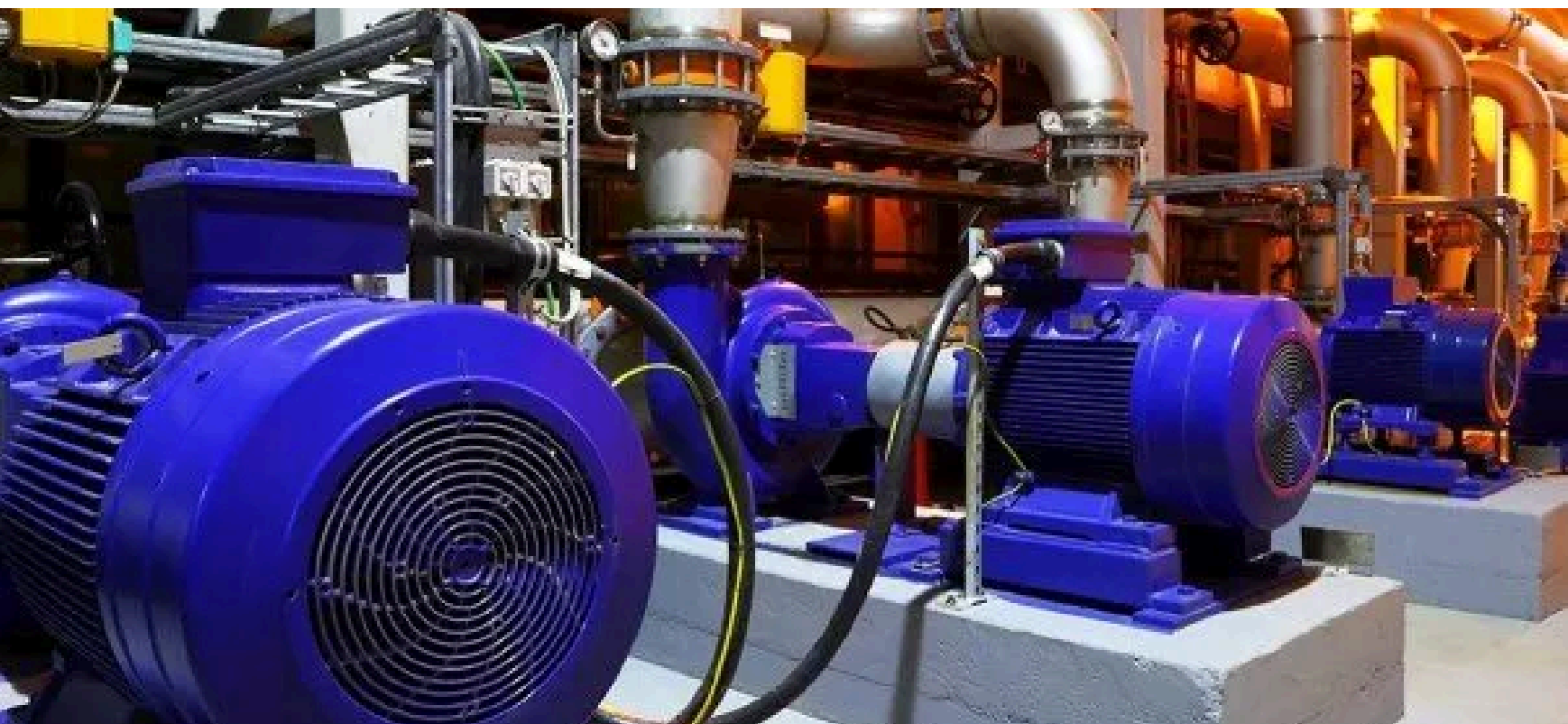


APPLICATION NOTES

Rish SPPR – Single Phase Preventor Relay



Introduction:

The Single phase preventer relay protects system from the faults occurring on voltage line. Relay protects against unbalance, phase failure, incorrect phase sequence faults. All faults are self resetting. Multiple LEDs indicate type of fault that helps for diagnosis purpose. Potential free relay contacts can be used for connection / disconnection of load or trigger alarm for annunciation purpose. Relay has Fail safe operation. Application in Motor protection, conveyor system and for process industry etc.

The Problem:

In industrial and commercial environments, three-phase electrical equipment — including motors, conveyor systems, server rooms, and control systems — is highly susceptible to power supply irregularities. These irregularities can cause severe damage, unexpected downtime, and safety hazards if not detected and mitigated in time.

The three most critical power supply faults in three-phase systems are:

- **Phase Failure (Single Phasing):** One or more phases of the supply drops out entirely. This is one of the most damaging conditions for three-phase motors, as they continue to draw current on the remaining phases, leading to overheating, winding damage, and eventual motor burnout if not detected promptly.
- **Phase Unbalance:** Unequal voltages across the three phases cause excessive heat in motor windings, vibration, and reduced efficiency. Even a modest voltage unbalance can reduce motor life significantly and increase energy consumption.
- **Incorrect Phase Sequence:** When the three phases are connected in the wrong order, motors and other rotating equipment run in reverse, which can destroy mechanical loads, conveyors, pumps, and compressors, as well as pose serious safety risks to personnel and machinery.

Traditional protection methods — such as thermal relays and fuses — address overcurrent and overtemperature conditions but do not inherently protect against phase failure, unbalance, or sequence reversal. This leaves a significant protection gap in facilities running critical three-phase loads. The absence of dedicated phase monitoring equipment means that faults may go undetected until irreversible equipment damage has occurred, resulting in costly repairs, production losses, and potential safety incidents.

Furthermore, many existing protection relays require a separate auxiliary power supply for their control circuits, adding complexity and cost to panel designs. In installations where wiring simplicity and space efficiency are priorities, this additional requirement can be a significant drawback.

Our Solution:

The RISH SPPR (Single Phase Preventer Relay) by Rishabh Instruments is a dedicated three-phase monitoring relay designed to continuously detect and respond to phase failure, phase unbalance, and incorrect phase sequence conditions in real time. The RISH SPPR connects directly across the three-phase supply (L1, L2, L3) and monitors line-to-line voltages continuously.

It operates across a wide input voltage range of 150–550 VAC (L-L) and a frequency range of 45–65 Hz, making it suitable for a broad range of global power supply standards (nominal 415 VAC, 50/60 Hz).

Key protection actions of the RISH SPPR include:

- **Phase Failure Detection:** The relay trips when the difference between any two line-to-line voltages exceeds 100V, indicating a complete phase loss condition.
- **Phase Unbalance Detection:** The relay triggers when the voltage difference between any two L-L phases exceeds 40V, catching developing unbalance conditions before they escalate to phase failure.
- **Phase Sequence Protection:** The relay monitors the phase rotation order and trips on detection of an incorrect sequence, preventing motors and equipment from running in reverse.
- **Self-Powered Operation:** The RISH SPPR draws its operating power directly from the monitored three-phase supply, eliminating the need for a separate auxiliary power supply. This simplifies wiring and reduces panel component count.
- **Auto Reset:** Once the fault condition is cleared and the supply is restored within normal parameters, the relay automatically resets within 300 ms, restoring normal operation without manual intervention.
- **Intuitive LED Indication:** Four LEDs (Relay, L1, L2, L3) provide clear visual status — solid ON for healthy/phase loss, BLINK for unbalance or incorrect sequence — enabling rapid fault identification at a glance.

The relay output is a single 1CO SPDT relay contact (NO/NC, rated 6A at 250 VAC / 30 VDC), which can be integrated directly into motor starter control circuits, contactor coil circuits, or alarm systems to automatically disconnect loads upon fault detection.

The Benefits:

Deploying the RISH SPPR in three-phase electrical installations delivers significant operational, financial, and safety advantages:

- **Equipment Protection and Extended Life:** By immediately tripping on phase failure, unbalance, or incorrect sequence, the RISH SPPR prevents the overheating and mechanical stress that cause premature motor and equipment failure. This directly extends the service life of connected assets and reduces maintenance costs.
- **Reduced Unplanned Downtime:** Early detection of developing power supply anomalies — particularly phase unbalance at >40V differential before it escalates to phase failure — allows for proactive intervention. This reduces the risk of unplanned production stoppages caused by catastrophic equipment failure.
- **Installation Simplicity with Self-Powered Design:** The self-powered architecture means no separate auxiliary supply wiring is required, saving panel space, reducing BOM costs, and simplifying installation. This is especially valuable in compact panel designs and retrofit applications.
- **Wide Application Versatility:** With an operating range of 150–550 VAC (L-L) and 45–65 Hz, the RISH SPPR is compatible with diverse industrial supply voltages globally. It is suited for motor protection, server room infrastructure, industrial control systems, and conveyor applications.
- **Fast and Reliable Response:** Trip delay under 300 ms and reset delay under 300 ms ensure rapid disconnection of loads under fault conditions and swift restoration of normal operation once faults are cleared — minimising both damage exposure time and process interruption.
- **Standards Compliance and Reliability:** The RISH SPPR is designed to IEC 60255-1 and tested to a comprehensive suite of EMC and immunity standards (IEC 61000-4-2, -4-4, -4-5, -4-6, -4-8, -4-11; CISPR 11), as well as a 2.2 kV AC HV dielectric test. CE and RoHS marked; it meets the requirements for industrial electrical installations across international markets.
- **Operational Safety:** Protection against reverse phase sequence is critical in applications such as conveyor systems, pumps, and compressors where reverse rotation can cause mechanical damage or safety incidents. The RISH SPPR provides this protection as a standard feature, contributing to a safer working environment.

In summary, the RISH SPPR offers a compact, cost-effective, and highly reliable solution for comprehensive three-phase supply monitoring and protection, making it an essential component in any installation where three-phase equipment reliability and longevity are paramount.

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PROVEN BY PERFORMANCE.”**

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