

Single Phasing Preventer for The Three Phase Loads

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Abstract:-*The power supplied to the rural areas in India is not always a three phase supply. Sometimes during a day usually two phase supply is given to them. This makes the agricultural community unable to irrigate during these times. For an uninterrupted irrigation the three phase supply is obtained by converting the two phase to a three phase by phase displacement from a healthy phase to a phase that is not supplied by the producer. During normal three phase operation of motor when a single phase gets disconnected, it leads to improper operation of motor. To prevent this single phasing preventer is also implemented. Three phase preventer are finding increased applications in industries environment with greater demand for high voltage. High power processing techniques with improved efficiency. In this competing world industries uses three phase supply that even a single phase failure supply not allow where efficient and effective production takes place, aim is to design a system with the help of existing phase supply that can support one of the phase. The development of this system will be completed by using microcontroller is programmed using embedded system.*

Keywords:*3 phase induction motor, phase compensation, microcontroller, phase loss.*

1.INTRODUCTION:-The three phase motors are used widely for the industrial and domestic purposes. They work properly when three phase supply is given to them. But when a two phase supply is given to it, the working is not the same

as with three phase supply. To avoid a condition like that either the supply should be cut-off for the good of the motor or some arrangements could be made to supply balanced three supply to the motor. This project aims at the protection of the three phase induction motor against sudden phase loss and operation in two phase by compensation of the lost phase to increase the continuity of motor operation. In India there are so many industries in different fields. For example steel sector, Oil sector, Irrigation etc. All industries have many drives and equipment's like conveyor belts, pumps, Mills etc. All the drives of industries use electrical motors. Most of the electrical motors are designed for three phase, 50Hz (in India) supply. These three phase motors are less expensive than starting of DC motors. Starting of AC 3-phase induction motors is less expensive than starting of DC motors as they require simple D.O.L or Star/delta starters. D.O.L or Star/delta starters generally have only over load protection. Three phase induction motors are very sensitive and get damaged, when they are subjected to single phasing. For the three phase induction motor it is necessary that all three phases of supply should present. While it is on load when the any one of the fuse goes out, or missing, the motor will continue to run with two phases only, but it will start drawing huge current for the same load. This high current may run the motor unless switched off immediately. A single phasing preventer avoids a mishap with this circuit, the motor will not run unless all the three phases are present. In this context we need to

design preventer which prevents these mishap protects the costly motor under such a conditions. The single phase preventer designed by my self is a very less expensive and protects reliably the motor which is very costly.

2. METHODOLOGY:-

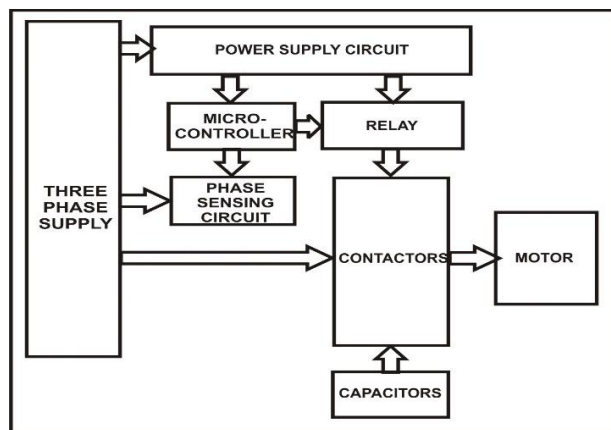


Fig. Simple Block Diagram Of Single Phasing Preventer For Three Phase Loads

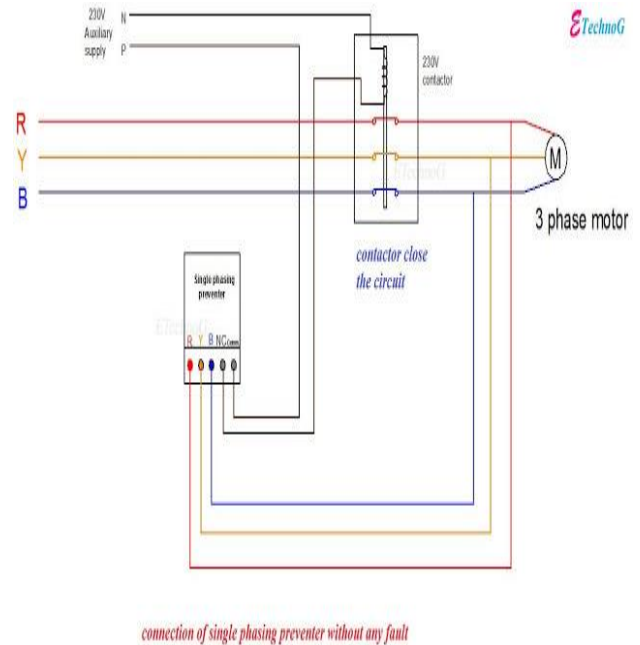
The block diagram explains the complete operation. The phase sensing circuit detects the availability of the three phases and gives status signals to microcontroller. The microcontroller gives the output signals as per input status signals and operational modes to operate the relay and contactors. The power supply circuit gives the proper voltage for the operation of microcontroller and relay. The motor is connected to the supply only through the contactor.

The Single Phasing preventer which is shown in pictures has Five terminals, three terminals red, yellow, and blue for three phase supply which are to be connected before the motor and after the contactor. The remaining two gray terminals are the 'Common terminal' of the relay and 'Normally closed (NC) terminal' of the relay. As you see in the below connection diagrams the Contactor having the rating 230V. So an auxiliary supply of

230V is given to the Contactor through the two terminal of the Single Phasing Preventer.

2.1 Under Normal Condition:

In normal condition the preventer act as closed switch therefore the contactor is connected to 230V supply and holds the circuits closed so the motor will be run.

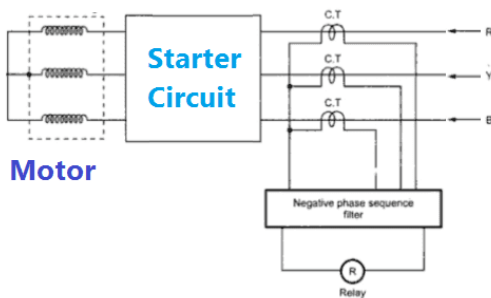


2.2 SINGLE PHASE PREVENTER WORKING PRINCIPLE:

Single phase preventer is used to protect the induction motor from single phasing fault. Single phasing is a very dangerous fault to the electrical motor and which is damages the motor stator winding rapidly. Generally a single phasing is nothing but a motor runs when one of the supply is disconnected due to open circuit or improper contact in switch or other electrical equipment failure. Normally, the motor runs with the three phase supply and which takes balance current in each phase winding. Consider one of the fuse has blown. But the motor still in rotating position which tries to rotates in the same speed. At that same time the absence phase current will be shifted to the remaining live phases. Therefore, the current in the other phases increases upto 3 times its normal value

instantly. That is called single phasing fault. The single phasing leads to unbalanced current in the motor stator. The component which is present in this unbalanced current called negative sequence component. These negative sequence component creates the magnetic flux opposite in to the main flux. This results in double frequency currents to induce in the rotor to cause it is heating.

Single Phase Preventer Function



The three number of current transformer is placed in each phase of the power supply. The output of the current transformer is given to a negative sequence filter circuit and which sense the magnitude of unbalance. The filter circuit will be connected to control circuit. The control circuit sends the trip command to the circuit breaker. If the negative sequence current exceeds the present value. If the failure of a single phase the unbalance current flow in the motor and the current will be sensed by the negative sequence filter. Then the control unit send the trip command to the circuit breaker or the other motor isolating mechanism.

3.EXPERIMENTAL RESULT:-

In this single phasing preventer for three phase loads we used microcontroller is used in the circuit for continuous routine operation that is done of working for whole setup. Also we are used two capacitors that stores electrical energy in an electric field. The main component is phase sensing circuit in which three phase RYB are connected to three individual transformer which is used for proper operation of whole circuit.

4.CONCLUSION:-

Thus phase displacement for phase compensation of three-phase induction motor during a phase loss was designed using microcontroller. Power supply circuit, phase sensing circuit and interface circuit using pic18f4550 was designed with three separate pcb board. Interface circuit is used to interface the supply circuit and phase sensing with contactor. After testing each PCB board, entire hardware is implemented. Then program is done. After that the whole setup is tested for the problem statement. This system have lot of scope whenever and wherever an uninterrupted operation of three phase motor is required.

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