Life Is On | Schneider Electric

Discover how simple control and interfacing contribute to your equipment efficiency and connectivity

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Many factors threaten equipment efficiency

Unforeseen issues: The productivity of each component greatly affects the efficiency of the entire system.

Human error: Mistakes and misuse impact efficiency and productivity due to unplanned equipment downtime.

Aging devices: No matter how robust the equipment, regular usage eventually leads to stress and failure. Consider factors such as the wearing of mechanical parts in a motion chain or heat resistance failure in temperature control application.

Sensor malfunction: Broken sensors — whether due to mechanical malfunction or human error — are costly. They can result in equipment downtime, expensive product replacement, and the need for a skilled technician.

Unbalanced networks: The race for better efficiency and productivity often results in new equipment, machines, and offices being added to an existing network. This can throw the system off:

- Just a 5% unbalance can lead to a motor overheating by 50%
- 15% of motor issues come from phase losses
- While motors can withstand small overvoltage, undervoltage can lead to winding temperature increases

The right solutions and products can help increase efficiency by minimizing downtime, reducing maintenance costs, and increasing availability and productivity.

Programmable logic controllers (PLCs) vs. relays

Relays

- Easy to wire and plug
- Cost effective solution for simple logic and control functions
- Electrical technicians can wire in combination with timing relays for simple and non-variable logic functions

PLCs

- Require programming skills that add cost and time to installation and commissioning
- A good choice when logic functions vary or when flexible production requires several processes and recipes
- Information can be stored in PLC memory and implemented instantly by an operator

PLCs and relays

- Control panels consist of a mix of PLCs and relays, depending on the application. PLCs are a good solution where electrical loads are small — typically 2 A or less. Larger loads require relays with a switching capacity rating of 5 A or more
- Today's PLCs are increasingly compact and made for high performance. They often come with high-density input and output modules, which require more and more relays to interface with sensors and actuators.

Integrating relays with PLCs makes replacement easier at end of life or for unforeseen maintenance issues. Schneider Electric™ relays offer the convenience of plug-in replacement versus a PLC, which might require replacing an entire output module.

Relays are vital to the efficiency of future-ready machines

What can relays do?

- Provide electrical isolation, amplification, signal change, and multiple contact. These functions can extend the life expectancy of PLCs, industrial PCs, or distributed control systems when the sensors and actuators are connected.
- Give multiple contacts capabilities to each single output of a PLC
- Deliver the logic wiring for the manual control
- Allow easy, fast, and cost-effective replacement

Relays and performance

Solid state relays

Some applications require switching with fast reaction time, high frequency, or accuracy that exceeds the capability of electromechanical components such as relays.

For these cases, Schneider Electric provides the solid state relay (SSR) family of products. Fully electronic devices, SSRs deliver several advantages.

SSR benefits

- Switch-on AC load in less than 10 ms without bounces
- Not subject to mechanical wearing, offering almost unlimited lifetime
- Low-level control input makes them compatible with all device outputs
- Zero-volt switching mode increases the lifetime of resistive load, decreasing the mechanical stress
- Robust in harsh environments where dust, humidity, and chemicals compromise the contacts of electromechanical relays.
- Can decrease total cost of ownership over time

Limitations of SSRs versus electromechanical

- Need proper heat sinking
- Always have a small leakage current
- Don't give multicontact outputs

Regardless of whether relays are electromechanical or solid state technology, when additional PLCs or computing systems are integrated, more relays are needed as interface.

Equipment availability

Machines and equipment are designed to perform automated tasks with a certain level of efficiency and robustness. They are defined and sized based on productivity needs and environmental conditions.

Availability means not only that the equipment will perform as expected, but also that maintenance and life expectancy are properly forecast. To ensure availability and performance, electrical loads are protected against issues. For example, motors are protected with thermal overload relays.

The fact is, without visibility, it's not enough to guarantee total availability. Equipment must be permanently monitored so that faulty conditions — especially unforeseen ones — can be detected in real time.

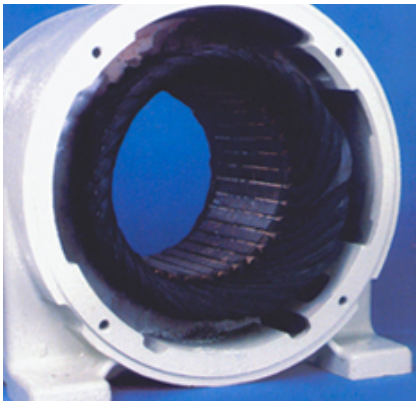
Schneider Electric control relays alert users to abnormal conditions, enabling corrective actions before serious and costly breakdowns can occur. By monitoring energy network conditions, electrical and mechanical loads can be controlled, increasing efficiency, and decreasing downtime and repair costs.

The cause of unreliable performance

- Within industrial processes, motors are the first cause of system failure
- 15% of motor issues are caused by phase issues

What threatens your motors?

- If, for any reason, motor windings draw current that exceeds their rating, excess heat is generated, which deteriorates the motor insulation. This deterioration is irreversible and cumulative. Eventually, the windings will short the motor housing, causing motor failure.
- Motor failure results in the direct costs of replacement parts and labor, as well as equipment downtime and lost productivity.



Phase issues

Types of phase failure

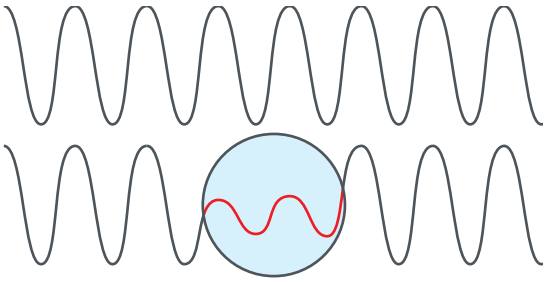
Unbalance occurs when incoming line voltages delivered from the power network are of different levels or when single-phase loads, such as lighting, electrical outlets, or single-phase motors, are connected on individual phases and not distributed uniformly. Unbalanced voltage applied to a three-phase motor will result in a current unbalance in the motor windings. This will increase the heat generated and cause deterioration of the motor insulation.

Thermal and/or magnetic overload protection devices do not detect this gradual unbalance.

Single phasing is the total loss of one of the three phases.

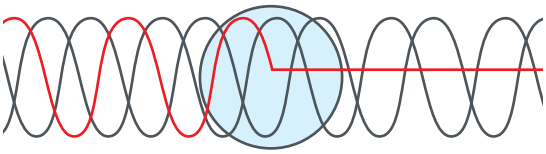
Loss of phase occurs from:

- A blown fuse in the power distribution system
- Mechanical failure within the switching equipment
- An open power line



Underbalance

Undervoltage occurs when the power supplied from your power network is overloaded, causing the voltage to drop. An undervoltage condition can also occur in remote equipment at the end of long power lines. As the voltage available to the motor is decreased, the current drawn by the motor increases, generating heat that deteriorates the motor insulation.



Phase loss

Phase reversal can occur when:

- Maintenance is performed on motor-driven machinery
- Modifications are made to the power distribution system
- Power restoration results in a different phase sequence than before the power outage

Phase reversal causes the motor to run in the reverse direction, which is extremely dangerous to both people and equipment.

Many regulations require phase reversal protection on all equipment that transports people, such as escalators or elevators.

Phase control relays can:

- Reduce the risk of overheated windings
- Increase motor life
- Reduce costly repairs or replacements
- Minimize downtime due to motor problems

Future-ready Schneider Electric control and monitoring relays deliver more than three-phase control relays, providing increased efficiency and reliability.

Mechanical and electrical loads can be monitored with our current control relays, voltage control relays, frequency control relays, liquid level control relays, speed control relays, and others.

Schneider recommendation

Reduce downtime and maintenance costs

Simple interface and control within automated systems contributes to process performance and availability:

- From sensing to computing by providing the right insulation and signal adaptation
- From computing to actuating by providing the right insulation, multiple contacts, signal amplification, or performance switching when applications require it
- By monitoring mechanical and electrical loads to ensure that failures are detected in time to trigger appropriate actions and avoid expensive maintenance costs and downtime

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September 2016

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998-19814295_FR-US

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