



Smarter safety

ANSI/UL low- and medium-voltage arc flash mitigation solutions for greater protection and productivity



- Maximum protection
- Maximum uptime
- Maximum peace of mind

The occurrence of an arc flash is a serious event within a power system. Its destructive impacts can lead to severe personnel injuries, costly equipment damage and long outages. ABB offers a wide range of solutions to prevent and mitigate the effects of arc flash events, thus enhancing safety, minimizing damage and reducing downtime.

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SMARTER SAFETY

There is a real business case for arc flash protection and mitigation. At ABB we are proud that our wide range of solutions goes beyond compliance with standards and regulations to bring you the best possible value.

Putting the protection of your people first is a smart choice.

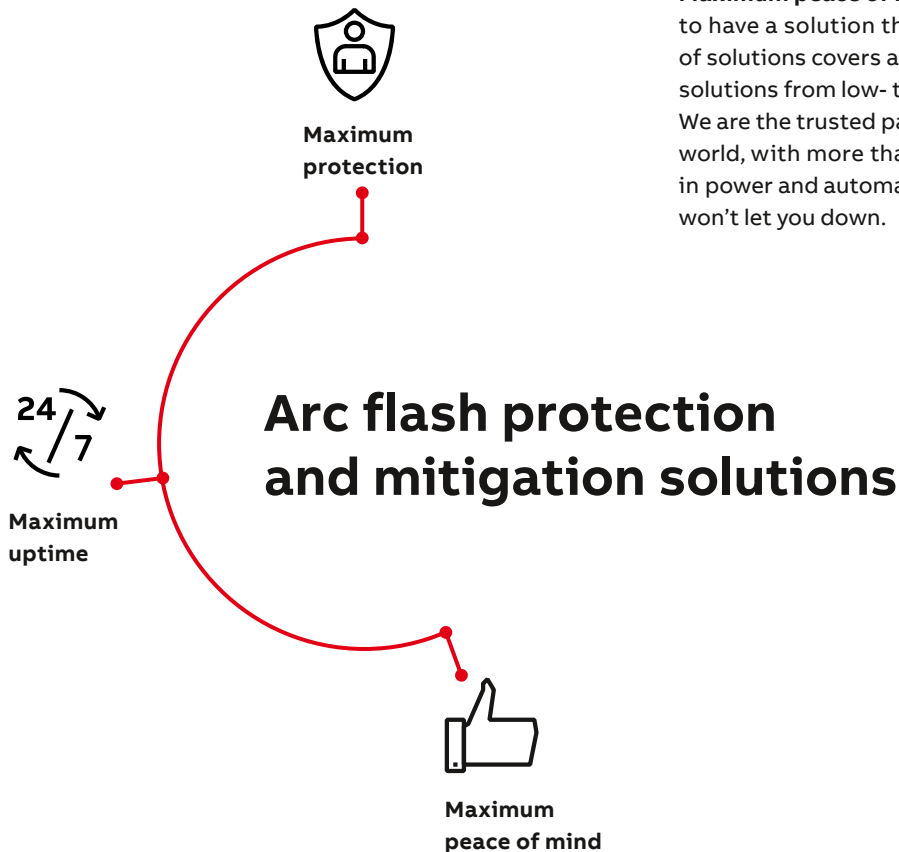
Because safety is not a cost, it is an investment.

Safety should be a priority for every business. Arc flash mitigation solutions are essential because they save lives. But that's not all. Taking the right precautions today can save you time and money in the future: protecting people and assets, reducing the cost of injuries and damage, limiting downtime and lowering maintenance costs. There is a real business case for arc flash protection and mitigation. At ABB we are proud that our wide range of solutions goes beyond compliance with standards and regulations to bring you the best possible value.

Maximum protection. Protect personnel with solutions ranging from passive protection to ultra-fast arc energy mitigation solutions. ABB's portfolio provides enhanced future-proof solutions exceeding the requirements of the current regulations. Innovative features such as remote condition monitoring lower risk by reducing the interaction of personnel and equipment.

Maximum uptime. ABB's arc flash mitigation solutions keep your business running, improving uptime by limiting the energy or impact of arc faults, therefore limiting the damage they cause to switchgear and assets and the repair time required. Predictive maintenance solutions ensure downtime is kept to a minimum and reduce the likelihood of unexpected failure during operation.

Maximum peace of mind. You can count on ABB to have a solution that's right for you – our range of solutions covers active, passive and preventive solutions from low- to medium-voltage applications. We are the trusted partner of businesses all over the world, with more than a hundred years' experience in power and automation. Our high quality solutions won't let you down.



What is an arc flash?

How can it be avoided?

Arc flash is one of the most dangerous and potentially deadly incidents that can occur in electrical installations, causing severe harm to the people and equipment involved. An arc flash is an electrical fault or short-circuit which passes through a physical air gap, or bridge, between two electrodes.

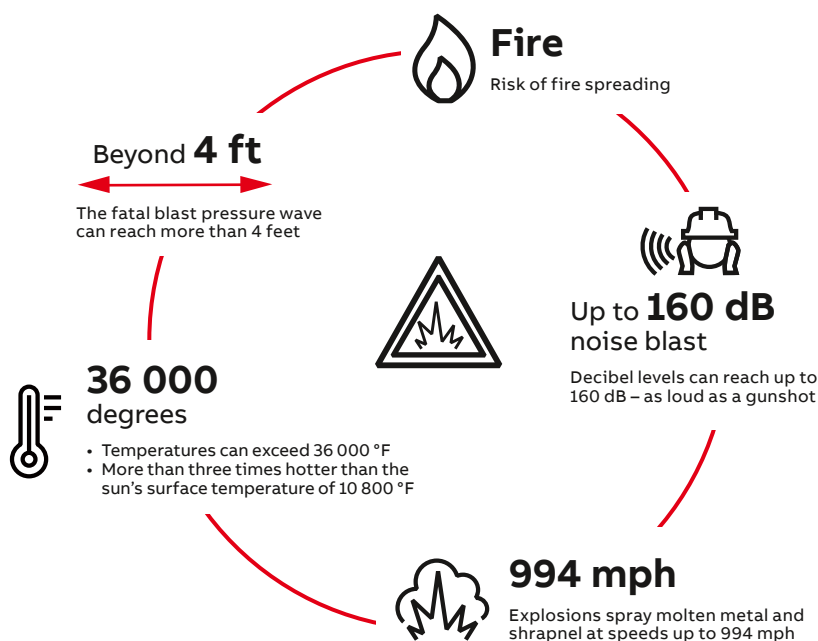
NFPA 70E, Standard for Electrical Safety in the Workplace, defines an arc flash hazard as: "A source of possible injury or damage to health associated with the release of energy caused by an electric arc".

Arc flash incidents can be caused by:

- Dust, impurities, corrosion, condensation, animal intrusion
- Dropping or left behind tools
- Failure of insulating materials
- Improper installation
- Loose bus or cable connections
- Lack of, or inappropriate maintenance
- Inappropriate operating conditions

Human impact

Arc flash dangers



Arc flash incidents are rare, but they have the highest mortality rate of any accidents in electrical installations. The IEEE 1584 guide for arc flash calculations addresses the thermal incident energy on an exposed person's chest and face. But the reality is that there are other sources of harm that are not quantified in the available standards. The inhalation of toxic gases, damage to hearing, injuries due to the ejection of materials and burns are all possible consequences.

Equipment damage

Arcing faults, which cause arc flash events, can also be destructive for switchgear and other assets, even buildings, as shown in images 01, 02 and 03. The explosion and resultant fires often cause great damage to equipment and facilities.

Reducing the effects of arc flash

Use of arc energy mitigation solutions can significantly reduce arc energy and the associated impacts. This improves safety and may drastically reduce the time required to repair the switchgear. You can see the difference that a fast active arc mitigation system makes in images 04 and 05 – the switchgear without arc protection is severely damaged compared to the switchgear with fast arcing fault detection and protection.

Scan the QR code to watch this comparison test in action.



Click here to watch online.

01



7

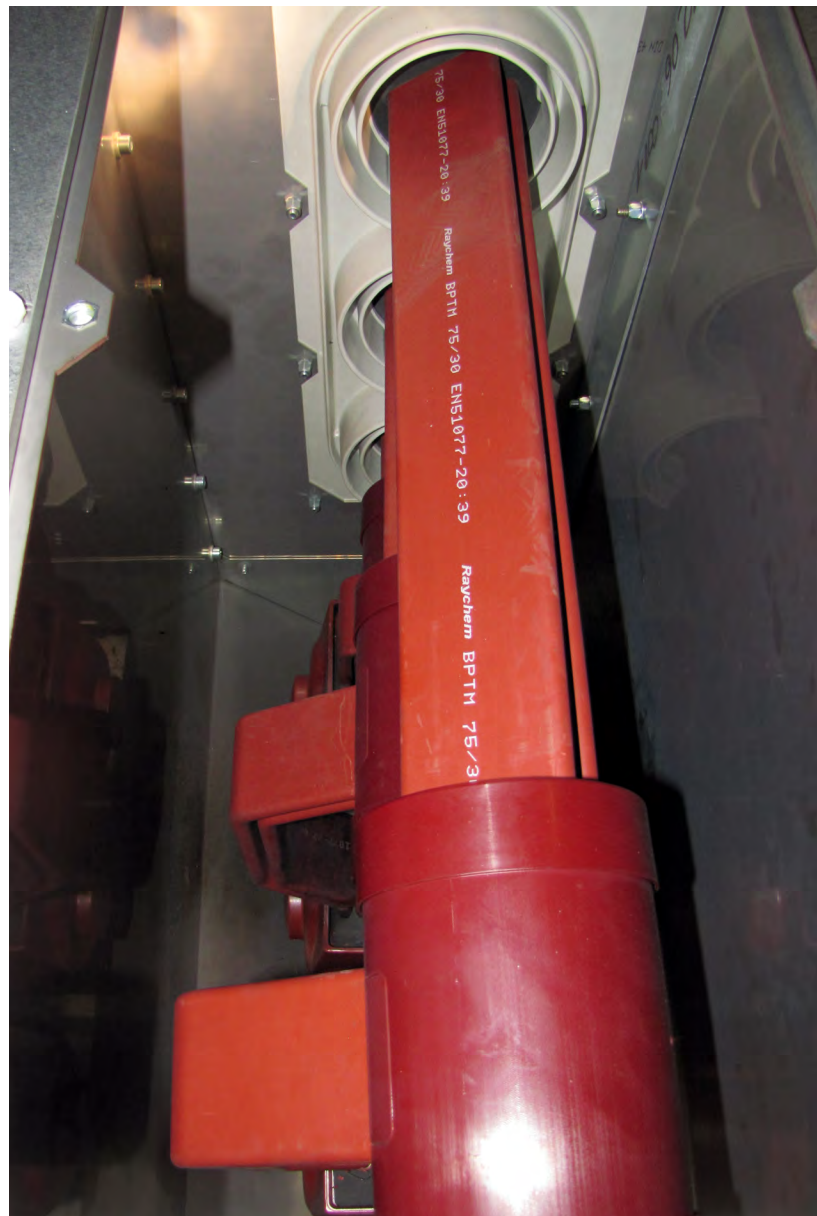
02



03



04



01 Switchgear damaged by an arc flash incident, without an arc flash mitigation system

02 Switchgear damaged by an arc flash incident, without an arc flash mitigation system

03 MV/LV substation damaged by an arc flash incident due to the absence of an arc flash mitigation system

04 Busbar compartment of medium-voltage switchgear after arc flash, without an arc flash mitigation system

05 Busbar compartment of medium-voltage switchgear after arc flash, with an ultra-fast arc flash mitigation system

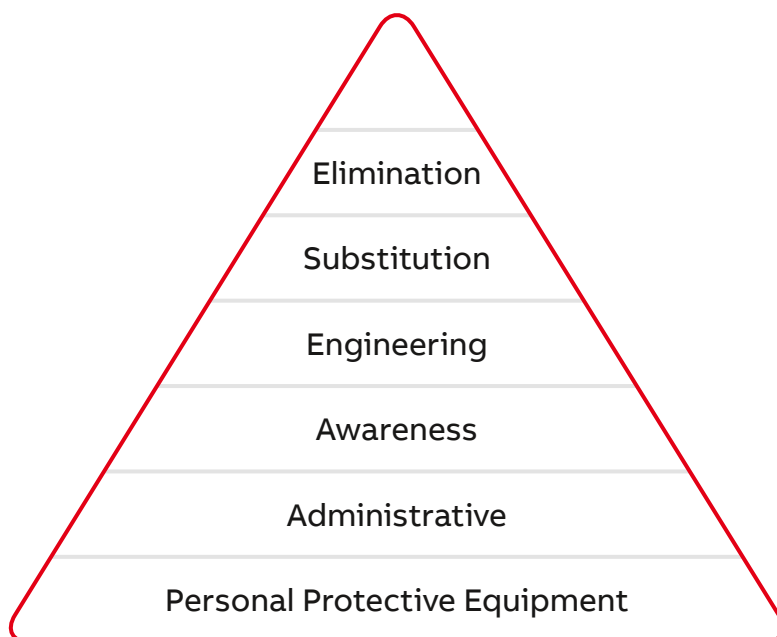
05

The ‘Hierarchy of Risk Controls’¹ and ‘Prevention through Design’²

A framework to improve safety in the workplace

Both concepts provide a framework within which to understand and categorize actions to improve safety in the workplace. The Hierarchy of Risk Controls, sometimes referred to as the hierarchy of hazard controls is described in many international industrial safety standards. For electrical safety in North America the main source is NFPA 70E, Electrical Safety in the Workplace, informative annex P, which in turn refers to ANSI/AHIA Z10 American National Standard for Occupational Health and Safety Management Systems.

NFPA 70E Hierarchy of Controls



Within the hierarchy, solutions to address hazards and their associated risks to workers are defined as:

Elimination: The permanent elimination of a hazard when designing or implementing a system. Or, in some discussions, the semi-permanent elimination of a risk through an administrative procedure such as properly executed lock-out and tag-out.

Substitution: The permanent elimination or reduction of a hazard and its associated risk by substituting a solution with no apparent risk or less risk. For example, implementing high resistant grounding (HRG) in a distribution system is a design choice that substitutes HRG in lieu of solid grounding. An HRG system is widely recognized to have lower probability of arcing faults, i.e. lower probability of arc flash events, however, it is not risk free.

Engineered controls: These are solutions that require some level of proper application and engineering within some operational context or application limits. They generally require some maintenance and periodic evaluation to ensure they accomplish the intended function reliably. They may be further divided into active or passive engineered solutions. Active engineered solutions may require sensing systems and operation of a protective mechanism to favorably impact the risk or severity associated with a hazard. For example, overcurrent protection is generally considered an active engineered control. Passive engineered controls tend to be risk controls that are static and always operational if well maintained and applied within appropriate ratings, which may require periodic evaluation due to system changes.

Awareness: Sometimes this is combined with the following category referred to as administrative controls. Awareness is the aspect of risk control involving education, warning signs and other

¹ NFPA 70E

² National Institute of Safety and Health

aspects of communications and related human behavior modifications to keep workers aware of hazards and associated risks. Good signage and training are important parts of this category of risk controls. Good design practices, known as Prevention through Design (PtD), can assist to implement effective awareness by minimizing the sources of energy within any one panel, minimizing the usage of unusual schemes that may surprise the unwary worker, use of modern HMI, electronics and communication capabilities and tools. Anything that allows workers to better understand hazards or stay away from hazards may be of value.

Administrative procedures: These are the actions workers must take or follow to ensure that they are properly controlling and minimizing risk to themselves and others. This includes following proper work planning and task execution procedures. Using grounding devices, proper lock-out and tag-out, use of maintenance switches, etc. Good site supervision, task planning and risk analysis is essential to optimal implementation of administrative procedures. During system design (PtD) execution of administrative procedures can be facilitated by installing tools such as ERMS devices, permanently mounted absence of voltage indicators, viewing windows, voltage monitoring points and other things to make it easier for workers to implement safer work practices.

Personal Protective Equipment (PPE): Considered the last line of defense. This is the clothing and equipment that workers should use to minimize risk of injury should an electrical accident happen. Electrical PPE is aimed at reducing the possibility of shock and reducing the impact of incident arc flash energy. PPE is the final way to reduce residual risk after all other measures have been implemented. During the design stage it is important to understand that PPE has a large human behavior component. Relying on high level PPE means the worker must

accept discomfort and potentially sacrifice dexterity when executing a task with proper PPE. That can lead to workers taking short cuts. Good PtD practice would indicate that the design of the system should be such that the need for high arc rated PPE should be avoided as much as possible to reduce the level of residual risk to as low as possible.

In discussions about the hierarchy of Health and Safety controls the first three controls are sometimes referred to as higher order controls as they are permanent and/or automatic and do not depend on the behavior of those at risk. The second three are considered lower order controls as they are very dependent on the behavior of those that need the protection they afford, and hence are much more subject to human error. Prevention through Design can be simply described as examining and considering all design and equipment selection decisions through the filter of this hierarchy and implementing the higher order controls as much as possible to eliminate hazards or reduce risk. As well as making design and selection decisions that facilitate the implementation of the lower order controls by those that will work within the facility to control any remaining risk.

It is in Prevention through Design implementation where many ABB solutions shine! With proper consideration they can be implemented to lower workplace risk while reducing maintenance cost and improving productivity and paving a path to continual improvement of all these characteristics.

Passive, active and preventive

Arc flash protection and mitigation solutions

Arc flash mitigation solutions reduce damage to equipment, limiting downtime as less time is required for repairs and keeping costs to a minimum. In addition, the safety of personnel is enhanced.

There are three ways to describe potential solutions that can be implemented within a system design in a Prevention through Design (PtD) context. These may reduce the probability of an arc flash event, reduce the energy associated with an event or reduce the impact on safety of an event. All of them can improve productivity. Generally they may be referred to as engineered solutions within the context of the hierarchy of risk controls and may, in turn, be further described as passive or active engineered solutions.



Passive arc flash protection solutions

The principal passive arc flash solution is Arc Resistant Equipment (ANSI/IEEE C37.20.7), designed and tested to mechanically withstand an electrical arc. Protection is afforded by the containment of the arc within the switchgear and the means to direct the arc gases and debris to a safe area. Passive solutions also include advanced switchgear design features to reduce the probability of an arc flash and shock occurring, such as insulated busbars and segregation between compartments.



Active arc flash mitigation solutions

Switchgear equipped with devices and solutions to limit the “arc flash” incident energy (the amount of thermal energy generated during an electric arc event¹) and consequently limit the damage to the equipment.



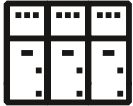
Preventive arc flash protection solutions

Switchgear equipped for remote operation, so that standard operations such as switching, diagnostic and operational monitoring, racking in/out, etc. can be conducted outside of the dangerous arc flash boundary and in a manner less prone to human error. Preventive solutions also include the predictive maintenance of assets, which enables a reduction in the number of live equipment interactions to only the most necessary and targeted actions as identified by analysis of the data provided by these systems. This not only minimizes and improves human-equipment interactions but also improves equipment reliability and reduces maintenance costs.

¹ IEEE std 1584-2018: Guide for Performing Arc-Flash Hazard Calculations

Passive solutions

Protect by containing or preventing an event



01 MNS SG AR

The principle of passive arc flash protection is based on the mechanical design of low- and medium-voltage power equipment. Robust design reduces the risk that a person, standing in front of switchgear with closed and latched doors, will be injured in the event of an arcing fault inside the equipment.

ABB arc resistant switchgear and motor control centers are type tested using ANSI/IEEE C37.20.7, IEEE Guide for Testing Switchgear Rated up to 52kV for Internal Arcing Faults. ABB's commitment to personnel safety is a key driver in developing and certifying arc resistant equipment.



Design

Arc resistant switchgear usually have one of the following characteristics:

- Reinforced mechanical structure able to withstand the stresses (overpressure) caused by internal arcing
- A preferential path inside the assembly for the discharge of hot gases and debris created by arcing
- Segregation between compartments to inhibit the propagation of the arc
- With respect to medium-voltage, internally separate gas tank for gas-insulated equipment and plug-in cable connections

Considerations

Arc resistant equipment should be selected with consideration of the following characteristics:

- **Length of arc time** – Protection must remove an arcing fault within the time specified by the equipment rating, in any part of the equipment. Some equipment may even incorporate characteristics that limit the duration of an arcing fault, a characteristic referred to as 'self-extinguishing'.
- **Accessibility rating** – This will define where protection is provided. This can be on all sides or only the front of the gear, with or without allowance to have instrument compartment doors open. Some arc resistant designs may include compartmentalization such that an arc in one compartment will not travel to another during an arcing fault, when all panel doors are closed.
- **Footprint and plenum requirements** – Arc resistant equipment may be larger than normal equipment and exhaust plenum requirements may limit where in a building such equipment can be located.

Active solutions

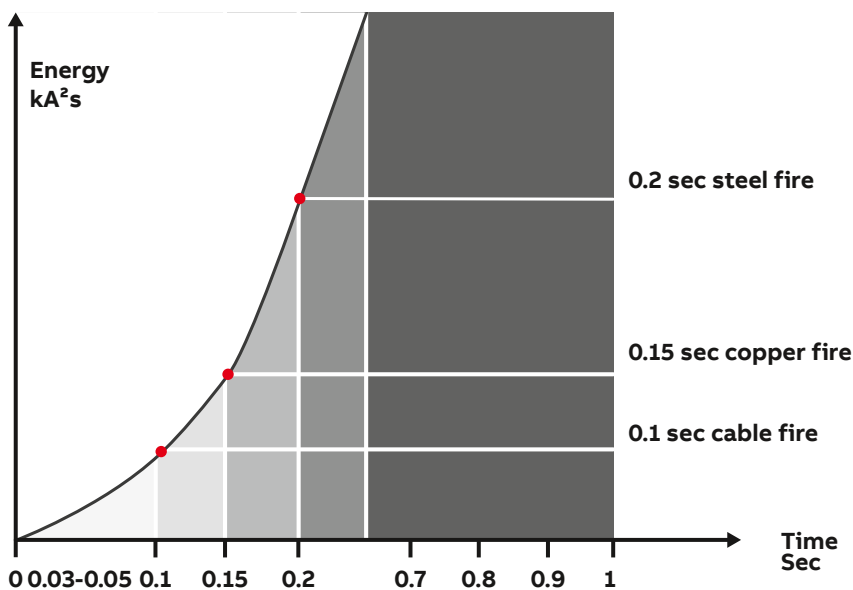
Reduce equipment damage
and improve operator safety



The main predicted parameter of an arc flash event that characterizes its potential for harm is Incident Energy (E_i). This is proportional to the length of time the arc lasts. The potential damage to equipment is similarly related to arcing time.

The arcing fault is usually interrupted by a circuit breaker and relay/trip unit or fuses. Without any active arc flash mitigation solutions in place, the arc clearing time (which is the total time between the beginning of a specified overcurrent and the final interruption of the circuit¹) may be driven by traditional coordination and protection analysis methods designed to optimize selectivity, resulting in relatively slow protection and high levels of energy released should any kind of fault occur. This is especially true at the most important upstream equipment. Within the length of time allowed, steel, copper and cable can burn, melt and vaporize, as shown in the diagram below, causing significant economic impact, and the arc flash incident energy can be quite high and dangerous.

Arc flash damage curve



Reducing the arc clearing time

In order to reduce the negative effects of an arc event, the arc clearing time must be reduced. This is the role of active arc flash mitigation solutions.

The following methods and technologies are available:

- **Optical-based arc-detection devices.** Relays that detect the arc flash light and current (optional). When the arc flash is detected, it sends the tripping signal to the circuit breaker.
- **Arc quenching system.** Equipment that provides a lower impedance current path after it has detected an internal arc fault in order to cause the arcing current to transfer to the new current path.
- **Combination of arc quenching system with current-limiting fuses.**
- **Energy-reducing maintenance switch.** Limits the duration of the fault current by temporarily lowering the trip threshold of the circuit breaker. This solution meets sections 240.87 and 240.67 of the national electrical code (NEC).

¹ IEEE std 1584-2018: Guide for Performing Arc-Flash Hazard Calculations

01 Arc Guard System™
TVOC-2

- **Zone-selective interlocking.** Application of zone selectivity instead of time-current selectivity to reduce the tripping time delays of overcurrent protection devices.
- **Bus differential protection.** Protecting a bus by monitoring all expected incoming and outgoing power circuits to quickly identify a small amount of power into a fault.
- **Alternative settings group (dual settings).** Tripping time delays of the overcurrent protection devices are set to lower values than the main protection settings automatically to match protection to varying topology or sources.

- Combination of **optical-based arc detection device** and circuit breaker's **energy-reducing arc mitigating algorithm**. After receiving a positive signal from the optical sensors, the arc detection device activates the energy-reducing arc mitigating algorithm embedded in the circuit breaker.

Positive results

Reduction of the arc incident energy through the use of active solutions will enhance personnel safety and limit high pressure, dangerous gases and damage to the faulty compartment of the switchgear. As a result, repair costs are lower and the electrical installation can be returned to normal operation faster than installations without an active arc mitigation system, reducing downtime.

A range of options

The products and solutions listed in this brochure have different values of total arc clearing time. Therefore, the effects of arc mitigation are slightly different from product to product. Your ABB application engineering team can help you select the solution that is best for your application and budget. Details on the total arc clearing time of our active arc flash mitigation solutions can be found in the overview table on pages 22-25.



Preventive solutions

Avoid internal arc events



01 ABB Ability™ Energy and Asset Manager

An electric arc can occur for several reasons, for example human error or contamination. Electrical maintenance, trouble-shooting personnel and operators are always exposed to these risks when working in the switchgear room. Maintaining a safe distance between personnel and equipment during operations provides the most effective means of avoiding injury. Preventive solutions limit risk by reducing maintenance activity to only the most necessary and targeted actions.

A safer remote operating environment

Remote operation and circuit breaker racking provide a safer operating environment for personnel by increasing the distance between the operator and potential arc flash incident energy from the switchgear. Enhanced switchgear operability preventing human errors can be achieved by:

- Remote racking devices
- Remote controls and HMI screens
- Embedded plant supervision with metering capabilities and communication protocols to provide status information

• Condition monitoring and diagnostics

Asset condition monitoring and diagnostics provide information on the mechanical and electrical health conditions for switchgear and assets, so personnel do not have to approach the switchgear to obtain this information. Furthermore, this information is available 24/7. The information can be used to schedule more targeted and safer condition-based maintenance, which also reduces costs and can improve overall reliability.

Mechanical and electrical health condition can be assessed by:

- Condition monitoring systems allow collection of data about equipment usage, temperature of critical electrical joints, vibration and partial discharge as well as environmental factors, which impact equipment reliability.
- Energy and asset management monitoring systems with predictive maintenance algorithm to make maintenance smarter, quicker and less expensive by allowing users to remotely monitor power system health and providing a predictive maintenance analysis so that service is only performed when necessary.



SMARTER SAFETY

“Protecting customers is at the forefront of our product innovation, and is central to ABB’s product philosophy and global mission. Our arc flash mitigation solutions are designed to offer added peace of mind when it comes to protecting people, assets and buildings. And it’s clear that taking the right precautions today can lead to efficiencies in the future – that’s what makes arc flash mitigation from ABB a smart choice.”

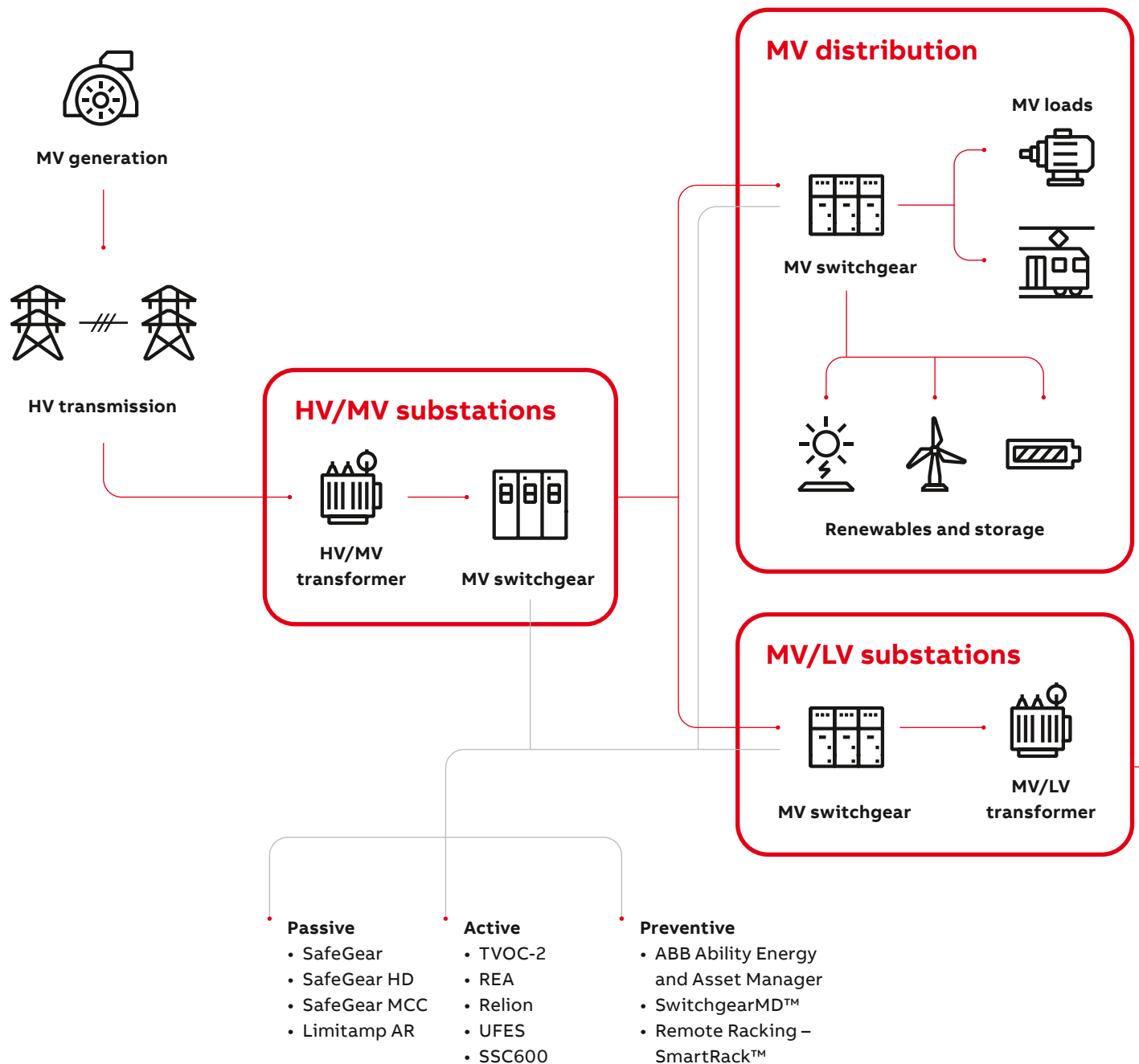
Carlo Roncorini, Product management excellence manager, Distribution Solutions division

Anatoly Kosyakin, Global application specialist, Smart Power division



A broad portfolio

Covering every level of low- and medium-voltage power distribution

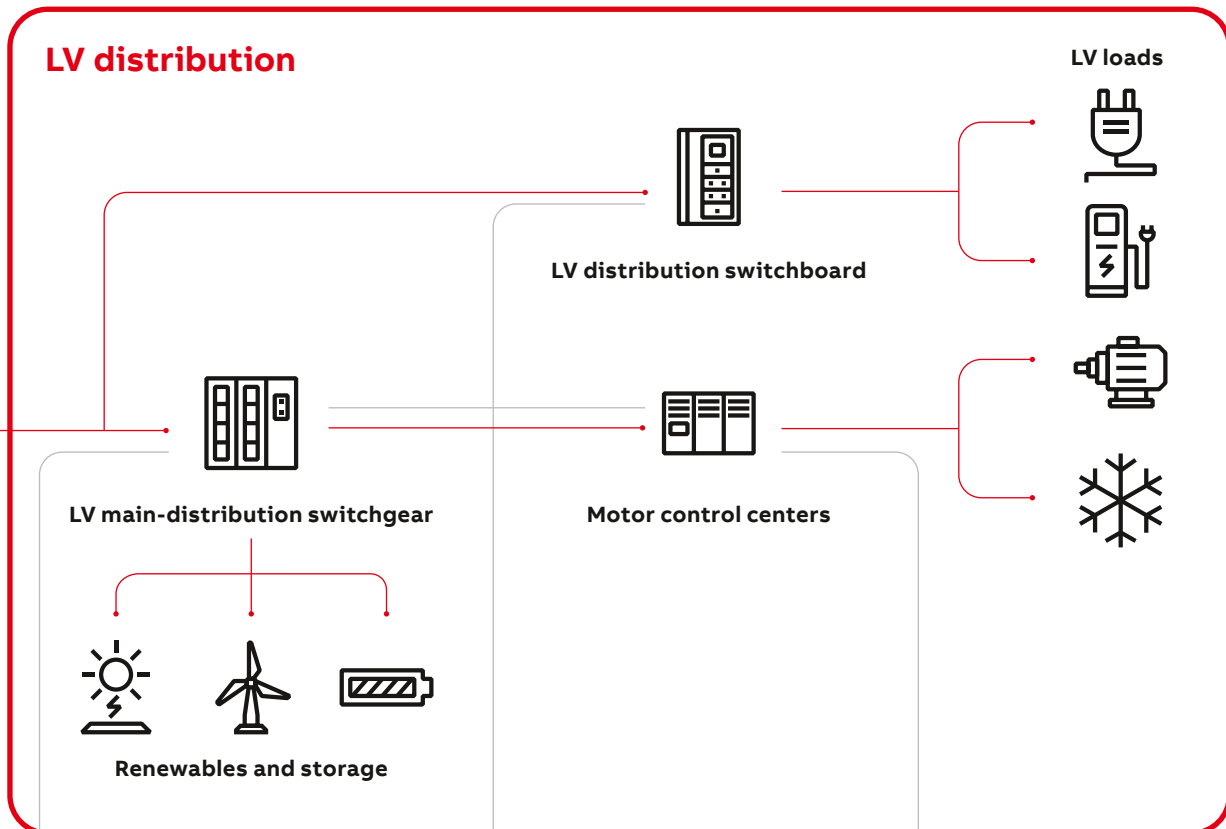


HV: High-voltage (above 66 kV)

MV: Medium-voltage (between 1 kV AC, or 1.5 kV DC, to 66 kV)

LV: Low-voltage (below 1 kV AC, or 1.5 kV DC)

LV distribution



Passive

- MNS SG AR
- AKD-20 AR
- Entellisys AR

Active

- TVOC-2
- REA
- Relion
- UFES
- ArcLimiter
- Zone selective interlocking
- Dual settings
- RELT Module
- HPC Switch

Preventive

- ABB Ability Energy and Asset Manager
- ABB Ability Condition Monitoring
- Ekip Signalling 3T
- Remote Racking Device - Emax 2



Passive

- MNS MCC AR
- Reliagear LV MCC



Passive arc flash protection solutions

Ensuring personnel safety



	MNS SG AR	MNS MCC AR
Product type	UL1558 Low-Voltage Switchgear	UL 845 Motor Control Center
Low-voltage application	Up to 600 V AC 4000 A 100 kA	Up to 600 V AC 2500 A 65 kA
Medium-voltage application	-	-
Arc classification standard	IEEE C37.20.7 Type 2, 2B	IEEE C37.20.7 Type 2
Arc protection characteristics	<ul style="list-style-type: none"> – Optional bus insulation system – IP20 fingers safe secondary terminals – Barriered terminal boards – Line side connection automatic shutters – Remote racking 	<ul style="list-style-type: none"> – IP20 touch safe vertical bus wall – SafeT Connect closed door, tool free unit removal – Optional bus insulation system – Door interlock prevents opening the unit door when unit is energized
Segregation between compartments	Bus compartment segregated from cable compartment and breaker/instrument compartments Breaker/instrument compartments separated from one another Cable compartments segregated between vertical sections	Bus compartment segregated from unit and wiring space Units segregated from one another Customer connections in wiring space insulated from one another
Product web page		





	AKD-20 AR / Entellisys AR	Reliagear LV MCC
Product type	UL1558 Low-Voltage Switchgear	UL845 Motor Control Center
Low-voltage application	Up to 600 V AC 5000 A 65 kA	Up to 600 V AC 2000 A 65 kA
Medium-voltage application	-	-
Arc classification standard	IEEE C37.20.7 Type 2, 2B	Arc mitigation via IEEE 1683 safety features
Arc protection characteristics	<ul style="list-style-type: none"> – Insulated bus – Bus compartment barriers – Section barriers and shutters – Push-to-latch circuit breaker cubicle doors – Pressure activated rear vent flaps – Reinforced CB escutcheon gasket <p>Additional features with Entellisys:</p> <ul style="list-style-type: none"> – Remote control panel – Remote racking – Advanced zone-based protection: – Bus differential – Dynamic zone-selective interlocking – Multi-source ground fault protection 	<ul style="list-style-type: none"> – Two-position closed-door retractable unit stabs – Automatic vertical bus isolation shutter – Stab & shutter status indicators on unit doors – IP20 & incidental contact barriers – Stab & door Interlock: prevents opening the unit door when stab is energized – Stab & unit interlock, racking screw & disconnect Interlock
Segregation between compartments	Bus compartment segregated from cable and breaker/instrument compartments Breaker/instrument compartments separated from one another Cable compartments segregated between vertical sections	Bus compartment segregated from unit and wiring space Units segregated from one another Customer connections located in units
Product web page		



Passive arc flash protection solutions

Ensuring personnel safety



	SafeGear	SafeGear HD
Product type	Air insulated MV metal-clad switchgear for primary distribution	Air insulated MV metal-clad switchgear for primary distribution
Low-voltage application	-	-
Medium-voltage application	Up to 15 kV AC 4000 A 50 kA	Up to 15 kV AC 4000 A 63 kA
Arc classification standard	IEEE C37.20.7 Type 2, 2B, 2BC	IEEE C37.20.7 Type 2, 2B
Arc protection characteristics	<ul style="list-style-type: none"> – Segregated grounded metal compartments – Hem bent metal construction; double thickness internal walls – Insulated bus – Internal venting system for arc gasses and debris – Auto closing vent covers – Plenum for directing arc fault by-products – Closed door racking of breakers and devices – Remote racking enabled – Multi-point latch breaker compartment doors – Segregated LV compartment 	<ul style="list-style-type: none"> – Segregated grounded metal compartments – Hem bent sheet metal construction, double thickness internal walls – Insulated bus – Internal venting system for arc gasses and debris – Auto closing vent covers – Plenum for directing arc fault by-products – Closed door racking of breakers and devices – Remote racking enabled – Multi-point latch breaker compartment doors – Segregated LV compartment
Segregation between compartments	Yes, due to metal-clad construction.	Yes, due to metal-clad construction.
Product web page		





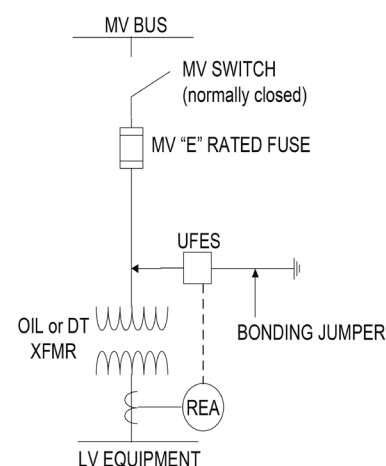
	SafeGear MCC	Limitamp AR
Product type	Air insulated MV motor control – UL347 Metal-clad type construction	Air insulated MV motor control – UL347 Metal-enclosed construction
Low-voltage application	-	-
Medium-voltage application	Up to 7.2 kV AC 3000 A 50 kA	Up to 7.2 kV AC 3000 A 50 kA
Arc classification standard	IEEE C37.20.7 Type 2, 2B	IEEE C37.20.7 Type 2B
Arc protection characteristics	<ul style="list-style-type: none"> – Segregated grounded metal compartments – Hem bent sheet metal construction – Insulated bus – Internal venting system for arc gasses and debris – Plenum for directing arc fault by-products – Closed door racking of contactors – Remote racking enabled – Multi-point latch contactor compartment doors – Segregated LV compartment 	<ul style="list-style-type: none"> – Welded construction using heavy duty reinforced side panels – Internal venting system for arc gasses and debris – Plenum for directing arc fault by-products – Multi-point latch contactor compartment doors – Segregated LV compartment as part of the contactor compartment door
Segregation between compartments	Yes, due to metal-clad construction.	No. Only LV compartment is segregated to meet the Type 2B arc rating.
Product web page		

Active arc flash mitigation solutions

Improve safety, reduce damage



	Arc Guard System TVOC-2	REA arc protection system
Technology type	Optical-based internal arc detection and mitigation, which trips LV or MV circuit breaker	Optical-based internal arc detection and mitigation, which trips LV or MV circuit breaker
Dedicated product or optional function	Dedicated product for arc flash mitigation	Dedicated product for arc flash mitigation
Application	Low-voltage, medium-voltage	Low-voltage, medium-voltage
Operating time	1-2 ms	1-2.5 ms
Total arc clearing time	With LV ABB circuit breaker: 45 ... 50 ms With MV ABB circuit breaker: 50 ... 100 ms	With LV ABB circuit breaker: 45 ... 50 ms With MV ABB circuit breaker: 50 ... 100 ms
Certifications	DNV, ABS, BV, TÜV (SIL 2)	ABS
Enables personnel safety during maintenance	Yes	Yes
Enables arc mitigation 24x7	Yes	Yes
Benefits and features	<p>Increased personnel safety. Significant reduction of overpressure, toxic gases.</p> <ul style="list-style-type: none"> – Outstanding reaction time < 1 ms (< 2 ms with CSU-2) – All-in-one unit with up to 30 single point sensors in three separate zones for selectivity – Suitable for MV and LV applications with light only detection or both light and current detection – Open loop Rogowski coils simplify installation and retro fit – Simple commissioning of TVOC-2 and CSU-2 through HMI, Modbus RTU or Ekip Connect – Factory calibrated sensors – no need for on-site adjustment – Modbus RTU and ABB Ability Energy and Asset Manager connectivity 	<p>Increased personnel safety. Significant reduction of overpressure, toxic gases. Can be used as redundant solution with protection relays.</p> <p>Compact, flexible and easy to integrate additional modules available to extend selective tripping capabilities, to create multiple loops or add more lens detectors.</p> <p>Light detection can be with:</p> <ul style="list-style-type: none"> – fiber loop sensor (cost-effective) – multiple point lens sensors (increased selectivity) <p>Adjustable light and current detection thresholds.</p>
Product web page		



	Relion 615-620-640 ANSI	Ultra-Fast Earthing Switch UFES	ArcLimiter
Technology type	Optical-based internal arc detection and mitigation, which trips MV circuit breaker	Arc quenching system with arc detection and switching devices	Combination of arc quenching system with current-limiting fuses
Dedicated product or optional function	Optional card and sensors for Relion family	Dedicated product for arc flash mitigation	Dedicated product for arc flash mitigation
Application	Medium-voltage	Low-voltage, medium-voltage	Low-voltage arc mitigation with medium-voltage application
Operating time	2.5-6 ms	1.5 ms	1.5-2.5 ms
Total arc clearing time	With MV ABB circuit breaker: 60 ... 110 ms	In combination with TVOC-2 or REA: <4 ms In combination with Relion: <10 ms	In combination with REA: 4 ms
Certifications	DNV, LR, BV, KEMA, RMRS, UL, ABS, GL	DNV, VdS, UL	As per REA and UFES systems
Enables personnel safety during maintenance	Yes	Yes	Yes
Enables arc mitigation 24x7	Yes	Yes	Yes
Benefits and features	<p>Increased personnel safety. Significant reduction of overpressure, toxic gases.</p> <p>Compact and easy to integrate additional card into multifunctional relay; is the perfect solution if a relay for protection is required.</p> <p>Light detection by use of:</p> <ul style="list-style-type: none"> – loop (cost effective) – single point (increased selectivity) – supervised FO on REX640 up to 4 loops of 60 m <p>Adjustable threshold levels.</p>	<p>Increased personnel safety. 20 times faster than standard arc protection. Significant reduction of overpressure, toxic gases.</p> <p>Compact switching devices and detection electronics enable easy integration into almost every switchgear.</p> <p>Tremendous reduction, up to 98%, of downtime and repair costs.</p> <p>Monitoring system compatible with REA, TVOC-2 and Relion Relays.</p> <p>Ultra-fast switching vacuum interrupter and operating system integrated in one compact unit. Fast and reliable micro-gas generator operating mechanism.</p> <p>Available as loose product, within ABB MV and LV switchgear or as retrofit solution by ABB Service.</p>	<p>Unique solution which uses ultra-fast earthing switch (UFES) in combination with fuses, solves the LV arc fault problem at MV level.</p> <p>Improves power quality for upstream processes during mitigation. Reduces voltage dip duration seen by upstream devices during fault clearing.</p> <p>Incident energy reduced to under 1 cal/cm², resulting in hazard risk category (HRC) zero.</p> <p>Embeds UFES benefits as part of the system solution.</p> <p>Suitable for upgrading existing plants, allowing use of existing MV fused switches and thereby avoiding replacement with relay and breakers.</p> <p>Also covers the area between transformer secondary and line side of the LV breaker.</p>

Product web page



Active arc flash mitigation solutions

Improve safety, reduce damage





Emax 2 and Tmax XT			
Technology type	Zone-selective interlocking	Alternative settings group (dual settings)	Energy-reducing maintenance switch with RELT module
Dedicated product or optional function	Optional function of Emax 2 and Tmax XT circuit breakers	Optional function of Emax 2 and Tmax XT circuit breakers	Optional function of Emax 2 and Tmax XT circuit breakers
Application	Low-voltage	Low-voltage	Low-voltage
Operating time	40 ms with S protection (ANSI 50TD, 51)	5-7 ms to change alternate settings	2.5 ms
Total arc clearing time	Depends on circuit breaker frame and fault current	Depends on circuit breaker frame and fault current	Emax 2: 28 ... 42 ms at 60 Hz
Certifications			
Enables personnel safety during maintenance	Yes	Yes	Yes
Enables arc mitigation 24x7	Yes	No	No
Benefits and features	<p>Increased personnel safety with hardwired or digital zone selectivity between circuit breakers.</p> <p>Can be used for zone selectivity interlocking i.e. selective short circuit, ground fault, instantaneous and directional protections.</p> <p>Digital zone selectivity can be provided with Ekip Link or Ekip Com IEC61850 to integrate the ABB circuit breakers in a substation automation system.</p>	<p>Increased personnel safety. Add an extra level of protection with two user selectable sets of settings for circuit breakers.</p> <p>All protection settings can be changed between SET A and SET B to reduce trip protection thresholds and time delays.</p> <p>Can be easily activated by Ekip Connect.</p> <p>Different input can be set for the parameter change, e.g., selector switch, open door microswitch.</p>	<p>Increased personnel safety. Dramatically reducing the impact of an arc flash event.</p> <p>The 2I is a temporary protection that is faster than the normal instantaneous protections.</p> <p>Depending on the fault current, this function can provide a total clearing time as low as 1.5 cycles at 60 Hz.</p> <ul style="list-style-type: none"> – Cannot be deactivated remotely. – Positive feedback provides a clear indication that the safety function is working properly. – Easy to use wizard is automatically engaged during initial installation. – Commissioning can be executed through the circuit breaker touch screen. – Active arc flash mitigation solutions Improve safety, reduce damage

Product web page





	Smart Substation Control SSC600	New Generation HPC Switch
Technology type	Bus differential protection and optical-based internal arc-detection and mitigation, which trips MV circuit breaker	High Pressure Contact-style Fused Switch with integral electronic trip unit and protection functions.
Dedicated product or optional function	Centralized protection based on Relion inputs	Range of protections offered by integral electronic trip unit
Application	Medium-voltage	Low-voltage
Operating time	2.5-6 ms	-
Total arc clearing time	60 ... 80 ms	58 ms for selective instantaneous protection 50 ms for Energy Reducing Maintenance Switch (ERMS) protection
Certifications	UL, Intertek	cULus UL977
Enables personnel safety during maintenance	Yes	Yes
Enables arc mitigation 24x7	Yes	Yes
Benefits and features	<p>Increased personnel safety. Significant reduction of overpressure, toxic gases.</p> <p>Compact and easy to integrate: additional card into multifunctional relay; is the perfect solution if a relay for protection is required.</p> <p>Low-impedance busbar current differential can also detect busbar faults without light detection.</p> <p>Operates based on detection of light and current from arc, which trips the MV circuit breaker or busbar differential.</p> <p>Light detection can be with:</p> <ul style="list-style-type: none"> – loop (cost effective) – single point (increased selectivity) – differential current on 1 or 2 busbar sections <p>Adjustable threshold levels and high logical selectivity.</p>	<p>A fused switch that offers many of the conveniences of a circuit breaker with advanced trip unit. HPC features that can keep operators away from energized electrical equipment, such as remote operation and metering / communications. Adjustable INST and GF protections provide protection beyond the capability of typical fused switches.</p> <p>RELT (ERMS) mode allows a second INST pickup setting on the relay for more sensitive and faster operation during maintenance activities. This mode is activated / de-activated via a local switch or through communications with the switch. Local control unit provides positive feedback when the "RELT ON" command has been received and processed.</p> <p>The INST protection of the New Generation HPC allows clearing of faults in 58 ms, and its ERMS function in 50 ms, both of which are far less than the 70 ms allowed by code in 240.67 and usually much faster than a large fuse will provide in most power distribution systems at arcing current level.</p>
QR code		

Preventive arc flash protection solutions

Safer operations at a distance



	ABB Ability Energy and Asset Manager	ABB Ability Condition Monitoring for electrical systems
Technology type	Energy and asset management cloud-computing platform and predictive maintenance indication	Condition monitoring and energy management on-premise based platform
Dedicated product or optional function	Dedicated product	Dedicated product
Application	Low-voltage, medium-voltage	Low-voltage
Benefits and features	<p>ABB Ability Energy and Asset Manager, the innovative cloud-computing solution designed to monitor, optimize, predict and control the electrical system.</p> <p>ABB Ability Energy and Asset Manager assists anytime and anywhere via smartphone, tablet or personal computer. The user can:</p> <p>Monitor Oversee site performance, supervise the electrical system and allocate costs.</p> <p>Explore Visualize the system structure, verify asset health and get actionable insights following predictions and prescriptions.</p> <p>Analyze Schedule and analyze automatic data exports, improve the use of assets and make the right business decision.</p> <p>Act Set up alerts to notify key personnel while remotely implementing an effective efficiency strategy, managing maintenance activities and scheduling next actions.</p>	<p>On-premises solution for plant-wide condition and energy monitoring. Data storage and analytics to prevent failures, predict asset maintenance needs and optimize production.</p> <p>Simple web browser access to intuitive user dashboard with health index, single line and panel views, trends. Integrated Knowledge Base provides root cause analysis and suggested action on any event.</p> <p>Integrated data analysis to provide detailed insights on asset health and prediction of upcoming maintenance needs.</p> <p>Monitoring temperature of critical connection with detailed analysis of switchgear thermal situation and early warning about developing issues.</p> <p>Report function of switchgear condition and statistics as well as energy report, which indicates load trends for each circuit low-voltage switchgear, switchboards, panelboards and MCC.</p> <p>Integration capability of ABB and 3rd-party products based on Modbus communication protocol.</p>

Product web page





	SwitchgearMD™	Ekip Signalling 3T module and PT1000 probes – Emax 2 and Tmax XT
Technology type	Condition monitoring	Condition monitoring
Dedicated product or optional function	Dedicated product	Optional module for Emax 2 and Tmax XT
Application	Medium-voltage	Low-voltage
Benefits and features	<p>Monitoring and diagnostic unit providing mechanical and electrical health status of a fleet lineup.</p> <p>Any new or existing panel can become truly ABB digital compliant by having SWICOM onboard, regardless of age, design or brand. One unit covers information from the whole switchgear lineup.</p> <p>Detects the primary circuit hot spots and monitors their trends as one of its crucial health monitoring tasks.</p> <p>Detects partial discharges (surface, corona, inner void and floating electrode discharges) before full dielectric breakdown, to minimize fault possibility.</p> <p>Fully integrated Monitoring Solution providing detailed analysis of switchgear health situation and early warnings of developing issues.</p>	<p>Sensors can be directly connected to the trip unit system. Some available sensors are:</p> <ul style="list-style-type: none">– Temperature– Humidity– Vibration– 4-20 mA inputs– And more... <p>Condition based maintenance algorithms can be implemented in the trip units or executed in software elsewhere.</p> <p>Sensors can be directly coupled to and combined with other information in the predictive algorithms embedded in the ABB Ability solution system.</p> <p>Thresholds for alarming and protection can be implemented for various monitored parameters or combinations of parameters including current, harmonics, use history and more.</p>

Product web page



Preventive arc flash protection solutions

Safer operations at a distance






	Remote Racking SmartRack™	Remote Racking Device – Emax 2
Technology type	Remote racking	Remote racking
Dedicated product or optional function	Optional device for MV circuit breakers, vacuum contactors, G&T devices and PT trucks	Optional device for Emax 2 circuit breakers
Application	Medium-voltage	Low-voltage
Benefits and features	<p>Remote racking system allows implementation of the circuit breaker racking in and out operation from a remote location.</p> <p>Perform racking procedures from a safe distance with the circuit breaker compartment door closed.</p> <p>Reduces exposure to arc flash energy; preserves mechanism and interlock integrity.</p> <p>Easy application due to the detachable driver docking technology.</p> <p>Common draw-out mechanism for all the MV switchgear.</p> <p>UL listed.</p>	<p>Remote Racking Device (RRD) for Emax 2 enables operation of the circuit breakers from a distance. The remote control is connected to the main device with a 10 meter (33 ft) cable.</p> <p>RRD improves employee safety by keeping distance between the circuit breaker and the operator.</p> <p>Immediate visual verification of the circuit breaker position, thanks to the 3 LEDs on the device and on the remote control.</p> <p>It is possible to interrupt the operation at any time using the emergency pushbutton on the remote control.</p> <p>Certification: RRDs have been investigated by UL in accordance with the standard(s) UL 2876.</p>
Product web page		 

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