TRCB

Smooth start device of brushless electric motor finds the power electronic market in Russia well. Their wide diversification amid cost and functionality allows customer to choose between foreign and national manufacturer. Multifunctional and reliability are main criteria when choose. About such device we are going to talk in current article.

Brushless motor with short circuited rotor is widely spread. During electric drive exploitation on the base of the present motor type is often occur necessity in smooth start and reverse. Now there are many foreign similar devices. In Russia main ones are "Bitek" research and Production Company with their reverse device of smooth start, brake and protection, and ABC Automatization Company with non-contact reverse starter PBR-ZI.

Principally, smooth start devices differ by functionality, control convenience and boundary value of commutated loads. Electrum AV, CJSC is not aside. Company specialists devised devise reliable to modern control requirements for brushless motors.

Thyristor reverse control block "TRCB" is multifunctional thyristor starter with microcontroller processor intended for smooth start, brake and reverse of three phase brushless electric motors with power up to 15 kW. It used in adjusting and gate shutters of pipe fitting, overhead crane track, roll tables, equipment and other mechanics where drive and smooth start reverse control are necessary.

Let's study functionality of thyristor reverse control block. Primarily, it is two-line LCD indicator that helps consumer to obtain full information about operation modes and electric motor state, acceleration modes, brake, motor protection conditions, Indicator shows rotation direction at each phase, power module radiator temperature and side-mounted sensor that can be set by customer.

Motor control can be provided in the following ways: smooth start at specified time up to 99 seconds; acceleration with start current limitation; start from the set moment; push starting; DC dynamic braking; rotation direction reverse switch. Device can be control each of manual from board panel and automatically by discrete signals or analogue sensor. Necessary algorithm is chosen by operator. There is possibility of immersed pump when analogue mode: by signal from analogue sensor can be provided capacity fulfillment up to set level or pump out liquid from container. All settings values are set by operator and saved in energy dependent memory storage.

"TRCB" will turn-off electric motor at occurrence of emergency situations:

- Maximum motor current exceeding;
- Interphase current exceeding more then 50%;
- Phase dropout
- Radiator temperature exceeding (higher +100 °C)
- Side-mounted sensor temperature exceeding (+1…+99 °C – necessary value is set by consumer)

When motor turns-off caused by emergency the indicators show emergency cause and operation blocks up to devise restart.

Active current value is determined by load grade. It will make the electric motor turn-off at exceeding. There is presented timeline of electric motor operation at exceeding of maximum current. If consumed current will two times exceed set the maximum value at any of supply phases then will happen emergency switch-off after 45 seconds. Exceeding in seven times will lead to emergency turn-off after 4 seconds. 10 times maximum current exceeding the switch-off reaction will be 10 ms maximum.

Block control, control type chose, operation modes, start and brake conditions is provided with help of switchers that are located on the forward board. Control and indication parts marshaled there have the following purpose:

- LCD indicator is intended for modes and parameters display at adjusting and device operation;
- "→" – motor rotation direction clockwise switching button in manual mode, move to next charge in "Setting" mode;
- "←" - motor rotation direction counterclockwise switching button in manual mode;
- "Start/Stop" – motor start and stop in manual mode;
- "Reset" – emergency mode reset button that is intended for control scheme restart after emergency mode cause elimination;

- “Choice” - parameters choice button of “TRCB” in manual mode at stopped motor, chose of reflected parameter at turned-off mode, change of chosen mode in “Setting” mode;
- “Setting” – resetting mode input button;
- “Control type” – switcher code is manually set, analogue or discrete control modes;
- “Braking start” – switcher code sets motor runout, electric motor stop at fixed time, electric motor start with current limitation, electric motor start at fixed time.
- “Operating mode” – switcher code sets operation mode number (for “Analogue” and “Discrete” control)

Functional block scheme is shown in Figure 2.

Motor control power thyristors that are installed on radiator and two by two united in 5 groups. Microprocessor control system obtains information about phase’s priority from the synchronization block, tasks from control board and form control signals. Information for control signals forming also are signals from analogue sensor and discrete inputs. Power regulation is based on power thyristors opening angle change. Microprocessor control system controls the value of consumed current, radiator temperature, supply voltage phases existence and their consequence after external temperature signal.

For analogue sensor supply and for discrete control organization there exist 24V voltage source with output current up to 200mA. All discrete inputs and emergency signaling output have optical isolation.

“TRCB” has reserve inputs and outputs as it seems from the functional circuit. That is done to improve block functionality at preliminarily accordance with customer. As practice shows at devising of such devices is impossible to envisage all functions that can be required by developer. That shows advantage of our enterprise: customer gets not only the brand, but gets the necessary block. Ultimately, control ease, adjusting flexibility, enlarged functional abilities and reliability allow taking the rightful place amid similar devices.

Functional circuit

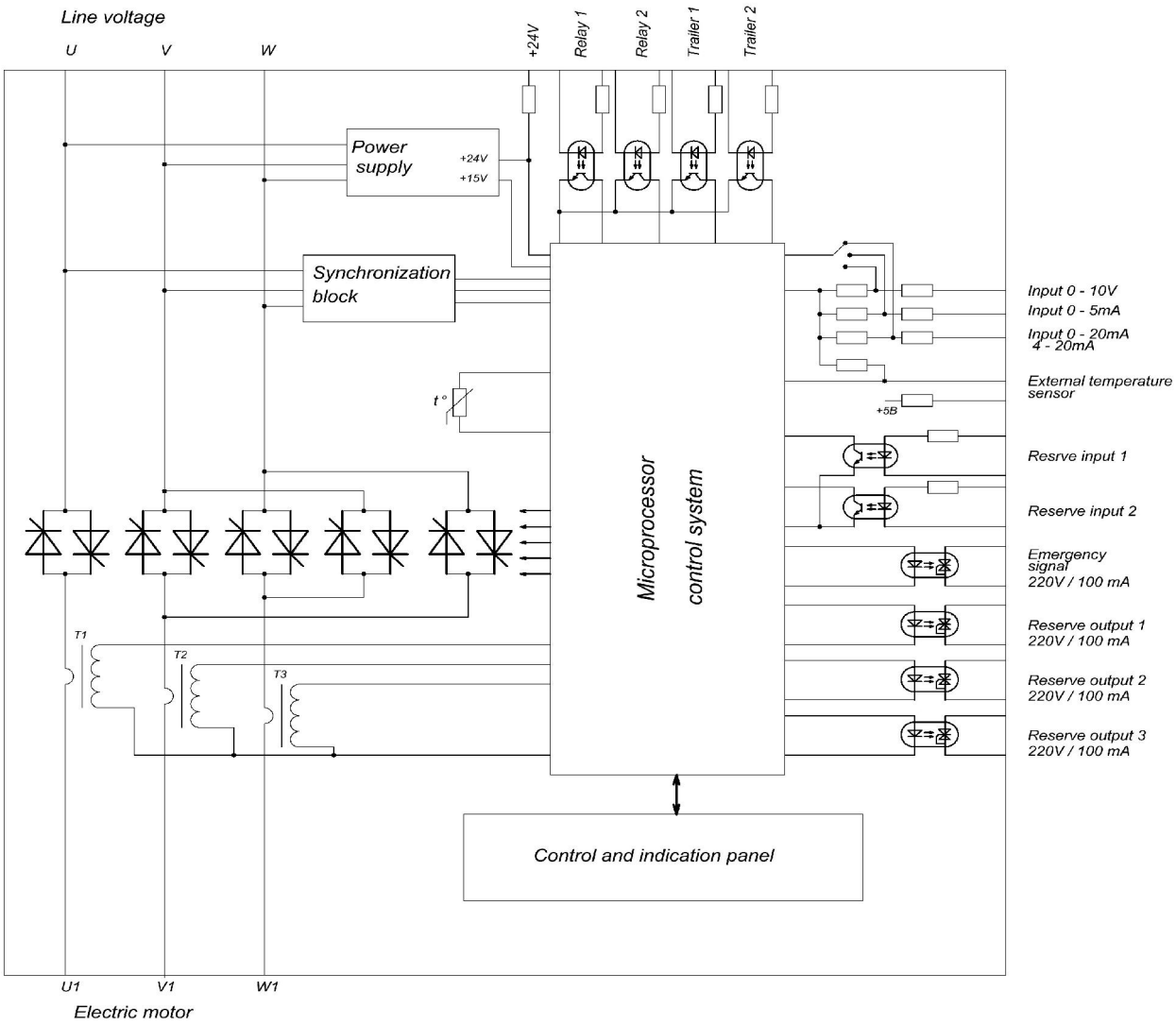

Figure 2 – block functional circuit