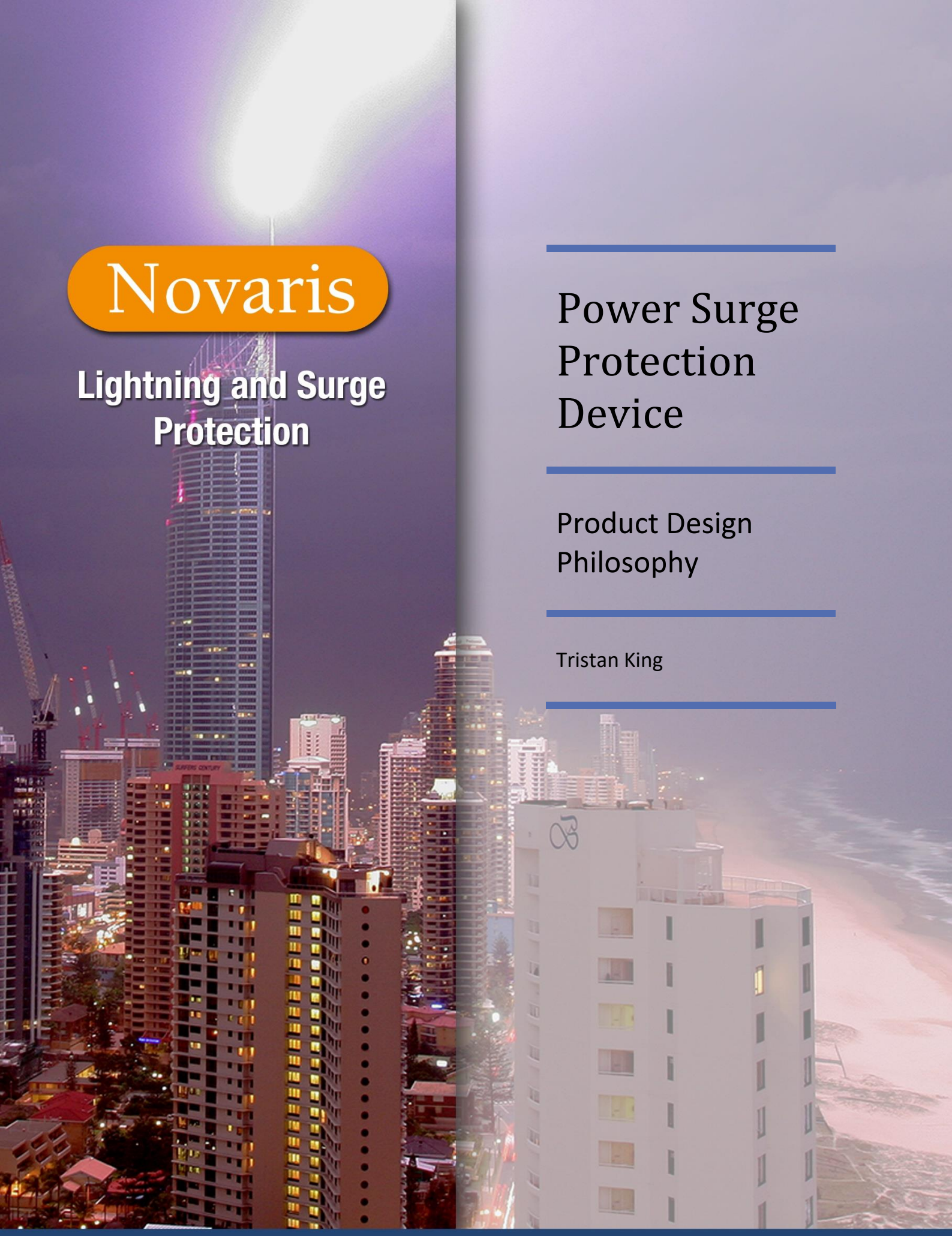


# Power Surge Protection Device

## Product Design Philosophy

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## Introduction

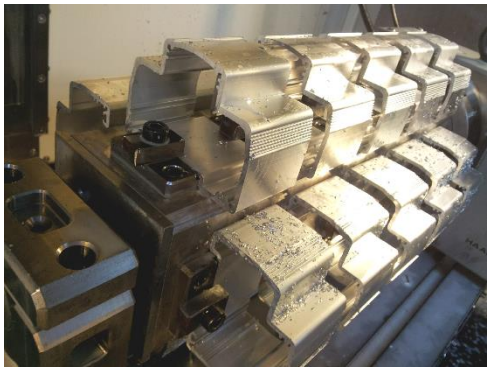
For more than 20 years Novaris has utilised a range of metal enclosures for our power protection products. The current Novaris product range utilises a unique aluminium extrusion design to provide the best quality and safest products to our customers.

There are of course some drawbacks to any design philosophy. This paper aims to discuss some of the advantages and disadvantages of the Novaris power surge protection design and our justifications for these design choices.

## Why a metal enclosure?

Surge protection devices are sacrificial. They are designed to absorb large amounts of energy during an overvoltage event. Normally this overvoltage event comes in the form of lightning or switching surges. Occasionally the overvoltage can originate from grid disturbances that cause a continuous overvoltage. Some examples are a Line to Neutral fault, Line to Earth fault, a broken neutral or MV/HV injection into the LV system.

The thermal disconnection systems used in surge protection devices tested per the IEC 61643-11 and UL 1449 standards can deal with slow heat build-up and end of life disconnection with a current limited source. Real world failures do not adhere to the testing methods of these standards and a simple 415V injection into a 275V MOV based product yields a catastrophic failure where the thermal disconnect does not have enough time to release. An MV or LV injection into a spark gap based protection unit will guarantee continuous current flow through the product. Both situations generate a lot of smoke, heat and flames.



Aluminium has a melting point of 660˚C (1,200˚F) whereas plastics used for injection moulding have a melting point under 200˚C (400˚F). In the event of a catastrophic failure the Novaris surge protector enclosure shields the rest of the switchboard from the generated heat.

Novaris surge protectors also earth the aluminium housing inside the product. If there is a component rupture within the device, it can short to earth and blow the incoming fuse instead of leaving broken plastic and live components exposed.

Using aluminium for the product enclosure is obviously a more expensive design choice, but an important one to ensure that Novaris SPDs are safer and more robust than plastic alternatives.

## What about pluggable cartridges?

An obvious drawback to using a metal enclosure is the fact that it cannot accommodate pluggable modules. There are two main reasons why we do not consider this to be an important issue.

### 1. Common Mode Surges

Most surge energy that a diverter is exposed to is common mode, applied to all lines at once. The common mode surge can originate from 3 phase switching surges, direct and indirect surges causing

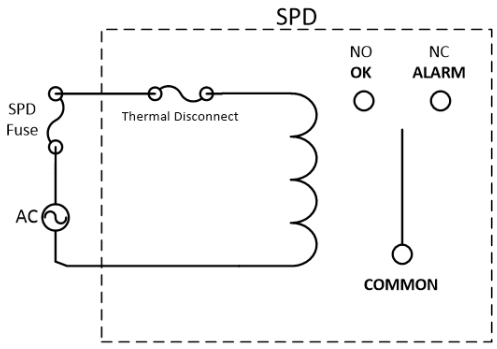
earth potential rise, and induced surges from lightning. This means that if a single module has failed then the other modules are going to be severely degraded. Best practice would be to replace all modules each time a module fails. If this is the case, then replacing the whole unit with a fresh product requires similar effort and the same cost.

### 2. Higher kA

The Novaris SDD3-100-275-A surge protection unit has an $I_{max}$ of 100kA and a $I_{nominal}$ of 40kA in a 4-module 72mm wide DIN enclosure. This means the product can handle 15 x 40kA surges in the same dimensions of a product that can handle 1 x 40kA ($I_{max}$) surge. The user can save 15 x 3 phase module replacements for the life of the product by selecting a unit with a higher kA rating.

## Why are active alarms important?

Most surge protection devices on the market utilise a plastic flag on a spring with a mechanical switch arrangement for monitoring the surge protection device. This arrangement does not monitor the integrity of the SPD back up fuse. This inherent failing forces other manufacturers to recommend inordinately large back up fuse ratings. This means that proper coordination with upstream overcurrent protection devices cannot be achieved.




The Novaris approach uses active electronics to monitor not only the state of the surge protection components, but the SPD fuse and the AC power feed.

The LED display and relay state give peace of mind as it provides a guarantee that the device is properly connected and protecting the system.

## Conclusion

Novaris is able to differentiate itself from other manufacturers by offering a robust and safer product by using higher quality materials. This design philosophy has helped establish Novaris as a surge protection leader in some of the highest lightning regions around the world.