

Appleton™ PlexPower™: Advancing Hazardous Location Electrical Equipment Technology

Understanding component-level protection and its benefits on installation, maintenance and safety.

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The combination of hazardous locations and ignition sources, such as circuit breakers, switches and motor starters, requires highly engineered protection that prevents a single spark or hot spot from placing facilities and personnel in danger. These technologies may differ around the globe, but the goal is the same: keep production running smoothly and safely by preventing electrical devices from causing ignition of the volatile gases, vapors, dusts or fibers that may exist within the workplace.

The standards set by the National Electric Code (NEC) and Canadian Electric Code (CEC) stipulate that enclosures used in hazardous locations must be designed on the assumption that vapors or gases have entered the housing and can be ignited. Appleton brand products by Emerson are designed to operate safely in hazardous locations by routing the hot gases from the ignition through precision machined “flamepaths”. These pathways allow the gases to cool to temperatures lower than the ignition point of the surrounding atmosphere before they are released from the enclosure.

For decades, North American enclosures designed for use in hazardous locations have been large cast aluminum or cast iron housings with numerous cover bolts. To maintain the explosionproof integrity of the enclosure, a flamepath

is incorporated into the flange between the cover and the body. In addition, the NEC and CEC requires seals such as barrier glands, Teck connectors or conduit sealing fittings for all incoming and outgoing electrical connections, as part of the final assembly, to guarantee explosionproof protection. All of these required components significantly add to the time, effort and cost needed to install, maintain and operate traditional cast enclosures in hazardous locations.

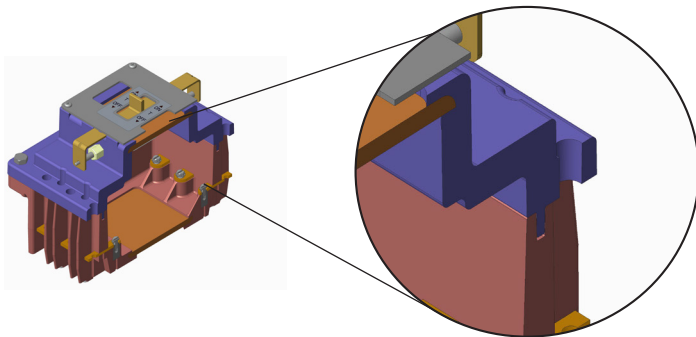
The need to reduce installation, maintenance and downtime costs, while preserving safety, is driving North American facilities to seek alternative technologies.

Creating North American Component Level Protection

The Appleton PlexPower Series by Emerson is redefining the way North American hazardous location products are designed by transferring the flamepath protection from the exterior enclosure to the internal components. Our PlexPower Series is made up two types of nested enclosures. The exterior enclosure is stainless steel, which provides NEMA Type 4X environmental protection. The inner enclosure, which is used to protect the individual internal components, is our flameproof PlexPower module. These modules allow for easy field replacement using standard off-the-shelf components.

Each standard off-the-shelf electrical component is placed within our PlexPower module. This special enclosure housing features a labyrinth joint flamepath located between the cover and body. The top cover has a ridge that encircles the entire opening. This ridge fits into a channel on the body to form the innovative flamepath.

Vents are located within the body to allow pressure and heat to dissipate, minimizing nuisance tripping of the breakers and the need for additional circuit breaker derating. The result is optimized performance and an increased lifespan of standard off-the-shelf components.



Flamepath Diagram

The PlexPower modules are designed to accept various circuit breaker combinations, up to three poles, molded case switches, fuses, contactors, and motor overloads. These components are connected to copper busses that are molded into the body of the module allowing the components to be completely enclosed with secure terminal contact, while providing connections to external lugs.

Safety by Design

An arc flash, or electrical discharge that travels through the air can result in serious injury and even death. The causes of an arc flash vary, and everything from dust to corrosion or faulty installation can trigger it. Protecting against an arc flash requires proper protective equipment and safety procedures, including arc flash boundaries, barricades, and often de-energizing the entire unit for servicing or maintenance.

With a traditional cast solution, all of the components that arc and spark are contained in one enclosure. These enclosures are extremely heavy, have numerous bolts and use a precision ground flamepath. These factors make a traditional cast solution difficult to install and maintain, while creating potential safety issues every time the enclosure is opened.

The PlexPower modules ensure component level protection. Every electrical component has its own individual internal enclosure with its own flamepath. The module's technology diminishes the risk of damaging the flamepath while limiting workers' exposure to high levels of incident energy when installed close to the process application.

Modular Design — Increased Installation Flexibility

As a result of transferring the flamepath from the outer enclosure to the internal component module, a large cast enclosure is no longer required for hazardous location protection. The PlexPower Series outer enclosure and hardware is manufactured from stainless steel. The smooth sides and lighter weight aid in transporting and maneuvering the enclosure during installation, creating greater flexibility and convenience.

The PlexPower Series of products are available in configurations with similar footprints to traditional cast products. For large applications, or where space is at a premium, the modular design permits multiple-enclosure coupling.



PlexPower Coupling

They can be connected and stacked horizontally or vertically. Additionally, the enclosures do not require conduit or cable seals, significantly simplifying the installation and maintenance processes. Installers can add entries to the enclosure in the field without worry of compromising the hazardous location rating.

Less Down Time

Accessibility to enclosures is one of the biggest challenges for end users installing, operating, and maintaining products located in hazardous environments. On traditional cast enclosures, to access internal components, up to 70 bolts must be loosened and the heavy cast cover must be removed. Upon completion of the maintenance, the cover must be replaced and then tightened. This requires extended downtime and additional maintenance personnel. Improperly torqued or missing bolts can be dangerous and cause accidents or safety risks.

Unlike its cast enclosure alternatives, the solutions provided by the Appleton PlexPower Series of products ensure that the outer enclosure can be quickly opened with a few quarter turn latches rather than multiple bolts. Only standard tools are needed, which means shorter maintenance times with fewer personnel required. The innovative design of the PlexPower modules provides an easy way to install and maintain products. By allowing end users to install their electrical control and distribution equipment in the hazardous areas, which are typically far away from the source of energy, available short circuit hazards are reduced.

Circuit Breaker and Molded Case Switches Modules

PlexPower circuit breaker modules can house and actuate single, two and three pole standard North American amperage circuit breakers and molded case switches. The design of the module allows for a variety of circuit breakers and combinations, such as thermal magnetic breakers, GFI breakers, EPD breakers, and high short circuit rated breakers.

The PlexPower circuit breaker modules can be locked out for all safety procedures directly on the module. In addition, the circuit breaker modules support operation external to the panel enclosure so the user does not have to open the enclosure door to actuate or lockout the breakers providing a safe lockout tagout process.

Fuse Modules

PlexPower fuse modules are used in the Appleton PlexPower Series Fused Panelboards and are available with up to a 150 Amp main circuit breaker or 180 Amp main lug configuration.

The PlexPower fuse modules house standard J Type North American fuses up to 30 Amps. Three fuses are mounted inside each fuse module using standard fuse holders. The PlexPower fuse module allows the J Type fuses to be safely used in hazardous locations in an easy to maintain module.



Fused Module

The Appleton PlexPower Series Fused Panelboards use individual breaker and fuse modules to provide explosionproof protection for standard off-the-shelf fuses and switches. They are available with up to a 150 Amp maximum mains circuit breaker or 180 Amp maximum main lug only.

Contactor and Motor Starter Modules

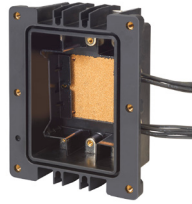
The PlexPower contactor and overload modules house standard, NEMA rated, North American contactors and overloads. For the contactor modules, the module design supports 3 pole contactors for voltages up to 600 Vac and offers many different control voltages. It also allows for multiple control wires via the integrated line bushings for the wiring of the coil wires and the auxiliary contacts. The PlexPower motor overload module provides control wires for the auxiliary contacts as well as a mechanical button to reset the thermal overload. The reset button can also be externally actuated when the enclosure door is closed to support easy and safe reset for plant personnel.



Main Breaker Module



Branch Breaker Module



Contactor Module



Overload Relay Module



PlexPower Series Fused Panelboards



PlexPower Series Panelboards



PlexPower Series Fiber Panel

The Appleton PlexPower Contactors and Motor Starters are a full voltage solution to provide disconnecting means, circuit protection, and motor running protection. These combination and non-combination contactors and starters are available with single and multiple contactors and starters.

Reduced Total Cost of Ownership

Our PlexPower Series offers products which are quicker and easier to install, operate, and maintain – delivering substantial savings compared to the total cost of ownership of a traditional cast solution.

Cast enclosures are typically very heavy and require several people and special equipment to install. They have many bolts to remove prior to opening and servicing and conduit seals are required to be installed and poured in most applications. The PlexPower Series provides a lightweight, stainless steel solution that doesn't require conduit seals to be poured during installation. Additionally, because of its component level protection technology, you can locate PlexPower products close to the process equipment. Shorter conduit and cable runs mean a reduction in installation labor and cable costs.

Maintenance on a PlexPower product takes less time and manpower. The outer NEMA Type 4X, stainless steel enclosure is equipped with quarter turn latches, this provides faster access to the panel. No bolts to remove,



PlexPower Series Enclosed Circuit Breakers and Disconnect Switches



PlexPower Series Contactors and Motor Starters

misplace, and retorque. The PlexPower modules support off-the-shelf components. You can source replacement parts from any distributor for easier maintenance and cost flexibility. Maintenance can easily be done in the field, whether it's on a land rig, offshore platform, petrochemical facility, heat trace panel location or another hazardous environment with greater simplicity and significantly less cost.

The hourly costs to access a traditional cast aluminum hazardous location enclosure, specifically those hours associated with removing and reinstalling the cover bolts while painstakingly maintaining the precision ground flamepath, can be exorbitant to facilities. Coupled with the cost of plant downtime, the PlexPower Series of products can provide a much lower total cost of ownership with simplified maintenance.

Continuing the Current of Innovation

The successful development and implementation of the PlexPower modules individual component level protection establishes a new standard for hazardous location electrical products. The Appleton PlexPower Series represents Emerson's continuing dedication to safer and more productive facilities through innovative technologies and engineering.

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