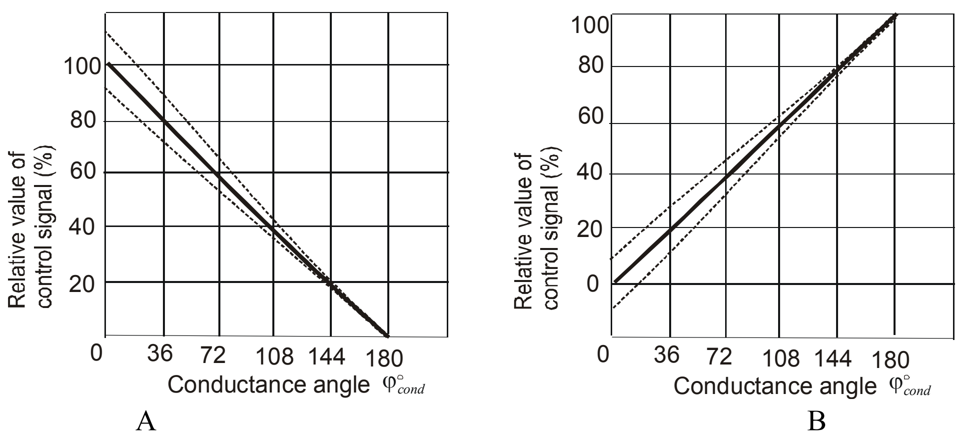


Figure 1 – Functional circuit of 3phCRD-400

Voltage zero transient identifier forms pulses during line voltage zero transient, which synchronize three-channel sawtooth generator (STG). In the three-channel comparator it is compared the voltage of STG and controlling signal given from the circuit of converter of the input signal. If the voltage of STG and the control signal voltage are matched, then a pulse for switching of external thyristors is generated. Adjusting of the input voltage is carried out by changing duration of on-state of power thyristors.

The 3phCRD-400 is controlled by an external signal of one of five types (0…5 V; 0…10 V; 0…5 mA; 0…20 mA; 4…20 mA). The 3phCRD-400 is produced in one of two kinds of dependence of thyristors’ conductance angle on relative value of the control signal. Dependences of thyristors conductance angle versus relative value of the control signal are shown on Figure 2.



A – 100% control signal corresponds to minimum load voltage;
B – 100% control signal corresponds to maximum load voltage.

Figure 2 – Control characteristics types

Basic technical characteristics are represented in Table 2.

Table 2 – Basic technical characteristics

Parameters name		Unit	Kinds and types of input circuits										Note
			A-1	A-2	A-3	A-4	A-5	B-1	B-2	B-3	B-4	B-5	
Basic electrical parameters													
1 Current consumption, max		mA	50										Usup = 5 V
2 Control signal value corresponding to minimum voltage on load		V	5±0.5	10±1	-	-	-	0÷0.5	0÷1	-	-	-	
		mA	-	-	20±2	5±0.5	20±2	-	-	4±0.4	0÷0.5	0÷2	
3 Control signal value corresponding to maximum voltage on load		V	0÷0.5	0÷1	-	-	-	5±0.5	10±1	-	-	-	
		mA	-	-	4±0.4	0÷0.5	0÷2	-	-	20±2	5±0.5	20±2	
4 Resistance of control signal input circuit		kΩ	≥10	≥10	-	-	-	≥10	≥10	-	-	-	
5 DC insulation voltage		V	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	1 minute
Maximum permissible values of basic parameters													
1 Supply voltage	min	V	4.5										
	max	V	5.5										
2 Input voltage «Ctrl»	max	V	6	12	2	2	2	6	12	2	2	2	
3 Peak voltage value on inputs «Pha», «Phв», «Phc»	max	V	1200										tp ≤ 10 µs
4 Rated value of linear voltage on inputs «Pha», «Phв», «Phc»	min	V	200										
	max		430										
5 Output current on control output	min	A	1										tp ≤ 50 µs
6. Frequency of three-phase network		Hz	400										±10 %
7. Operating temperature range		°C	–40…+80										

Outputs application is shown in Table 1.

Table 1 –Outputs application of 3phCRD-400

Socket	Output #	Symbol	Application
XS1		Pha	Input of phase A of AC power network
XS2		CEa	Connection of controlling thyristor electrode
XS3		Ca	Connection of thyristor cathode
XS4		Phв	Input of phase B of AC power network
XS5		CEв	Connection of controlling thyristor electrode
XS6		Cв	Connection of thyristor cathode
XS7		Phc	Input of phase C of AC power network
XS8		CEc	Connection of controlling thyristor electrode
XS9		Cc	Connection of thyristor cathode
XS10	1	Gnd (-5 V)	Common «minus» of supply circuits
	2	+5 V	Supply voltage +5 V
	3	Ctrl gnd	«Minus» of control signal
	4	Ctrl	Input of control signal

Overall drawing of 3phCRD-400 is shown on Figure 3.

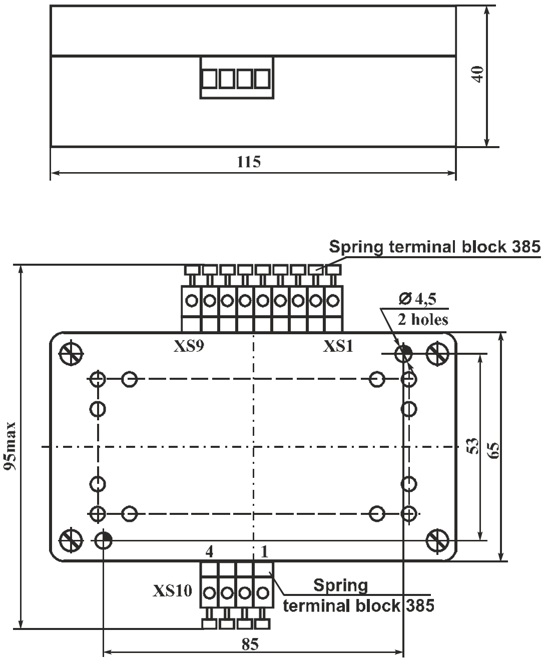


Figure 3 – Overall drawing of 3phCRD-400

Symbols system: $\frac{\text{3phCRD}}{1} - \frac{\text{A}}{2} - \frac{1}{3} - \frac{400}{4}$

1 Driver name

2 Control characteristics:

A - 100% control signal correspond to minimum voltage;

B - 100% control signal correspond to maximum voltage.

3 Control signal type:

1 - 0…5 V;

2 - 0…10 V;

3 - 4…20 mA;

4 - 0…5 mA;

5 - 0…20 mA.

4 Frequency of three-phase network.

Connection recommendation

Connection circuits of 3phCRD-400 are shown on Figures 4 – 6.

As closer as you can the 3phCRD-400 should mount to the controlled bridge but only not on cooler it is mounted on. When mounting it is not allowed to lay the wires of power line and control circuits all in one harness or in common pipe (ducting). Avoid loops in the connecting wires of control and supply circuits. The connecting control wires should make as twisted-pair wires to provide noise immunity.

Attention! When connecting it is necessary to provide exact phases sequence.

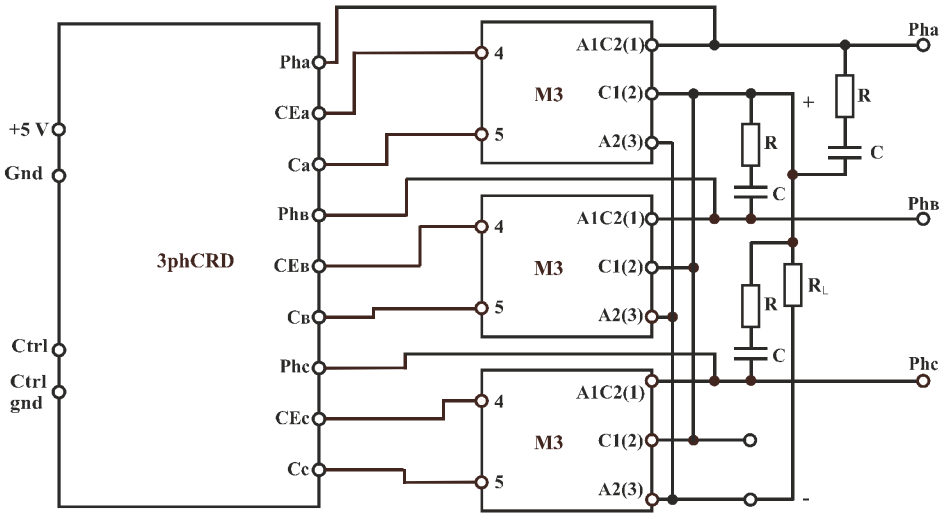


Figure 4 – Connection circuit of 3phCRD-400 to bridge based on modules M3

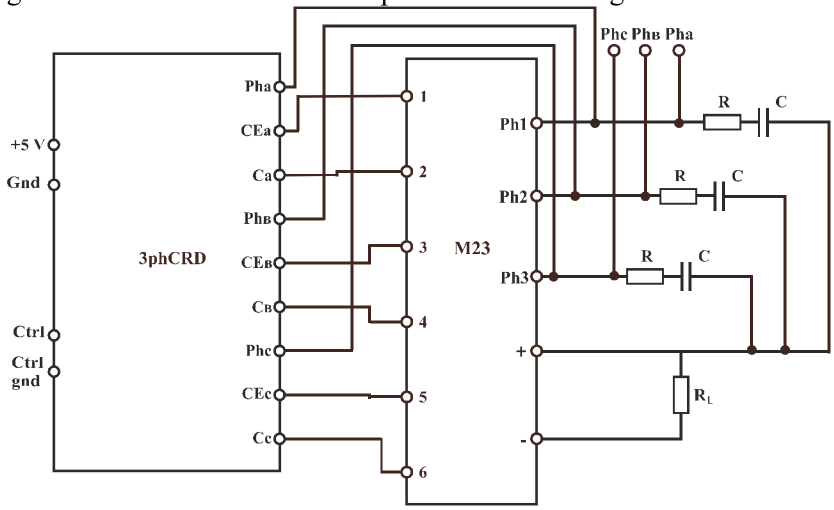


Figure 5 – Connection circuit of 3phCRD-400 to bridge M23

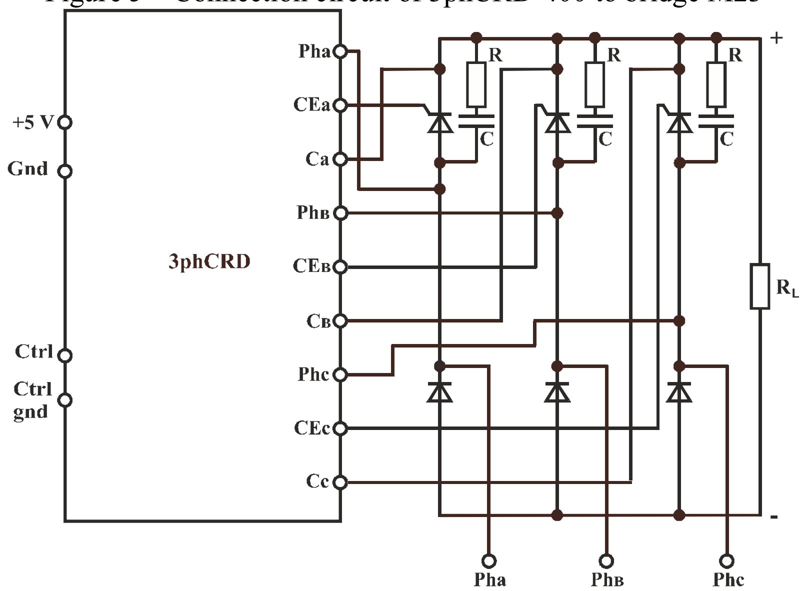


Figure 6 – Connection circuit of 3phCRD-400 to diode-thyristor modules

R = 5.1 Ω x 10 W
C = 0.15 μF x 1000 V

It is necessary to shunt the module by RC circuits for improving resistance to dU/dt (see Fig. 4, 5, 6).

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