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Brief Operating Description: Longer Motor Life Starts with a Switch

For over 75 years, single-phase motors have utilized a mechanical centrifugal switch to switch the start circuit. Inherent characteristics of a mechanical device have made these switches prone to various problems, including tolerances, tolerance build-ups, mechanical fatigue, vibration and a host of others that can lead to switch failures and/or performance inconsistency.

Our challenge was to design a reliable solid-state switch to replace the mechanical switch and actuator mechanism that would duplicate the function of connecting and disconnecting the start circuit at particular speeds with the additional benefits of a solid-state device. After considerable research, we decided a successful electronic motor starting switch could be created by sensing the voltages present in the main and start windings.

Until the rotor of a single-phase motor begins to rotate, there is no coupling between its start winding and main winding. When the rotor begins to turn, the main winding induces flux in the rotor, which then induces a voltage in the start winding. The voltage induced in the start winding is directly proportional to motor speed.

In Stearns SINPAC Electronic Switches, the voltage across a motor's main winding and the voltage across its start winding are sampled and fed to a comparator. The logic circuitry is designed so that the electronic switch interrupts the start circuit current after the motor has accelerated to the speed at which cut out voltage is developed, generally 75 to 80% of synchronous motor speed. The logic circuitry then shuts down the switch's power stage, which consists of a triac or inverse parallel SCR's. This function is referred to as "cut out." When the start circuit is disconnected, the main winding field then drives the motor's rotor to its running speed.

If the motor encounters an overload, and the motor speed falls to approximately 50% of its synchronous speed, the SINPAC Switch automatically reconnects the motor's start circuit. This function is referred to as "cut in." Cut in detection circuitry constantly monitors start winding voltage. When the motor's speed falls to the cut in point, the detection circuit causes the control logic to energize the SINPAC Switch's power output stage. The motor then goes through its normal startup procedure, with the start circuit being switched out at a motor

speed approximately 75 to 80% of synchronous speed.

SINPAC Switches are potted and completely sealed, making it impervious to dust, dirt and moisture. The unique speed sensing circuit provides a universal design which allows a few switches to work on most standard motor designs regardless of manufacturer.

Acceptance by Motor Manufacturers

US and foreign motor manufacturers have tested and retested the SINPAC Switch for reliability and quality. Today, many of these manufacturers have begun installing SINPAC Switches on their standard motor lines with more companies ready to make the changeover.

UL Recognition

Many SINPAC Switches have already been recognized under the Component Program of Underwriters Laboratories, Inc. (E-71115). In addition, all switches have internal surge protection which is tested according to IEEE C62.41 – 1991 Category A3.

CSA Certification LR-6254.