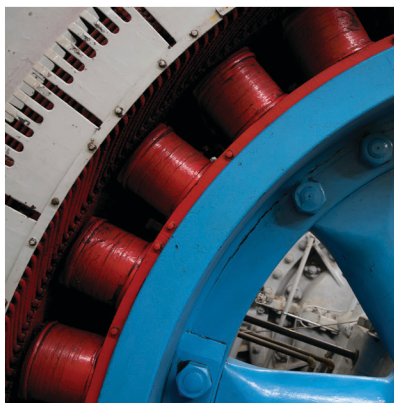
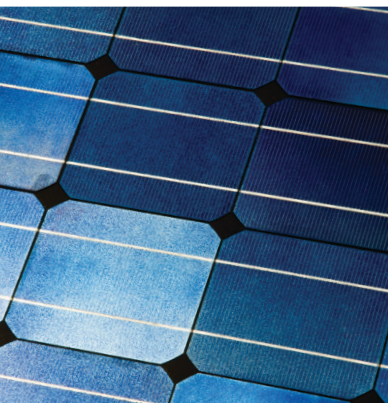
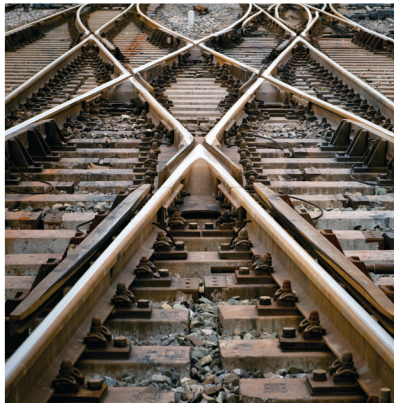




## Industrial Surge Protection Solutions



## About Raycap



Raycap is a privately-held technology solutions provider offering products and services that support and protect the world's critical telecommunications, energy, transportation and other infrastructure.

Since 1987 Raycap has built a worldwide organization with offices and production facilities throughout Europe and in North America. The company combines advanced engineering, superior product design, systems integration and manufacturing capability with a deep understanding of the needs of the customer to create unique technological solutions for mission-critical applications. It also offers engineering services such as custom product design and site surveys, as well as warehousing, logistics, customer training, and much more.

The company's comprehensive understanding of customer needs and the industries in which they operate is crucial to

its ability to develop effective products and solutions that integrate the latest technology with the highest quality of service.

The Raycap team of talented, highly experienced staff works together with customers to find the best-fit solutions. As a result, more than half of the products delivered are custom-built for unique customer applications and to their specifications. From rigorous internal and independent testing to a consultative customer-focused approach, Raycap is determined to deliver the highest quality products with responsiveness, innovation and agility.



# Value Proposition

## Experts in State of the Art Electrical Protection Solutions

With hundreds of thousands of installations worldwide, Raycap has extensive experience supplying custom solutions for some of the world's largest companies.

## Dedication to the Customer

The company's philosophy is to reach a deep understanding of its customers needs and requirements in order to create unique solutions that help minimize operational expenses, optimally adjust capital expenditures and maximize the return on investment.

## Constant Product Innovation

Listening to insights from professionals operating the world's largest networks and taking into account the most recent technical standards, Raycap consistently improves, innovates and adapts to its customers feedback, making sure that its solutions are a league ahead of its competitors.

## Focus on Quality

To support its demanding global customer base, the company operates the most up-to-date quality management systems. All of its production facilities are certified to ISO 9001-2008, (EN 29000) and ISO 14001 standards. All products are tested according to the most rigorous standards and are fully traceable, ensuring a complete vision throughout the product life-cycle and the best possible customer support.

## Unparalleled Operational Flexibility

Within extremely short time frames, Raycap is uniquely positioned to design, manufacture and deliver fully customized solutions that meet the specific needs of its customers. Operations personnel are cross-trained at each location and the company is capable of working around the clock to design, prototype, develop and manufacture quick product turnarounds.



# Strikesorb Surge Protection Technology



Strikesorb 80  
Strikesorb 35  
Strikesorb 40  
Strikesorb 30

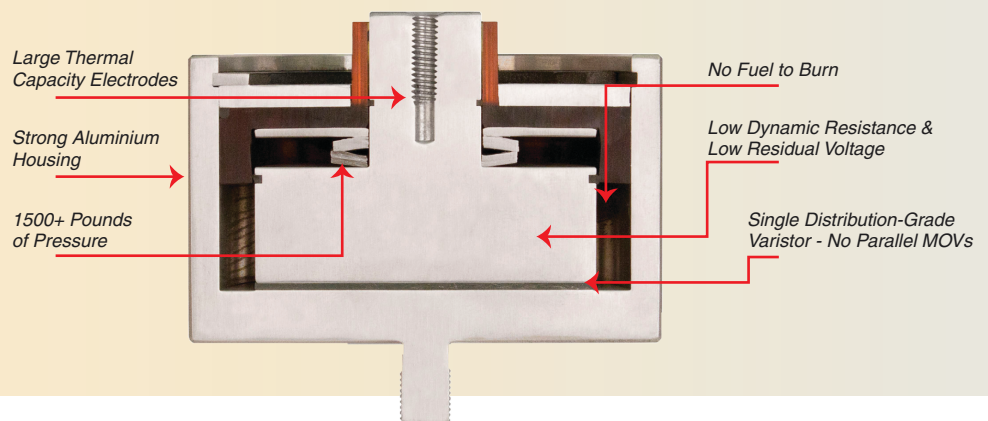
Raycap has led the way in finding creative protection solutions that ensure its customers vital equipment does not experience downtime due to lightning or other power surge events. The company has made significant R&D and operational investments to develop and validate its unique Strikesorb SPDs to meet global safety standards.

The innovative Strikesorb technology is uniquely equipped to safeguard against lightning surges, and has been engineered and tested for use in AC and DC power applications. Strikesorb modules are compliant to IEC 61643-11 and the UL 1449 4<sup>th</sup> Edition Safety Standards. Strikesorb 35 is a Type 1 SPD, per the EN 50539-11 IEC standard for surge protection devices, and a Type 2 component assembly SPD per UL 1449 4<sup>th</sup> Edition. It is specifically designed for DC operations. Where ever deployed, Strikesorb will significantly improve the availability of the equipment it protects.

## Strikesorb Benefits

- **Patented 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.

*Strikesorb's unique design features a distribution grade metal oxide varistor (MOV) that can handle much larger surges without effecting performance.*



## Strikesorb Assemblies

- **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 assemblies enable original equipment manufacturers (OEMs) to effectively integrate a variety of systems such as motor control equipment, variable frequency drives (VFDs), and other industrial systems. These Strikesorb assemblies can be custom designed to fit into virtually any sized cabinets or configured as additions to existing equipment in the field.



3 Phase flat busbar configuration with Strikesorb 80 surge protection modules deployed for an in-line installation.



Dual Strikesorb 40 surge protection modules.

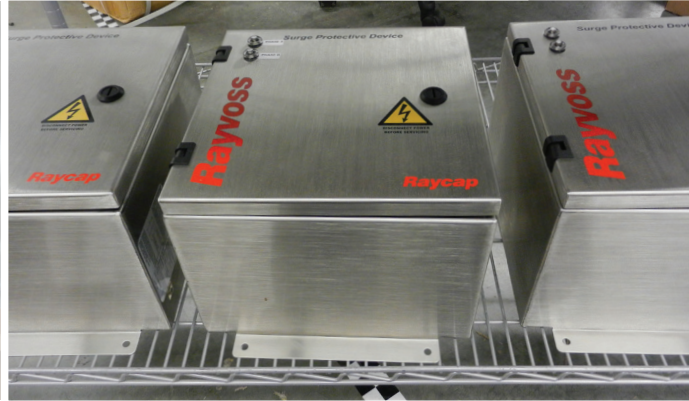


## Rayvoss Protection

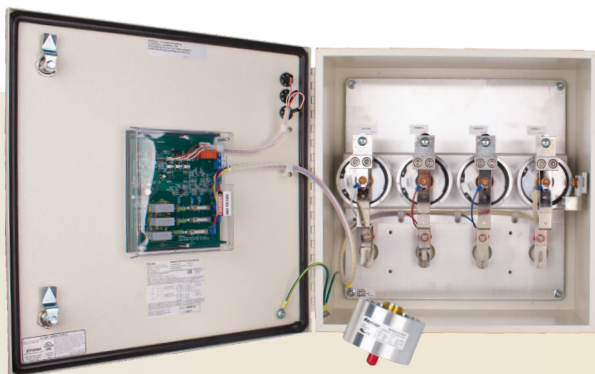
With Strikesorb 40 or Strikesorb 80 surge protection at their core, Rayvoss® industrial solutions offer unsurpassed electrical protection that meets the requirements of telecommunications, power generation, defense, transportation and other mission-critical applications. Rayvoss systems can be customized with a variety of operating voltages, configurations and cabinets, conforming to industry standards and certifications.



Rayvoss Family of Products



*Rayvoss units are custom configured to suit any application and protect a broad range of operating voltages for single or multiple phase distribution types. They are available in a variety of enclosure sizes with optional stainless steel and various monitoring features.*



*Metal enclosure with 4 Strikesorb 80s.*



*Raycap offers Rayvoss in a non-corrosive, stainless steel, IP67 rated cabinet for use in harsh weather conditions.*

# SafeTec Surge Protection Technology



SafeTec delivers a reliable solution for all overvoltages, surges and transients. The all in one technology is suitable for all DC and AC applications. The patented SafeTec technology is an open circuit mode in combination with current limiting technology. This current limiting control prevents permanent disconnection during adverse temporary overvoltage (TOV) conditions.

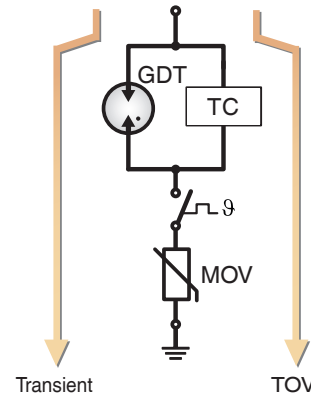


SafeTec T2-300-1+0-R



SafeTec T2-300-2+0-R

SafeTec T2-300-3+0-R



Transient	Short duration
TOV	Long duration
TC	Thermal control function
GDT	Gas discharge tube
MOV	Metal-oxide varistor
9	Thermal disconnect

Two possible types of overvoltages may appear in the power supply network:

*Transient overvoltages – switching operations, direct and indirect atmospheric discharges*

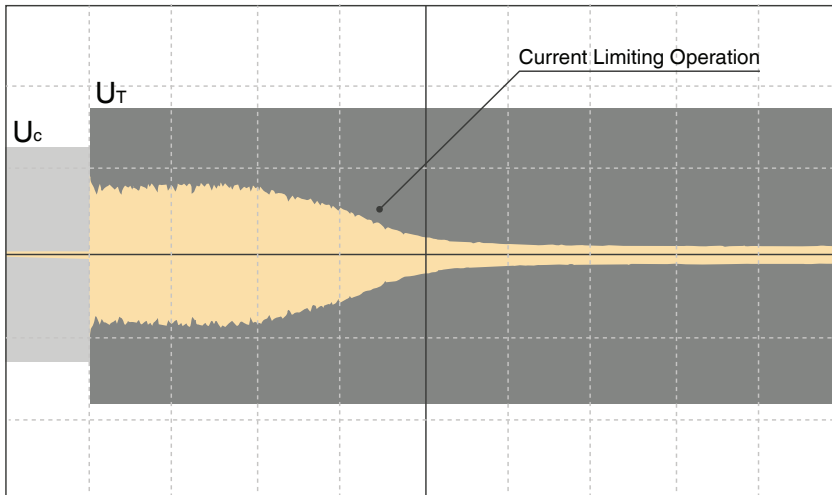
*Temporary overvoltages (TOVs) – last between 5 seconds and up to a few weeks, voltage amplitude can reach 173%  $U_{REF}$*

$$U_{REF} = U_0 \times 1,1$$

$U_0$ ... Nominal Line Voltage

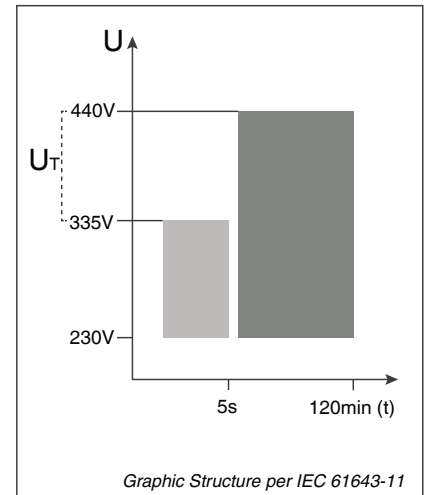
## SafeTec Technology

- Good protection level
- Industry standard DIN rail technology for situations where TOVs or switching transients are present on a distribution network
- Open circuit mode in combination with patented current limiting technology offers great immunity to TOVs
- 5-year warranty, 10-year life span
- Low-maintenance cost
- Modular, pluggable, field replaceable modules



Temporary Overvoltages (TOV)

- Maximum Countinuous Operating Voltage
- Temporary Overvoltage (TOV)
- Current Through SPD



Graphic Structure per IEC 61643-11

- SafeTec TC Technology
- Conventional Technology

Driven by the need for higher reliability, system cost reductions and market needs, SafeTec technology addresses significant performance improvements in a new industrial design. The patented SafeTec technology serves as a current limiter in the event of unexpected faults in power supply networks and ensures that the maximum

current through the MOV in the initial state of conductivity is a few ampere. The current balance is quickly established at a level of about 10mA. The unique SafeTec technology ensures that the current does not exceed the MOVs energy handling capability, and prevents unwanted SPD disconnection from the power supply.



## ProTec DIN Rail SPD Series

ProTec industrial SPD solutions offer very good electrical protection using a variety of surge protection technologies including metal oxide varistor (MOV) and gas discharge tubes (GDT). With a wide variety of operating voltages and technology available, ProTec's sleek industrial design, physical characteristics and innovative technology offerings bring a flexibility to the market, creating ideal solutions to meet the electrical protection needs of a diverse customer base. The ProTec product line can be deployed in any industrial setting.



ProTec T1-300-1+0-R

### DIN Rail Features

- Contemporary design
- Low residual protection level
- Lifetime indicators
- Redesigned thermal disconnection
- Patented protection technologies
- No external back-up fuse required up to 315A
- Vibration and shock withstand capability
- Space-saving design
- Easy replacement
- Patented module locking mechanism
- Meets IEC/EN and UL 1449 4<sup>th</sup> Edition



ProTec T2-300-2+0-R



ProTec T2-300-3+0-R



ProTec T2-300-3+1-R



ProTec T1HS-300-3+0

## ProGRID Surge Counters and Monitors

Surge currents can cause loss of data transmission, switch tripping, disturbance of machine control systems and a slow but noticeable degradation of circuit elements. In addition, a surge can be an indicator of a short circuit which causes currents of power to travel along unintended paths with little or no electrical impedance, for example after a blackout or wiring insulation damage. Raycap's ProGRID surge and lightning counter solutions have different capabilities that can sense, record and transmit the occurrence of otherwise undetectable surge currents, enabling users to take preventive measures and plan appropriate maintenance.



ProALARM Monitor



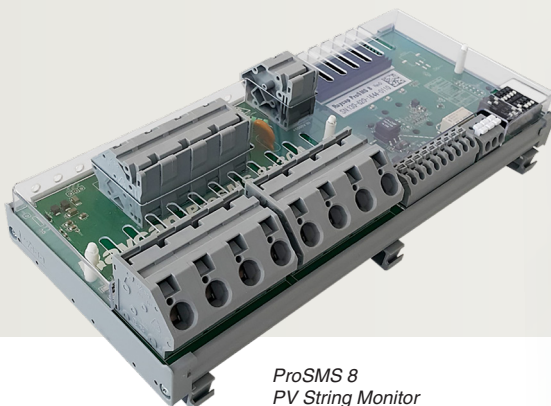
ProSLS Monitor



ProSEC II+ Counter



ProLEC Basic Counter



ProSMS 8  
PV String Monitor

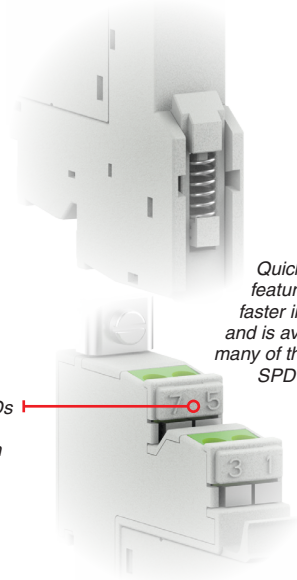


ProSCT  
Component Tester

# RayDat Protection



RayDat surge protection for data and signal line systems provide unsurpassed electrical protection for signal power applications. These products meet the diverse requirements of industrial and other signal protection applications. RayDat products are available in a variety of operating voltages and configurations that conform to the latest industry standards and certifications.



*Quick Connect feature enables faster installation and is available on many of the RayDat SPD solutions.*

*RayDat SPDs feature line identification marking.*

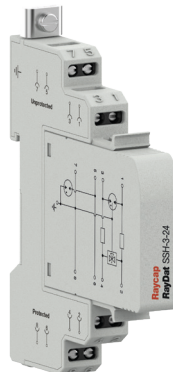
*Raycap's anti-vibration mechanism ensures the pluggable surge protection modules remain locked onto their bases despite severe shock or vibration conditions.*



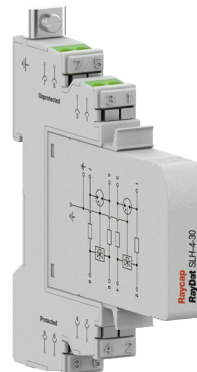
RayDat NET 6 POE



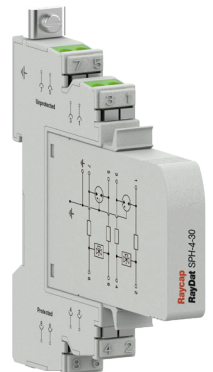
RayDat SBH-3-5



RayDat SSH-3-24



RayDat SLH-4-30



RayDat SPH-4-30



## R & D Capabilities

Successful custom engineering solutions require three ingredients: Expertise, the proper testing facilities and access to the best prototype equipment available. Raycap has all three. Experience has shown that each application has different requirements, and thus more than 75% of all Raycap design projects have been developed as custom solutions. Raycap's global design team is responsive to requests no matter the complexity of the problem or geographical region.

### Customized Protection Solutions

From its Strikesorb, to SafeTec, ProTec and RayDat product lines, Raycap has the ideal solution for protecting even the most unique industrial applications from lightning and other transient voltage surges that can damage critical operational functions.

## Manufacturing Capabilities

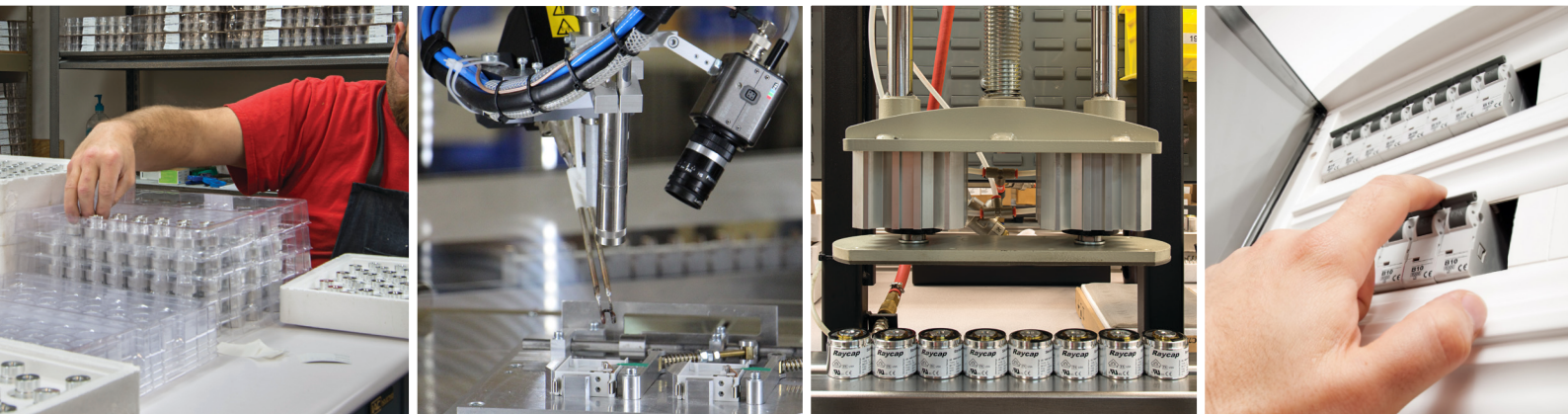
Raycap has created a global manufacturing organization that is capable of meeting the most demanding requirements of the most discerning customers.

The company has a well-developed ISO quality system and disaster recovery strategies that focus on uninterrupted global supply. Not only can Raycap handle large customer volumes and roll-outs, but it specializes in custom manufacturing.

In order to best serve its customers, the company has invested in modern manufacturing processes and facilities located in:

- Munich, Germany
- Post Falls, Idaho, USA
- Drama, Greece
- Ljubljana, Slovenia
- Nicosia, Cyprus
- Bucharest, Romania
- Suzhou, China

Raycap's products are certified by global standards bodies and the company's testing facilities include IEC and VDE certified R & D labs in Europe, and a UL certified test lab in the United States.



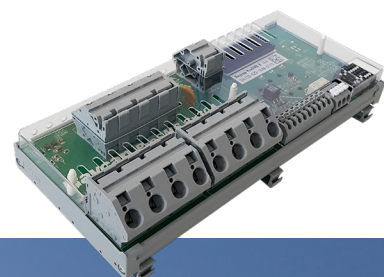
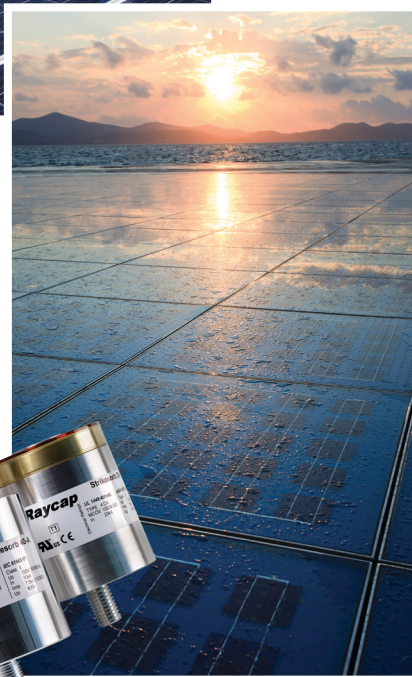


Photovoltaic Farm



Inverter and Power Transformer Building

Offshore Solar  
Alternative Energy  
Source



## Applications for Industry



### Solar Energy

Many solar power plants are built in remote areas and are vulnerable to violent lightning strikes. To ensure long-term system reliability, surge protection must be placed on both the AC and the DC side of the solar power plant to protect from lightning strikes and grid-side surges.

*Solar power plants and photovoltaic systems benefit from the unique, high-performance capacity of Raycap's lightning protection solutions. The high reliability found in Raycap products really counts in remote operations.*



## Wind Energy

Lightning damage is a very real threat to the wind farm operator. Wind turbine manufacturers integrate Raycap's surge protection and monitoring products into various locations of the wind turbine. From the wind turbine generator to the sensitive communications and monitoring equipment located inside, all systems must be protected from and monitored for powerful lightning surges.



Wind Turbines



Wind Power Transformer Station



**Wind turbines are especially susceptible to damage from lightning strikes. When compared to costly repairs and unnecessary downtime caused by lightning strikes, the relatively low cost of Raycap solutions far outweighs the alternative.**



*Air Traffic Control Tower*



*Cargo Containers  
Aboard Transport  
Ship*



*Oil Tanker*



## Transportation

Raycap surge protection solutions are designed for specific use in transportation applications. They successfully protect railway passengers from electrocution on European railways; are the product of choice by the US Federal Aviation Administration (FAA) to successfully protect air traffic control tower equipment at US airports; and are installed by the US Navy and commercial maritime companies to safeguard sensitive shipboard marine electronics.



*Raycap's electrical protection solutions are a complement to transportation applications. The robust nature of the products ensures they will stand up to any harsh environmental conditions, and their high reliability means they will continue to protect mission-critical systems for the long run.*

Telecommunications Tower



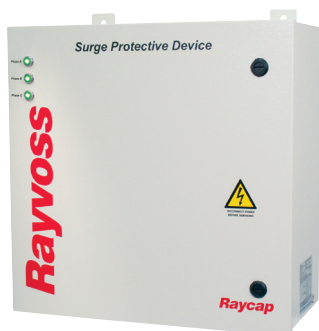
Datacenter Server Room



Emergency Services Deployed

## Telecommunications, Emergency Networks & Data Centers

The mandatory upgrading of many emergency networks, and the advent of 3G, 4G and LTE technologies has made it necessary to move radio equipment to the tops of cell towers, exposing it to the elements and in particular, lightning. Raycap is the world leader in providing both AC and DC power protection and connectivity solutions for FTTA (fiber to the antenna) PTTA (power to the antenna) and hybrid RRH (remote radio head) architectures. Raycap solutions are also ideal for data center electrical protection.



**Raycap's extensive experience in providing lightning protection and connectivity solutions for telecommunication companies offers customers peace of mind and a partner they can trust to help safeguard their network equipment.**

Sewage Water Treatment



Water Pumping Station



Water Lift Station



## Water & Wastewater Treatment Facilities

Water and wastewater treatment systems are heavily dependent upon a series of pumps and variable frequency drives (VFDs) which can be extremely susceptible to damage from electrical surges.

In these applications surge protection is integrated directly into the equipment by the original equipment manufacturer to protect the VFDs.



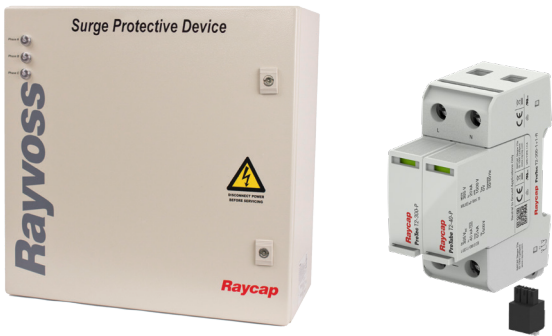
**Deploying Raycap SPDs at critical points inside water and wastewater treatment plants protects mission-critical equipment from damaging electrical surges and ensures the reliability of the public water supply and water treatment plants.**



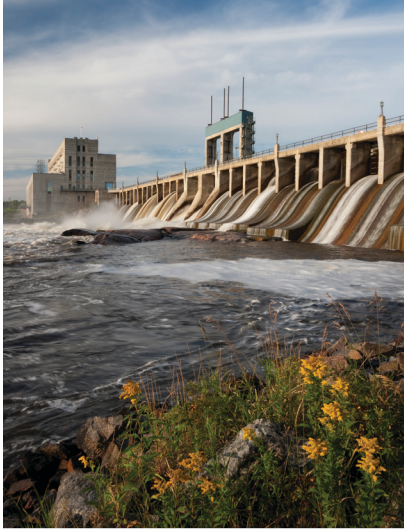
## Hydroelectric Power Plants

Hydroelectric energy facilities are supported by a variety of sensitive electrical systems that control everything from intake valves to fish passage and protection.

Surge protective devices are used to protect the equipment inside the facility from power surges and inconsistencies.



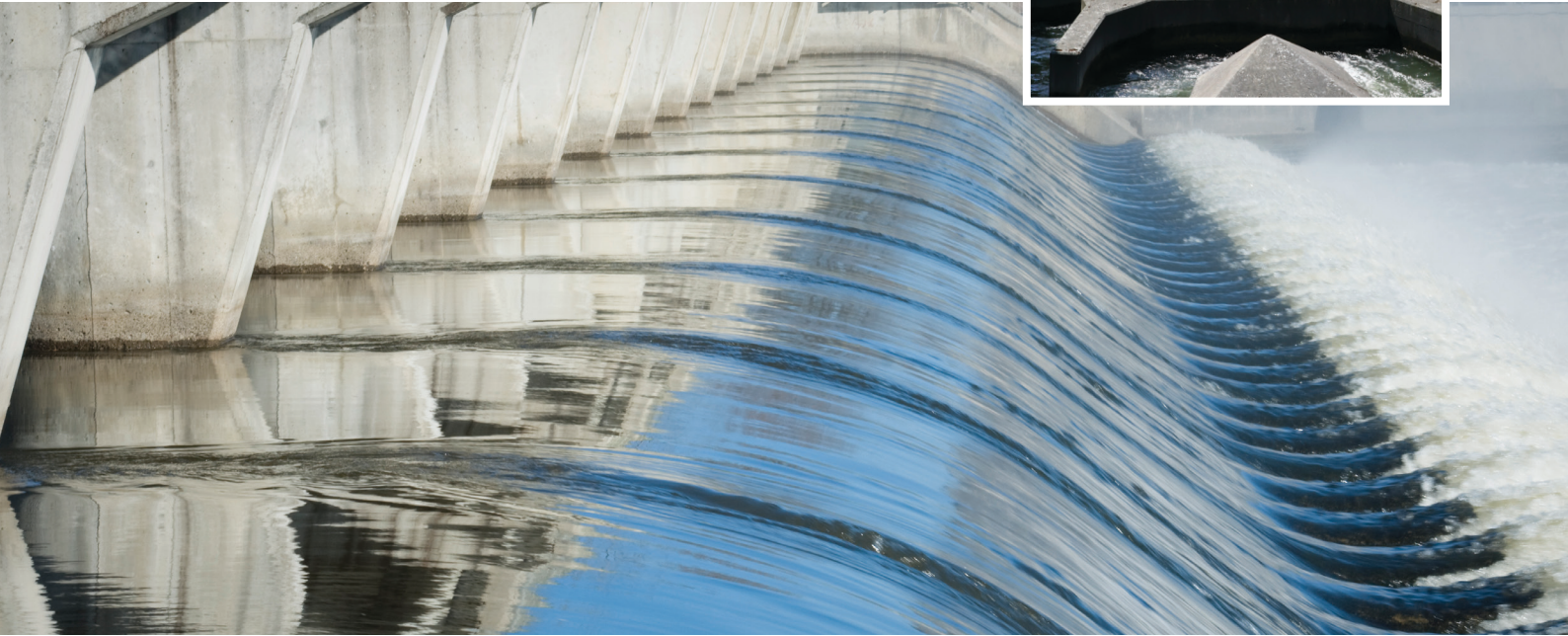
Hydro Electric Power  
Generating Station



Hydro Electric Power  
Turbine Generators



Automated Fish  
Ladders and Locks



**Raycap's surge protection solutions are used inside hydroelectric power plants to help protect the sensitive equipment inside from damage caused by electrical surges.**



*Dock side Coal Conveyor*



*Bucket Ladder Excavator for Open-Pit Mining*



*Coal Conveyor*



***At surface mining facilities Raycap's protective devices are used to protect the automated mining equipment from lightning strikes, power surges and fluctuations.***



## Mining Facilities

When a mining operation goes offline the resulting downtime and repair costs can be extremely high. It is important for mine operators to install surge protective devices to ensure continuous and maintenance-free equipment operations above and below the surface.



*Top Drive System (TDS)  
on Oil Drilling Rig*



## Oil & Gas Applications

The process of extracting and the modes of transporting crude, shale oil and natural gas must be protected from dangerous power and lightning surges.

In these applications Rayvoss SPDs, Strikesorb assemblies and other SPD solutions are used to protect and monitor the various electrical systems inside and outside manufacturing facilities.



*Oil and Gas  
Processing Plant*



*Oil Well Casing Bundle*



**Raycap's surge protection solutions are deployed at oil and gas pumping, processing, and transfer stations to safeguard vulnerable equipment and protect the entire operation from damage caused by lightning strikes.**



## Power Distribution Networks

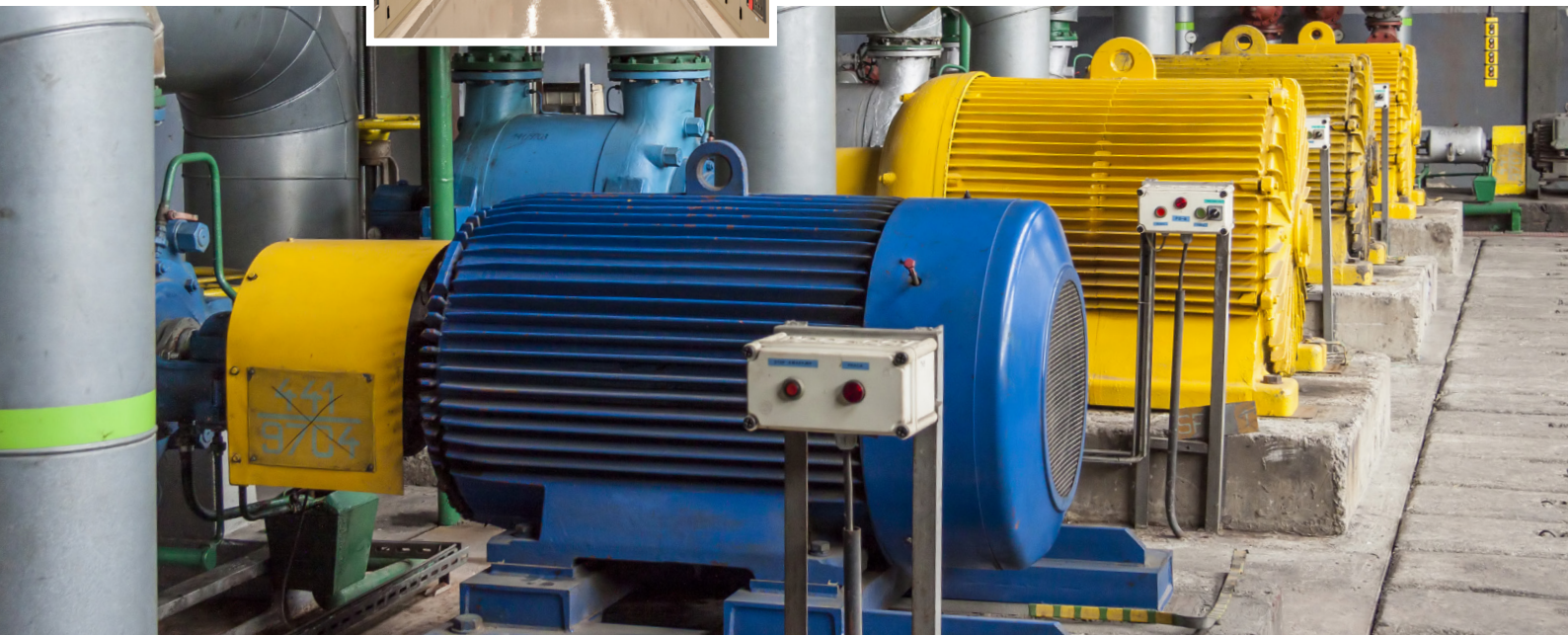
Power distribution grids are particularly susceptible to lightning surges, causing system outages and affecting the reliability of the power supply, resulting in enormous financial burden. The transfer of overvoltages to the low voltage side is mainly associated with a rise in potential at the transformer grounding caused by current flowing through the medium voltage surge arresters and creating an electromagnetic coupling between the medium-voltage and low-voltage transformer terminals. Installing surge protection significantly reduces the overvoltages to safe lower peak values which remain practically unaffected by transformer and/or load grounding resistances.



Electrical Power Transformers



Electrical Energy Substation Panel



**Raycap's electrical protection solutions can safeguard power distribution equipment and help prevent transformer failures, saving money and protecting the backbone of the power grid.**

## Industrial Automation & Robotics

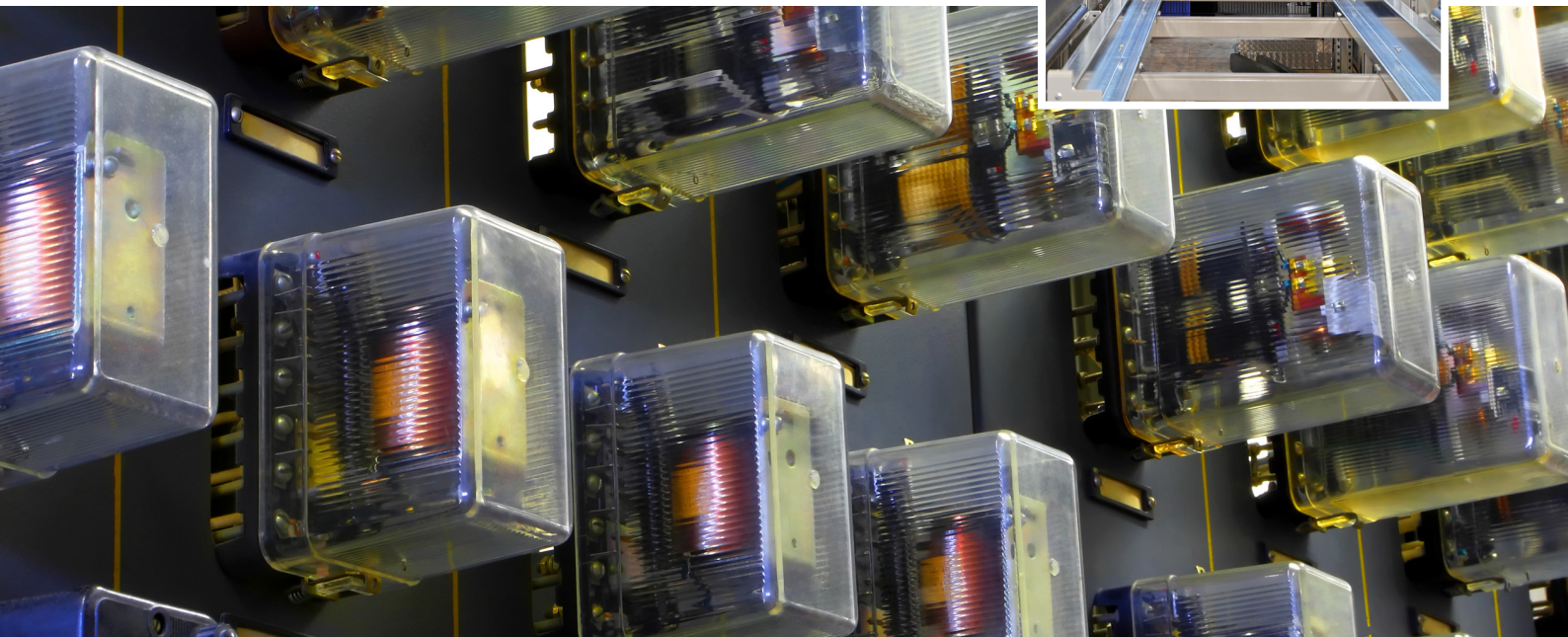
Raycap industrial surge protective devices provide protection for industrial buildings, commercial facilities and factories from damaging power surges and spikes. By installing highly reliable surge protection at the service entrance and electrical panels throughout the facility, the equipment will be protected from voltage spikes which can be caused by lighting and utility accidents. The equipment will also be protected against smaller, more frequent surges caused by the switching on and off of adjacent equipment such as motors, pumps, refrigeration equipment or other large equipment inside the facility. All of Raycap surge protection for industrial applications protects against energy impulses that cause equipment damage or malfunction, translating into expensive downtime, repair, and replacement costs.



Water Bottling Machine



Warehouse Automation



**Raycap's lightning and surge protection for industrial applications provides customers peace of mind and a partner they can trust to safeguard their mission-critical equipment for every aspect of the manufacturing process.**

# Raycap Worldwide Locations



**Raycap Inc.**  
806 South Clearwater Loop  
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**Raycap GmbH**  
Parkring 11  
85748 Garching Munich  
Germany

**Raycap S.A.**  
Telou & Petroutsou 14  
15124 Maroussi Athens  
Greece

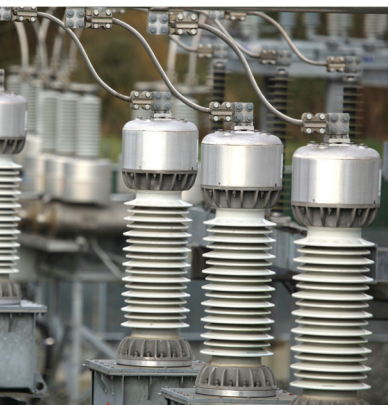
**Raycap S.A. Manufacturing**  
Industrial Area of Drama  
66100 Drama  
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# Raycap

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