Raycap

Lightning and Surge Protection for Wind Power Systems

Strikesorb® Provides Unparalleled Lightning and Surge Protection for Wind Turbine Systems

As more wind farms are built, turbine manufacturers and wind farm operators are becoming increasingly aware of the operational threat posed by lightning strikes.

Lightning: A real challenge for turbine electrical systems

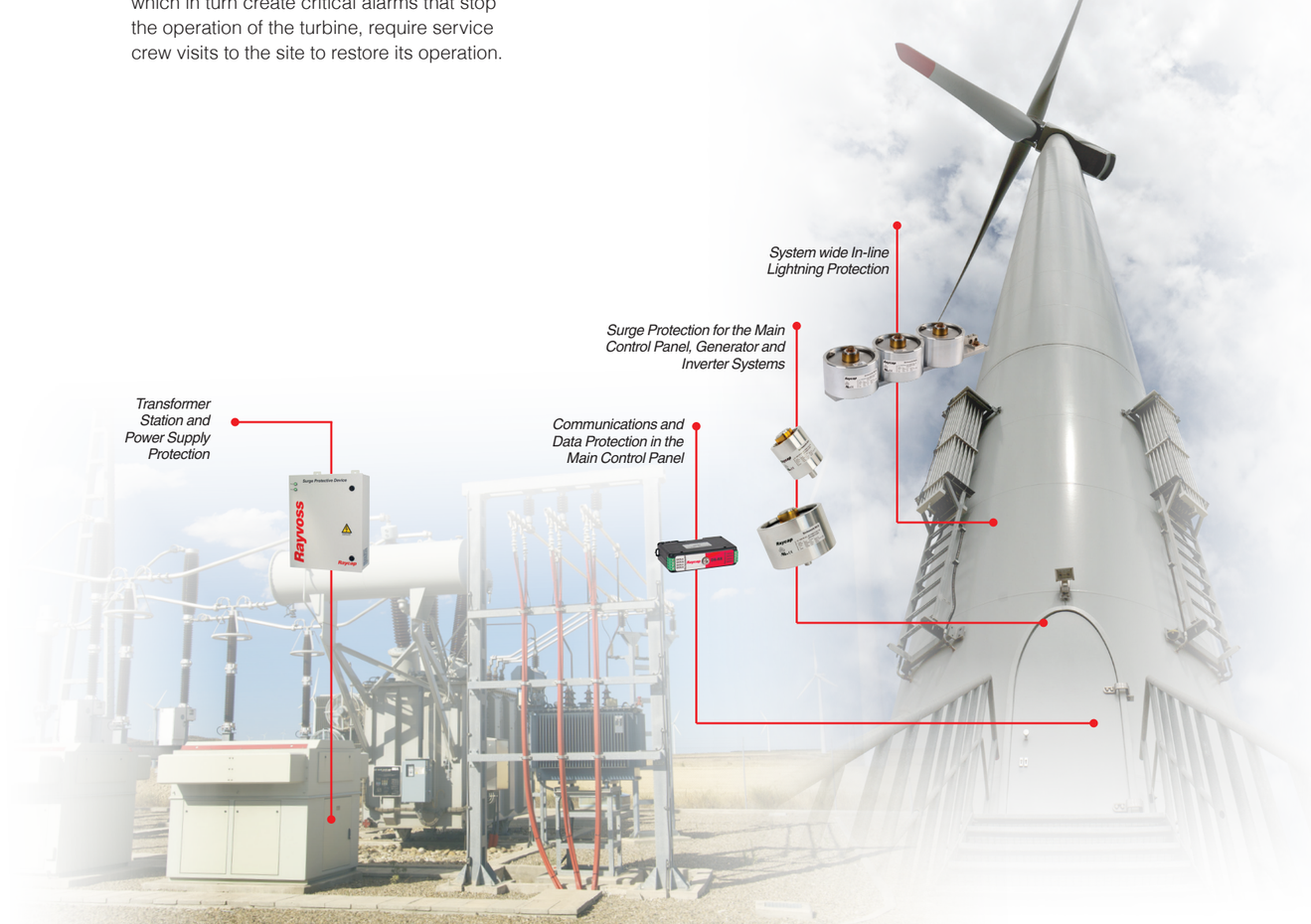
In the landscape surrounding a wind farm, wind turbines are typically the tallest structures. Given their height and exposure to the elements it's expected that they will experience extremely harsh weather conditions, including direct lightning strikes, multiple times during their operating life. Lightning surges produce an intense electromagnetic field that creates transient overvoltages which are passed throughout the electrical system of the turbine. These powerful surges propagate through the wind turbine's sensitive electrical equipment, causing severe and latent damage. Power components such as generators, transformers, and power converters; as well as control electronics, communication and SCADA systems are all at risk. These damages are not always immediately noticeable after a lightning event, they may occur at any time due to the cumulative effect of repetitive exposure to surges.

Replacement of the key power components in a wind turbine is expensive and in many cases lightning induced failures may not be covered by manufacturers' warranties. When a wind turbine is disabled, the costs of service teams, transportation and replacement components are all absorbed by the wind farm operator or the turbine manufacturer. Lead-time for replacement parts can be significant and access to wind farm sites offshore or in remote areas may be restricted for weeks due to weather conditions. All of this adds up to significant revenue losses caused by lightning.

For many years the only surge protection technology available to wind turbine manufacturers were conventional Metal Oxide Varistors (MOVs) in a DIN rail housing. Originally developed for residential and light industrial use, the application of these conventional surge protective devices (SPD) was not sufficient to protect critical wind turbine systems against damage caused by direct or indirect lightning currents. Even routine power and control system failures, which in turn create critical alarms that stop the operation of the turbine, require service crew visits to the site to restore its operation.

Solution

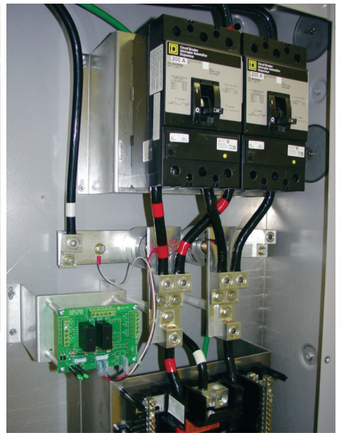
Reinforcing the surge protection systems inside modern wind turbines has become an imperative. Raycap's state-of-the-art product, Strikesorb® is a superior industrial grade surge protection technology engineered to provide high reliability and safe maintenance-free operation.

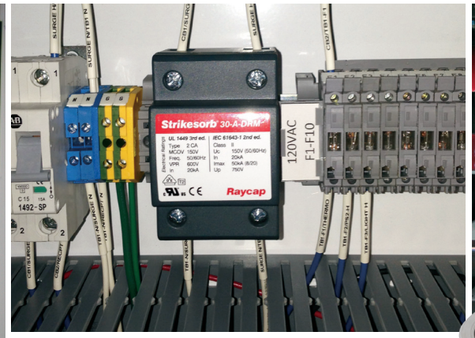


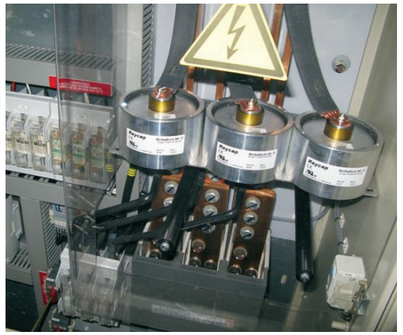
Raycap's Strikesorb modules are based on cutting-edge design parameters that eliminate common failures associated with conventional SPD technology. Strikesorb modules incorporate a more robust industrial grade MOV in a distinctive cylindrical aluminum housing. This design offers lifetime protection against surges as it resolves ageing issues that seriously impact the performance of traditional DIN rail mounted SPD technologies. Strikesorb SPDs can sustain multiple and successive lightning strikes and power surges without requiring maintenance. They are classified as Class I and Class II SPDs according to the international IEC 61643-11 standard for surge protection devices, and are fully compliant to the UL 1449 5th Edition Safety Standard. In addition to Strikesorb's ability to absorb and efficiently dissipate intense power surges, it has been tested for safe operation to high levels of short circuit currents. This, in combination with the fact that it does not rely on the use of internal fuses or thermal disconnects, provides great flexibility for installation.

Strikesorb modules can be combined in different configurations. They can be installed in front of sensitive electronic subsystems or power components (generator, transformer) to prevent damages that significantly impact the turbine operation. In space-limited applications where the use of an enclosure is not an option, Strikesorb modules can be integrated on the transformer LV taps, or inside the various electrical panels of the turbine.

Wind farm operators can also upgrade the lightning/surge protection levels of their turbines currently in operation. Upgrade kits can be custom designed to meet the specific requirements of a particular wind turbine and are easy to install during planned periods of maintenance.







Strikesorb®

Lightning Protection Solutions for Wind Turbine Applications

Field Experience

Strikesorb is a mature and field proven technology with hundreds of thousands of installations worldwide. Many of the world's largest manufacturers of wind turbines already turn to Strikesorb to protect the critical electrical systems inside their equipment. Strikesorb technology is also widely used in the protection of Remote Radio Heads and other electronics equipment at next generation wireless sites, inside of industrial plants, in the protection of defense systems such as radar, at airport facilities to protect air traffic control towers, on board ships, in oil and gas fields, and in many other applications worldwide.

Strikesorb Benefits

- Technology – Strikesorb features an innovative SPD design that ensures continuous protection and eliminates all the failure and safety risks related to conventional SPDs.
- Maintenance Free – Strikesorb's fuse-less operation, its unparalleled performance against power surges and its immunity to TOV conditions make it the most reliable SPD for protection of the entire installation, and eliminates the need for maintenance and replacement parts.
- High Surge Current Withstand Capability – Strikesorb incorporates a wide distribution grade MOV disk kept under pressure between large aluminum electrodes, enabling effective thermal dissipation and excellent management of the surge currents' negative effects. Strikesorb can actually withstand thousands of repetitive surge events without degradation.
- High Short-Circuit Current Rating – Strikesorb's inherent capacity to resist high short-circuit currents enables flexible integration into industrial systems and "in-line" installation in all common AC and DC applications without the need for a dedicated fuse.
- Best overall protection for the installation – Strikesorb's capability to be installed "in-line" even in the case of very high short-circuit currents, eliminates the need for long cable lengths, results in the lowest possible let-through voltage and ensures optimum protection levels. The sensitive equipment remains continuously protected in the most efficient way possible.
- Safest SPD – Strikesorb's aluminum casing and internal components manage the heat generated within the device when multiple lightning surges or faulty operating conditions occur. Its design eliminates the use of any materials which could burn or smoke.
- International Standards Certified Compliance – Strikesorb modules have been tested and approved by internationally accredited independent laboratories to the latest IEC and UL safety and performance standards.
- Long Lifespan and Warranty – Strikesorb's expected lifetime is much more than 20 years; it is supplied with a 10 year limited lifetime warranty.

Strikesorb Modules

Strikesorb Electrical Specifications*																									
Strikesorb Modules		**40-V1**	**40-A**	**40-B**	**40-C**	**40-D**	**40-E**	**40-F**	**40-G**	**80-A**	**80-B**	**80-C**	**80-D**	**80-E**	**80-F**	**30-V1**	**30-A**	**30-B**	**30-C**	**30-D**	**30-V1 DRM**	**30-A DRM**	**30-B DRM**	**30-C DRM**	**30-D DRM**
Surge Protective Device (SPD) Type	per UL 1449 5th Edition	Type 2 Component Assembly								Type 2 Component Assembly						Type 2 Component Assembly					Type 2 Component Assembly				
	Class per IEC 61643-11	Class I	Class I	Class I	Class I	Class I	Class I	Class I	Class I	Class I	Class I	Class I	Class I	Class I	Class I	Class II	Class I+II	Class I+II	Class I+II	Class I+II	Class II	Class II	Class II	Class II	Class II
Nominal Operating AC Voltage [U_n]		60V	120V	240V	277V	480V**	480V	600V	1000V	120V	240V	277V	480V**	480V	600V	60V	120V	240V	277V	480V**	60V	120V	240V	277V	480V**
Maximum Continuous Operating AC Voltage [U_c]		75V	150V	300V	350V	550V***	600V	750V*	1200V	150V	300V	350V	550V***	600V	750V	75V	150V	275V	350V	550V***	75V	150V	275V	350V	550V***
Nominal Discharge Current [I_n] (8/20µs)	per UL 1449 5th Edition	20kA								20kA						20kA					20kA				
Maximum Surge Current Capacity [I_{max}] (8/20µs)	per NEMA LS-1	140kA								200kA						60kA					60kA				
Impulse Discharge Current [I_{imp}] (10/350µs)	per IEC 61643-11	12.5kA								25kA							5kA	7.5kA	7.5kA	7.5kA					
Voltage Protection Rating (VPR)	per UL 1449 5th Edition	400V	600V	1200V	1200V	1500V	2000V	2500V	4000V	600V	900V	1200V	1200V	1800V	2000V	600V	700V	1200V	1500V	1800V	330V	600V	1000V	1500V	1800V
Voltage Protection Level [U_p]	per IEC 61643-11	300V	600V	1200V	1300V	1800V	2300V	2800V	4400V	600V	1000V	1200V	1600V	1900V	2400V	400V	700V	1200V	1600V	2200V	500V	750V	1300V	1700V	2300V

** 690 V per IEC 61643-11*
*** 400 V per IEC 61643-11*
**** 480 V per IEC 61643-11*

Information in this chart is subject to change at any time without notice.

For additional information on Strikesorb protection technology visit us at: www.raycap.com

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