ANALYSIS OF A MODERN MICROPROCESSOR RELAY FOR THE PROTECTION OF ELECTRIC MOTORS

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Abstract: *Security is ensured if abnormal situations are detected in time and measures are taken. Summing up from the above, it can be said that there is a great demand for the appearance and use of an automatic device that protects its elements in order to protect electrical systems and electrical consumers from damage and abnormal situations. Until recently, all bodies of relay protection were performed only with the help of electromechanical relays.*

Key words: *Relay, current transformer, Protection sensitivity, protection limit, protection speed.*

In order for electrical systems and electrical consumers to work normally, the damaged device in the electrical network should be quickly identified, turned off, and thus conditions should be created for the normal operation of the remaining electrical consumers and the energy system. Security is ensured if abnormal situations are detected in time and measures are taken. Summing up from the above, it can be said that there is a great demand for the appearance and use of an automatic device that protects its elements in order to protect electrical systems and electrical consumers from damage and abnormal situations. Until recently, all bodies of relay protection were performed only with the help of electromechanical relays. The necessary patience time was created by means of clock mechanisms controlled by electromagnetic devices in the logical part of such execution. For these purposes, along with clock mechanisms, electromagnetic relays with magnetic retention of armature separation were used.

In order to create a relay with a time-dependent characteristic, mechanical systems with an induction mechanism were used. The speed of movement of such mechanisms depends on the value of the current passing through them. But the electromechanical equipment is worn out and needs to be replaced. In them, it is difficult to achieve high accuracy, fast maneuverability, and difficult characteristics. To maintain the working condition of the protection, a lot of labor is required for maintenance. The equipment takes up a lot of space and requires a large number of electrical materials. High power consumption requires high-power operational power supplies and high-power current and voltage measurement transformers. In most cases, the new requirements for relay protection may not be satisfied due to the lack of improvement of the equipment, including electromechanical devices. It became clear that the use of electromechanical devices in relay equipment has held back the further

development of relay protection technology both qualitatively and quantitatively. One of the possible ways to get out of this created situation is to use a new generation of modern semiconductor circuit technology, first of all - relay protection. The transition to a new element base does not change the principles of relay protection and automation, but only expands its functional capabilities, eases its operation and reduces its price. It is for these reasons that microprocessor relays are rapidly replacing outdated electromechanical and microelectronic relays. The main characteristics of microprocessor relays are much higher than microelectronic, especially electromechanical relays.

The power they consume from current and voltage measuring transformers is around 0.1-0.5 VA, hardware errors are 2-5%, the return coefficient of measuring bodies is 0.96-0.97. In analog RX systems, as a rule, it is envisaged to check the functionality of the hardware part, such as with the participation of a person, only during periodic test control. In periodic control, it is possible to operate the defective system of RX for a sufficiently long time - until the next scheduled inspection. Thus, the performance of digital devices is more reliable.

Based on the above considerations, we found it permissible to use digital and microprocessor relays to protect the electric motors of the MTMZ mechanical workshop. Based on operational tests and comparisons for electric motors RXA (0.4) kV, considering the microprocessor relay protection devices of several leading domestic and foreign manufacturers, and among the microprocessor relays, RDTs-01-055 series microprocessor designed for relay protection of electric motors with a voltage of 0.4 kV we considered it permissible to use the relay.

Figure 1. Overview of RDTs-01-055 relay

RDTs-01-055, (hereinafter referred to as Relay) motor protection relay 3x380 V 50 Hz protection of three-phase asynchronous electric motors with direct power, showing digital adjustment and controlled parameters intended for. (0.55... 2.2) kW, (2.2...9.0) kW (RDTs-01-205) and power (9.0...450) kW (RDTs-01-055) measurement

is connected through current transformers. The relay protects the electric motor from the following consequences:

- from current overloads;
- rotor blocking;
- short circuits (current section);
- Current asymmetry;
- work with low load;
- increase in supply voltage;
- reducing the supply voltage;
- reversed phase sequence when the supply voltage is applied;
- reducing the insulation resistance before starting the engine.

When the controlled parameters reach certain pre-programmed levels, the relay switches the electrical control. The relay has the ability to disable the following functions:

- protection against maximum voltage;
- minimum voltage protection;
- protection against idle / dry operation;
- current asymmetry protection;
- vine section;
- rotor blocking protection;
- protection against incorrect phase sequence.
- insulation resistance protection.

The relay can be configured to operate in one of two modes:

1) control of currents in phases A, B and C;

2) Control of currents in phases A and C.

At the same time, in addition to protective functions, the relay has the ability to monitor the following parameters:

- consumed current for each phase (IA, IB, IC or IA, IC);
- network voltage for each phase (UA, UB, UC);
- insulation resistance before starting the engine;
- network frequency;

The relay belongs to the static maximum current relay without an operational source and has a digital display of the values of the controlled parameters and programmable discrete settings for the operation of the input influencing quantities. RDTs-01-055 relay current circuits for direct connection to the network or rated up to 5 A in the range of recommended accuracy class 0.5 and transformation ratio (5/5…1000/5) external measurement for current is intended for connection through current transformers.

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