

TECH TIPS



Select monitoring controls to protect your machinery

Since electricity powers the wide majority of industrial and infrastructure equipment, it is becoming more important to ensure that this incoming power does not damage the equipment it is meant to power. Besides monitoring DC signals, 1-phase AC signals or the 3-phase AC mains voltage entering into a building or a room, monitoring of the equipment or machinery within the building is just as important.

Machine and equipment monitoring devices detect abnormalities in the incoming power, and permit preventative actions to be taken to protect equipment before any damage can occur.

Monitoring relays are used in a vast majority of applications, such as pumps, motors, HVACR equipment, elevators/escalators, as well as food and beverage production and dispensing equipment.

Below are some helpful tips on selecting the proper monitoring device for your machinery:

01 KNOW WHAT TO MONITOR

Machinery monitoring devices and relays provide a multitude of preventative options. You'll want to select a relay or device that is capable of monitoring the most critical aspects of the supplied power for your application.

Monitoring relays are designed for voltage, current, frequency, three-phase power, power factor, or temperature. For each relay type, you'll want a clear delineation of the acceptable tolerances and measurement parameters for your application.

02 PHASE FACTOR

Many types of heavy industrial equipment rely on 3-phase power. Inconsistencies or anomalies in this power quality can cause disastrous damage to machinery or equipment. Inconsistencies in 3-phase power can include: phase loss, improper phase sequence, and/or an imbalance between the three phases. Many of these situations can be averted through the use of a **3-phase monitoring relay**.

If a motor operating on 3-phase power were to suddenly receive two phases out of sequence, it will reverse direction. This not only poses a threat of damage to the motor, it could also pose a safety risk in applications such as elevators, moving walkways or conveying equipment. Furthermore, per the National Electrical Code, all people-moving equipment requires phase reversal protection.

Losing one of the three phases of incoming power can render a motor unable to operate, or force it to operate at a lower efficiency rating. In addition to decreased performance, the latter mentioned consequence can lead to heat generation within the motor, which shortens component life.

A similar result can occur if all phases are present, but one or more of the phases is underpowered because 1-phase loads are drawing power unequally on one or more of the three phases.

03 VOLTAGE VERIFICATION IS ESSENTIAL

Powering devices, such as motors, on a voltage that is lower than specified causes the load to draw more current.

This then leads to inefficiencies and excessive heat, which as mentioned earlier, will lead to shortened component life.

Overvoltage can also cause component stress, resulting in permanent damage of some parts.

Voltage monitoring relays can handle anywhere from a low millivolt range up to several hundred volts. Versions are available that monitor under and/or overvoltage, some offering adjustable hysteresis and time delays.

Voltage relays for DC voltage are often used to monitor backup battery status, such as those found on generator sets or solar power systems. Relays designed for 1-phase AC work well for motors, which could possibly be used in a variety of countries, where different supply voltages are present and/or in areas where voltage fluctuates, causing brownouts and/or voltage surges.

04 KEEPING CURRENT

Current can be used as an indication of proper machine function. Equipment that suddenly starts drawing more current might be experiencing a voltage imbalance, an impending bearing failure, or a number of other issues. **Current monitoring relays** help detect these variances, allowing action to be taken before equipment damage occurs. Low-current AC or DC inputs can be directly connected to most monitoring relays, and AC currents up to 100 A can be monitored by some modules directly. However, higher currents need to be monitored through the means of a shunt or current transformer. **Power monitoring relays** can also detect variations in the power consumption of various loads. Depending on the relay, you can detect and react to load excess or absence, motor load variation, and motor direction.

05 COMPACT CURRENT MONITORING

In addition to DIN rail mount or plug-in monitoring relays, some manufacturers of these protective devices have integrated monitoring relays with current transformers, creating an all-in-one solution. They typically provide a relay, transistor, or analog output, with some even requiring no supply voltage.

The **current monitoring device with integrated current transformer** is an innovative concept which allows you to run the wire carrying the AC current right through the device's through-hole, therefore simplifying installation and minimizing wire connections.

06 TACKLING TEMPERATURE

Knowing the temperature of your equipment can help prevent equipment downtime or even fire. **Temperature monitoring relays** use PTC thermistors, mounted in motors, whose resistance increases with rising motor temperature. They are capable of monitoring the temperature of up to six motors or motor windings simultaneously, and can be used to shut down motors during over-heating, thereby preventing damage to the motor.

07 FLEXIBILITY IS KEY

With monitoring relays, you can set up the device to immediately interrupt power to the equipment, similar to the operation of a fuse. More commonly, the monitoring relay signals a shutdown relay that is applied to safely power down the equipment. If minor variations of voltage, current, or frequency are tolerable, you can utilize a monitoring relay with adjustable hysteresis and time delays. These types can prevent nuisance tripping in the instance of occasional sags or spikes in the incoming power. The choice is ultimately up to you.

08 INVEST IN PREVENTATIVE PROTECTION

Many design engineers look at machine monitoring relays like an insurance policy. Some higher efficiency industrial motors can cost into the thousands of dollars, whereas monitoring relays typically cost from a few hundred dollars or less—usually one tenth of the equipment cost. It just makes sense.

When considering the initial cost, remember that machine monitoring relays can protect machinery and help reduce the cost of both downtime and damaged products, which in turn provides immediate payback. To get that extra peace of mind, always specify and select relays with approvals like UL or CE appropriate for your application. Additionally, it's always a good idea to use one relay to monitor the incoming power to a building.

09 TURN TO EXPERTS FOR HELP

For more help in selecting **machine monitoring relays**, turn to automation experts such as Carlo Gavazzi. They have the knowledge and resources to provide expert insight and advice on specifying and implementing the ideal solution for your application. They also have an international distribution network and experienced personnel who can assist you by email, phone, web conference or in person.