Protection against electric arc hazards in power systems
Energizing a world that demands more.

Powering business worldwide
As a global power management company, we help customers worldwide manage the power needed for buildings, aircraft, trucks, cars, machinery and businesses.

Eaton’s innovative technologies help customers manage electrical, hydraulic and mechanical power more reliably, efficiently, safely and sustainably.

Discover today’s Eaton.

EATON Arc flash hazard analysis
We deliver:

- **Electrical solutions** that use less energy, improve power reliability and make the places we live and work safer and more comfortable.

- **Hydraulic and electrical solutions** that enable machines to deliver more productivity without wasting power.

- **Aerospace solutions** that make aircraft lighter, safer and less costly to operate, and help airports operate more efficiently.

- **Vehicle drivetrain and powertrain solutions** that deliver more power to cars, trucks and buses, while reducing fuel consumption and emissions.

We provide integrated solutions that help make energy, in all its forms, more practical and accessible.

With 2015 sales of $20.9 billion, Eaton has approximately 100,000 employees around the world and sells products in more than 175 countries.

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**Eaton’s electrical business**

**Eaton is a global leader with expertise in:**

- Power distribution and circuit protection
- Backup power protection
- Solutions for harsh and hazardous environments
- Lighting and security
- Structural solutions and wiring devices
- Control and automation
- Engineering services

Eaton is positioned through its global solutions to answer today’s most critical electrical power management challenges. With 100 years of electrical experience behind us, we’re energized by the challenge of powering up a world that demands twice as much energy as today. We’re anticipating needs, engineering products and creating solutions to energize our markets today and in the future.

We are dedicated to ensuring that reliable, efficient and safe power is available when it’s needed most.

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Arc flash
The threat is real

Compliance with European safety standards does not automatically prevent arc flash incidents. Despite intrinsically safe equipment designs and the preference for working on de-energized equipment, arc flash accidents continue to happen all across Europe.
An arc Flash is the result of an electric current that is passed through air when the insulation or isolation between energized conductors is no longer sufficient to withstand the applied voltage. The majority of arc flash events take place during or immediately after work on an electrical installation. An arc flash is often the result of human actions, such as a circuit breaker racking failure, misplacement of a test probe, or dropping a tool on live parts of the installation. Some work activities such as voltage testing, fault finding, and commissioning also take place in close proximity of energized conductors.

Arc flashes are often an unexpected event, due to the fact that human error is difficult to predict. They frequently result in the destruction of the equipment involved, fire, and injury to workers in the vicinity.

It is a common misconception that high voltage systems pose a greater arc flash hazard than low voltage systems. In reality, low voltage installations can have very high potential arc energy levels, and yet they are operated and worked on much more frequently.

An electric arc fault may be rare, but the damage caused and its effects are extremely serious.
Why do arc flashes pose a hazard?

Electrical arc flashes are associated with the release of a large amount of heat energy that causes the copper and steel inside the electrical equipment to melt and evaporate almost instantly. The result is a fiery explosion that has the capacity to produce extremely serious and fatal injuries. Professional analysis is required in order to quantify the potential risks and to properly protect workers against them.
Arc flash safety solutions

Common practice
Throughout the world, arc flashes threaten personnel safety, while companies face lost time, lawsuits, fines, equipment damage, facility downtime, and lost production.

Arc flash hazards impact all business areas, notably
- Safety
- Legal
- Financial
But there is a solution.

Regulations
European codes and standards do not specifically require a risk assessment for arc flash hazards, despite the fact that arc flashes are a recognized risk. Many electrical workers will have stories to tell about real accidents or near misses that they have seen or heard about. According to the EN 50110 Standard, which is applicable to the operation of electrical installations, work on these installations is divided into three categories: live working, dead working and working in the vicinity of live parts.

The Eaton approach
Eaton’s Arc Flash Analysis helps you deal with your arc flash hazard. The starting point of this analysis is to prevent dangerous situations. Through a comprehensive assessment of every part of your electrical network, we provide insights into the specific arc flash hazard at any location. In addition to quantifying the risks, we also address any concerns relating to short circuit capacity and selectivity. For any locations that have dangerously high arc flash incident energy, explore solutions that will significantly lower the probability of an arc flash event and limit workers’ exposure, for example through a new system design, equipment modifications, alternate protection settings or improved work methods.

Optimized settings for protection devices, the use of override switches, equipment modifications and remote switching are only some of the many methods used to effectively improve electrical safety. The costs of the solutions vary, but even higher cost solutions are small investments compared to the costs of dealing with the consequences of arc flash accidents.

A top-notch safety plan incorporates not only the recommendations of the arc flash hazard analysis but also practical training for the personnel who operate and maintain electrical equipment. Eaton’s trainers are the same electrical engineers who perform the arc flash assessment, and they often also work in the field. In addition, Eaton’s training program is based on the most up-to-date information, techniques, and procedures available to keep your personnel safe and your processes running.
A comprehensive arc flash hazard analysis

An arc flash hazard analysis is critical for ensuring that work on or near energized electrical equipment is safe. Based on extensive empirical testing and research, the analysis allows for an accurate assessment of the arc flash hazard by quantifying the amount of thermal energy that may be released by an electric arc. At the conclusion of the assessment Eaton will provide recommendations for both preventing and mitigating the hazard.
Eaton’s highly-qualified power systems engineers have performed many arc flash assessments in all types of industrial plants in across Europe. Every engineer has access to a variety of analysis tools to best address the safety risks of your unique system. With the use of proprietary software and models based on IEC and IEEE standards, we will create a complex model of your system, which includes fault current calculations and protective device coordination.

For each system node, multiple scenarios are run to evaluate protective device duties, devices clearing time, arcing fault currents, the likely duration of an arc and the resulting incident energy. Eaton’s engineers draw on their past experience, rigorous training and expertise to provide tailor-made recommendations, which are compiled in a written report upon completion of the assessment. Our engineers are available to present their findings and to conduct basic personnel training at the customer site.

A comprehensive arc flash hazard analysis includes the following services:

**A comprehensive arc flash hazard analysis includes the following services:**

• Creation or verification of one-line electrical drawings
• Arc flash system studies, which include:
  • Short circuit and protection coordination studies
  • Arc flash calculations and expert advice
• The Study report includes:
  • Input data
  • Short circuit analysis results
  • Time-current coordination curves (TCC)
  • Worst case incident energy
  • Arc flash boundaries
  • Safe working distances
  • Practical methods for reducing arc flash hazards
  • Personal protection equipment (PPE) - safe work practices

**Arc flash labeling and training**

Thanks to Eaton’s extensive experience in arc flash hazard analysis, we are able to provide the best solutions for protecting what you value most.

**Which standards apply?**

The arc flash calculations, as performed by Eaton, are based on the following standards:

• IEEE 1584
• NFPA 70E

Our arc flash hazard analyses comply with the following European standards:

• EN 50110
• IEC 61482
• IEC TR 61 641 (Low voltage)
• IEC 62271-200 (Medium voltage)
• IEC 60909

**Comprehensive arc flash solutions from the industry experts**

Eaton’s engineering solutions stress prevention, protection and preparation. Our products, engineering experience, and industry know-how allow us to create a comprehensive arc flash solution to meet your company’s needs. By offering a complete arc flash hazard analysis we help companies protect what they value most.

**Enhanced safety**

Improve your facility’s overall arc flash safety through training, labeling, analysis and products that reduce or eliminate exposure to dangerous situations. Meet or exceed the standards for electrical safety in the workplace.

**Operating cost efficiencies**

Reduce or eliminate unplanned downtime, equipment damage, fines, lawsuits, injuries and fatalities through improved safety practices.
Best products. Best services. Best solutions.

Eaton offers the industry’s widest range of arc flash related products and services. Our electrical services group is comprised of leading engineers who have the experience and expertise to help you understand the level of arc flash hazard in your facility and optimize your safety program accordingly.

Getting started

For further information about a comprehensive arc flash analysis please contact us. For more technical information (white papers, etc.) please check our website at www.eaton.eu/arcflash

IEEE Standard 1584

The arcing current of an arc flash behaves very differently from the bolted short-circuit current that can be calculated using traditional methods. The methods for performing arc flash calculations are contained in IEEE Standard 1584. This global standard takes a vast number of design factors into consideration and is based on many years of research and empirical laboratory testing of the arc flash phenomenon.
Eaton is dedicated to ensuring that reliable, efficient and safe power is available when it’s needed most. With unparalleled knowledge of electrical power management across industries, experts at Eaton deliver customized, integrated solutions to solve our customers’ most critical challenges.

Our focus is on delivering the right solution for the application. But, decision makers demand more than just innovative products. They turn to Eaton for an unwavering commitment to personal support that makes customer success a top priority. For more information, visit [www.eaton.eu](http://www.eaton.eu)

**Eaton’s electrical solutions & services**

The ESS portfolio and scope of work has expanded beyond the repair and maintenance of Eaton’s utility networks solution. It now includes complete turnkey power distribution projects, both for electricity suppliers and for large industrial conglomerates, and indeed any business with an electrical MV and LV distribution network.

**Range of ESS services**

- Equipment erection & installation – pre-commissioning, final system co-ordination commissioning
- Technical studies & reports; relay protection, earthing, power quality, partial discharge, design
- Maintenance of MV & LV systems networks, UPS & lighting systems products - capital equipment (all makes and models - non-destructive, non-intrusive predictive & conventional time-based)
- Equipment life extension - retro-fit equipment & accessories including vacuum breakers
- Local operational site control - ‘sap’s’ based on clients sites (sap-switching/safe systems/safety rules)
- Training for competency and authorisation of persons
- Power systems engineering & integration (protection, control & automation)
- Supply of transformers, erection & commissioning (cast resin, liquid and oil transformers 3.3 kV - 33 kV)
- Crisis response and disaster recovery - 24 hour call-out retainer contracts and emergency/supply failure

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