

Ten Ways to Design Safety & Customer Value Into Your Product's Electrical Panel



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Machine and control design engineers often overlook the electrical control panel as a place to add customer value. The control panel, also called a power panel, is a point of user interaction...and one that could ruin an otherwise flawless customer experience. When a fuse opens within the panel, the user typically wants to find it fast and return the panel to production quickly. Maintenance workers want to see an orderly layout and clean wiring, not a disorganized mess of components that might appear as if the designer had no concerns for their safety and convenience.

As a result, designing safety and functionality into a machine's electrical panel can be a feature advantage that may make your product more appealing than others. Quite simply, a good design means paying attention to the details. To help you with this, Littelfuse has developed a list of ten things to keep in mind when designing a machine control panel for industrial use:

1. Use indicating fuse blocks to save your customers time and money.

Fuse holders that indicate when a fuse opens, by means of a light or LED, can significantly reduce downtime as operators can quickly identify which fuse to replace. Downtime in some industries can cost employers \$50,000 or more per minute!

2. Use indicating fuses in indicating or non-indicating fuse holders. This is an advantage to your customers as indicating fuses still indicate which fuse has opened even after power has been turned off.

Indication within the fuse itself is another means to indicate that a fuse has blown. Some fuses have a clear window that changes color, and some have a pin that extends from the end of the fuse when the internal element opens. The pin can then trip a switch to provide a remote indication. It is important to note, however, that not all indicating fuses can be used in a UL-listed branch circuit.

In addition to the above, indicating fuses provide positive indication that the fuse has opened and cleared the circuit. Qualified workers know that power must be turned off before

fuses are replaced. Indicating fuses provide blown fuse indication whether or not they are installed in indicating fuse holders. When power is removed, indicating fuses save time and avoid errors when troubleshooting and restoring power.

In situations where fuses are installed in fuse holders featuring indicating lamps, an added safety advantage exists in that when power is still applied, the indicating fuse holder will light up. This feature reminds workers that power is still being applied and that the system must be de-energized before replacing fuses or working on other energized equipment.

3. Offer the flexibility of DIN-rail mounting.

In a situation where changes need to be made within a system, the use of DIN-rail mounted components and fuse blocks makes replacing or relocating a fuse block literally a snap, as the blocks can be mounted and released with just one hand. There is no longer a need to remove and replace screws (let alone running the risk of dropping or losing them) just to relocate a fuse block. Moreover, a DIN rail allows an infinite number of positions along its axis. There is no need to re-drill holes in the back of the panel just to make the desired changes.

4. Reduce panel size and shrink the footprint of your equipment's design.

Rating for rating, fuse blocks are available today that are physically smaller than their predecessors. In some cases, the footprint reduction allows a user to fit three fuses in the same space in which other fuse holders accommodate just two fuses. Such a change might allow OEMs to save considerable costs by reducing the size of the enclosures. This is especially true with industrial enclosures made of stainless steel or cast iron where a smaller enclosure could save thousands of dollars. Alternatively, smaller fuse holders may also make room in the existing panel for new features, products or components to also be added.



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5. Provide a neat, stylish appearance.

Original Equipment Manufacturers (OEMs) and panel shop owners are constantly searching for ways to distinguish and add value to their products. One way to accomplish this goal is by improving aesthetics and developing cleaner, more practical electrical panels. Common practices include reducing the amount of wiring required, carefully organizing those wires to keep them out of the way of other devices, aligning components symmetrically, and neatly spacing those components within the enclosure to provide a sense and look of clutter-free compactness. Fuse blocks with smaller footprints and a modern appearance give an opportunity to present a unique and more appealing design to end-users. Similarly, fuse blocks that mount on DIN rails make it easy to space components within a panel, thereby optimizing the aesthetics.

6. Use power distribution and splicer blocks to provide safe, convenient wire management within your panel.

Electrical safety is a critical concern in any panel, so the use of power distribution and splicer blocks is encouraged to improve the safety of panel boards and power installations. Using the touch-safe versions of the blocks further reduces the exposure of an electrical worker to live, energized surfaces. Distribution blocks offer a safe, convenient way of splicing cables while providing a fixed junction 'tap-off' point for splitting primary power into secondary circuits. This provides your customers with a variety of options for inputs and outputs in critical installations. Littelfuse offers more than 100 SKUs in a variety of amperage ratings and wire terminations, providing you and your customer with optimal flexibility when designing electrical panels.

7. Use touch-safe fuse holders or fuse block covers.

Using touch-safe (or dead-front) fuse holders, devices and fuse block covers provides excellent protection against shock and arc-flash hazards. These devices are also compliant with global touch-safe standards.

8. Clearly label the short-circuit current rating of each panel as required by NEC® Article 409.

Article 409 of the National Electrical Code® (NEC) requires industrial control panels containing components that control power to utilization equipment to have their short-circuit current rating (SCCR) clearly marked on their label. This label allows installers and inspectors to compare fault current studies at the facility where the panel is to be installed to the SCCR of the control panel. This comparison is necessary in order to ensure that the panel complies with the NEC and minimizes potential hazards in industrial or commercial facilities. Aside from being an NEC and OSHA violation, a control panel with too-low an SCCR can result in damage to equipment or injury to personnel. It is important to note that the use of current-limiting fuses can increase the SCCR rating of the panel (see the next item).

9. Use current-limiting fuses in control panels for easy compliance with UL Standard 508A.

Current-limiting fuses are designed to clear a fault before the maximum available fault current can flow. A current-limiting fuse must open and clear the current in less than 1/2 of an AC electrical cycle (8.3 ms). By reducing the peak let-through current, current-limiting fuses limit the thermal and magnetic stress on the components in the panel.

UL 508A, the Standard of Safety for Industrial Control Panels, covers industrial control panels intended for general industrial use, operating from a voltage of 600 volts or less. One of its sections details how to determine the panel's SCCR. The NEC® defines SCCR as the prospective symmetrical fault current at a nominal voltage to which an apparatus or system is able to be connected without sustaining damage exceeding defined acceptance criteria.

In most cases, a panel's SCCR is determined by the "weakest link" or lowest-rated SCCR of any device or component within the panel. But there is an exception to this rule: if the panel uses current-limiting fuses in the feeder circuit, its SCCR may be increased to more than that of the lowest-rated component. This method of calculating the SCCR when current-limiting fuses are used is discussed in more detail in the Littelfuse white paper "Using Current-Limiting Fuses to Increase Short Circuit Current Ratings of Industrial Control Panels" available online at littelfuse.com or LittelfuseBusinessCenter.com

In addition, current-limiting fuses can help reduce arc-flash hazards. The danger to personnel is reduced as the current available during an arcing fault is reduced.

10. Add an external fusible disconnect-switch before the control panel to increase the panel's SCCR and increase worker safety.

Attaching an external, fusible, disconnect switch containing current-limiting fuses to feed power to a control panel can be a safe way to isolate that control panel during lock-out/tag-out procedures. Doing so might minimize or eliminate the need for PPE during maintenance on these control panels. In addition to increasing the SCCR of the control panel and enhancing safety during lock-outs, current-limiting fuses will reduce arc-flash hazards at the panel during energized maintenance services.

For more information, please contact the Littelfuse Engineering and Technical Support Group at 800-TEC-FUSE or techline@littelfuse.com.



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