

Test Fixtures for Load Break Switches

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Abstract - Switch is an electrical component that is used to connect or disconnect the conducting path in a circuit. It is also used to interrupt and divert the electric current from one conductor to another. An ac isolator/load break switches are also one of such kind, they are high voltage isolation devices that are used to isolate the apparatus like circuit breakers, transformers and transmission lines for maintenance purpose and also for rerouting the flow of current between different paths. There are two major and contrasting parameters as far as the disconnection/connection of Electrical utilities is concerned they are Breaking capacity and Making Capacity. Making capacity is higher since it is considering the initial starting current, inrush and faults that might occur at switching on moment. Subsequently, the Circuit breakers have both while the load break switches has only breaking capacity. Isolator therefore used to isolate/disconnect/break load. To be switched on only under no load. In simple way the Load Break Switches are used to cut off healthy circuits or to break / disconnect the load. As a precaution, normally the Isolators are to be switched on under no load, the connected load to be utilized after switching on the Isolator. This paper focuses on the design and implementation of a production level testing kit for an ac isolator/load break switches to ensure their quality without compromising the production rate. This automated testing mechanism will check the difference in the input and output current values for marginal variation thus ensuring their quality with a stamp.

Key Words: Switches, Load break switches, Isolator, Pneumatic Pressure, Step down Transformer, High Voltage, AC, DC, Pneumatic air cylinders.

1. INTRODUCTION

A switch has two conductive parts made out of metal called contacts. They are connected to external circuit, that touch to make / complete the circuit, and separate to open / break the circuit. The contact materials are selected on the basis of their resistance to corrosion, because most metals form insulating oxides that would prevent the switch from working. These materials are also chosen based on their electrical conductivity, hardness (resistance to abrasive wear), mechanical strength, low cost and low toxicity. Formation of oxide layers at contact, as well as surface roughness and contact pressure, determine the contact resistance, and wetting current of a mechanical switch. In some cases the contacts are plated with noble metals, for their excellent conductivity and resistance to corrosion. Therefore Isolators also have the same following components and their characteristics. These are need to be

quality ensured by considering some vital parameters like current and conductivity.

This paper gives the design, implementation and construction of a device which is used to automate the testing mechanism for switching gadgets with a couple of modules. This gadget allocates hardware sources, which consist of several components and inter-module connector ports, routinely constructs a test environment for each test object, and executes test scripts.

It can reduce the complexity of scheduling hardware and putting in the take a look at environment, lessen the checking out cycle time, and improve hardware aid usage. This is a automatic testing fixture that monitors the continuity and current difference between the ports drop in a controlled environment.

1.1 EXISTING SYSTEM

The existing system consist of a testing kit which has a testing base synchronized with a two parallel eight tooth holder which is embedded to a Pneumatic air cylinders which enables the linear movements of the jaws. There is a mounting base which is designed to suit the base of different types of load break switches. This system is incorporated with a continuity testing circuit to ensure the continuity across the terminals and a timer circuit to customize the piston movements.

When the system is powered, the two parallel placed pistons moves the jaws grabbing the switches mounted on the base which provides a firm grip to hold the switches. The conductivity is ensured with the indication of led. There is also a timer circuit installed to maintain and to customize the time intervals of the Pneumatic air cylinders. This regulates the piston movements and provides and synchronous motion over the fixture.

Thus the continuity is ensured with the indication through the led outputs and the switches pass these screening are moved to the packing section and the other which fails the test are subjected to correction.

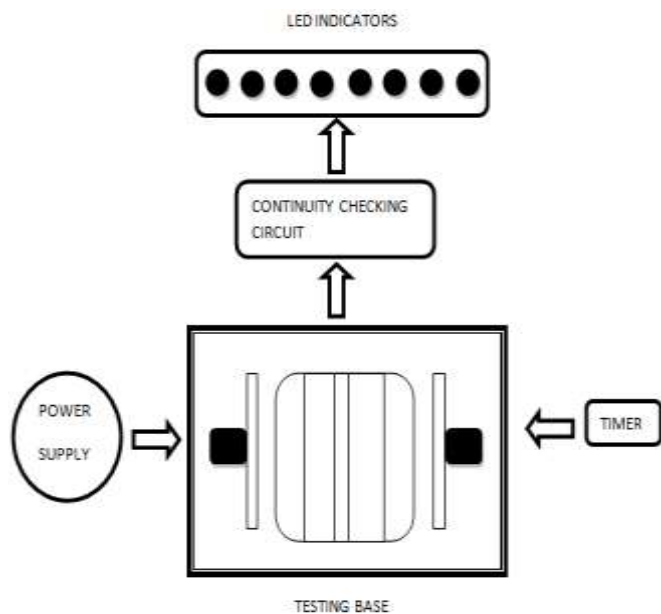


Fig-1: Block diagram of Continuity Testing Kit



Fig-2: Internal Structure of the Isolator Switch

1.2 PNEUMATIC AIR CYLINDERS

Pneumatic cylinders (air cylinders) are mechanical gadgets which use the energy of compressed gas to produce a force in a reciprocating linear movement. Like hydraulic cylinders, something forces a piston to transport in the desired route. The piston is a disc or cylinder, and the piston rod transfers the pressure it develops to the item to be moved.

Engineers occasionally choose to use pneumatics because they're quieter, cleaner, and do no longer require big quantities of area for fluid storage. Because the running fluid is a fuel, leakage from a pneumatic cylinder will now not drip out and contaminate the environment, making pneumatics extra proper in which cleanliness is a demand.

1.3 LOAD BREAK SWITCH

Load break switch is generally used in medium voltage industry for switching and protection purpose. It is well known in the market for its super electric characteristics together with compact design that make contributions to area saving installation and operational convenience.

The primary production and layout of the transfer makes it exceedingly compact, safe and reliable. It is manufactured the usage of polyamide glass stuffed fabric which is recognized for its insulation. It is exceedingly dependable to face up to quick circuit currents. It is used for isolators, primary switch, inverter packages and emergency on and off devices.

Unlike the circuit breakers , isolators are only used for the breaking purpose. Hence they can only isolate or break heavy loads , so their applications are limited and specific.

1.4 STEPPER MOTOR

A stepper motor is a DC electric motor without a brush , it splits a full rotation into a number of equal steps. The motor's position can then be authorized to move and hold at one of these steps without any position sensor for feedback system. DC motors with the brush, rotates continuously when DC voltage is applied to their terminals. The stepper motor converts a sequence of input pulses (typically square wave pulses) into a precisely defined increment in the shaft position. The shaft moves through a fixed angle for each pulse. They have multiple coils in cluster called "phases". When energized in sequence it will rotate one step at a time. When controlled using a processor, very precise positioning and/or speed control can be achieved . Because of such traits, stepper motors are preferred for many precision motion control applications.

2. PROPOSED SYSTEM

In this proposal we have designed an testing kit that checks the continuity of the switches across the terminals and also calculates the difference between the input and output current values across the terminals to ensure that the switches meet their specifications.

This will be integrated to the already existing system which consist of a testing kit which has a testing base synchronized with the a two parallel 4 pin holder which is embedded to a pneumatic air cylinder which enables the mobility of the jaws. When the system is powered these pistons moves the jaws and they provide a firm grip to hold the switches. A separate circuit to check the current drop and continuity of the switch which is also combined together.

The continuity is ensured with the indication of led and the buzzer. There is also a timer circuit installed to maintain and to customize the interval timings of the air cylinders. This regulates the piston movements. As a result, executed by using addition of device that will increase the working speed

of the disconnect transfer blade and the addition of some sort of device to regulate the arcing phenomena and permit the secure interruption of the arc resulting whilst switching load currents.

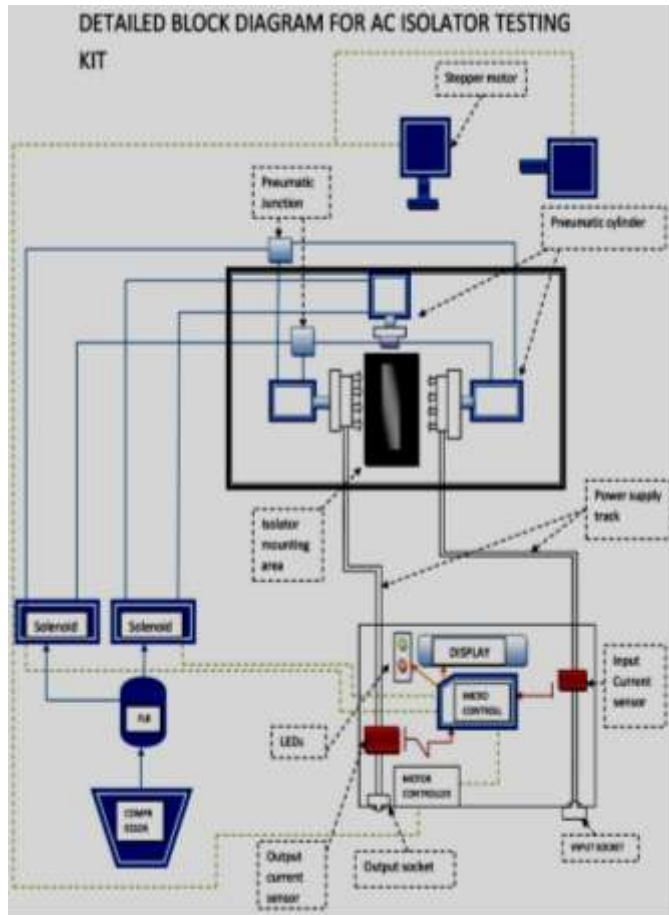


Fig-3: Block diagram of CCV Testing Kit

2.1 WORKING PRINCIPLE

In this concept, we have designed an examining kit that checks the continuity of the switches through all the terminals and also calculates the current difference between the input and output ports of all terminals to ensure that the switches meet their specifications. A load break (LB) switch is a device that provides making or breaking of detailed currents. This is substances electric powered strength to an electrical load. This is substances electric powered strength to an electrical load.

There are a total of three pneumatic pistons involved in this kit. The two pistons that are placed horizontal to the structure hold the switch, while the third piston drops vertically which is aligned with 3.5 kg torque stepper motor to automate the ON/OFF pattern of the isolators. The number one characteristic of a energy supply is to transform electric present day from a source to an appropriate voltage, present day, and frequency to strength the weight. Efficient

checking out of switching systems is crucial to provide new services fast and to reduce improvement prices. Therefore the core values are received.

The switches are examined with a load and their parameters like current, voltage & continuity are measured and analyzed. Since the circuit are biased with their additives using a engaging in medium(connecting wires) the self resistance of each and every material is calculated to obtain accurate results. These obtained values are then installed into a circuit. This circuit will then automate the procedure of finding difference in current values in the ports of the switches that are placed in base.

After which, the values will be automatically received and will be subjected to further processing inside a microcontroller. These values obtained have to fit the mediocre values calculated. So an assessment between the acquired value and the calculated core value has to be accomplished based on which the output is indicated whether the switch is good or not along with a quality identification mark.

2.2 RESULT

Thus the load break isolators are tested by subjecting it to a 5 ampere load. The load break switches are connected to a circuit that measures the variation in current values across the terminals of the switches. For accurate results the self resistance factors for every material is considered. Considering the mediocre values of the current difference in input and output ports of the load break isolators of range 25 amps, 45 amps and 65 amps, three designated values for the above mentioned range of isolators are obtained.

These three values are embedded into a decision making system so as to automate the testing process of LB switch. When a load break isolators are placed in the testing base, two pistons that are placed horizontal to the structure hold the switch, while the third piston drops vertically which is aligned with 3.5 kg torque stepper motor to automate the ON/OFF pattern of the isolators.

An active load testing mechanism obtains the current values and also for the continuity during both on/off conditions of each isolators placed in the testing base. These obtained values are then matched to the values that are embedded to the decision making device (microprocessor). The processing device then compares the values and sends the pulses to the indicating devices to display the results.


Fig-4: 3D front view of the testing kit

Fig-5: 3D side view of the testing kit

3. CONCLUSIONS

This testing method ensures the minimum quality of LB switches in the production level without disturbing the production phase and the followings can be concluded based on the results obtained from testing system.

- The potential drop across terminals can be monitored.
- The overall current drop are measured and displayed on the output unit.
- Individual continuity of each port is inspected during on/off conditions.
- Those found good are stamped with a verified signature.

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