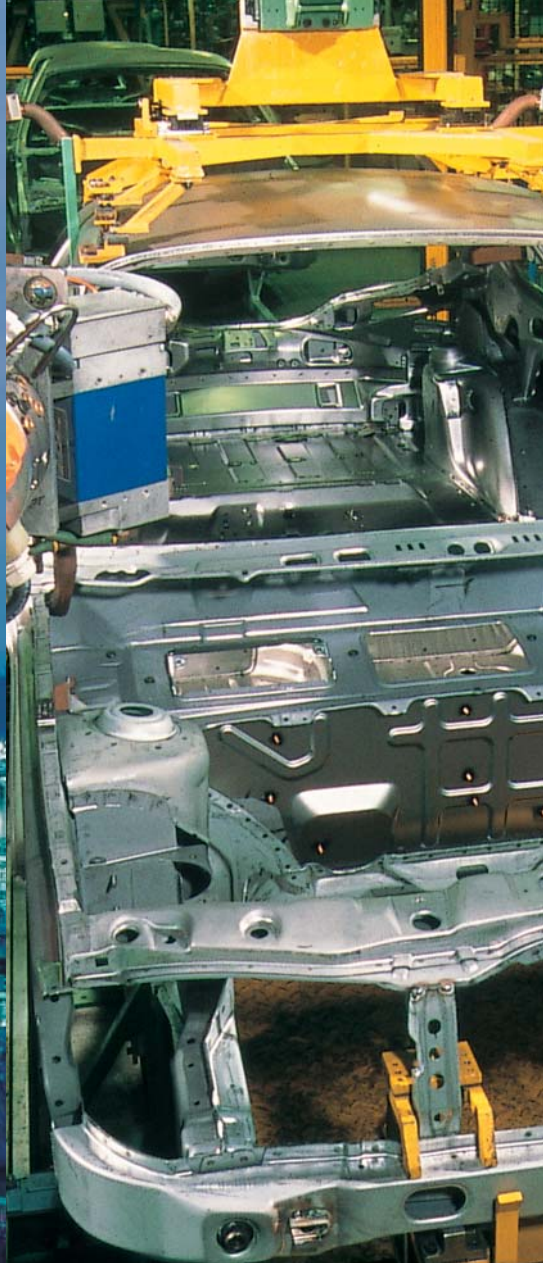
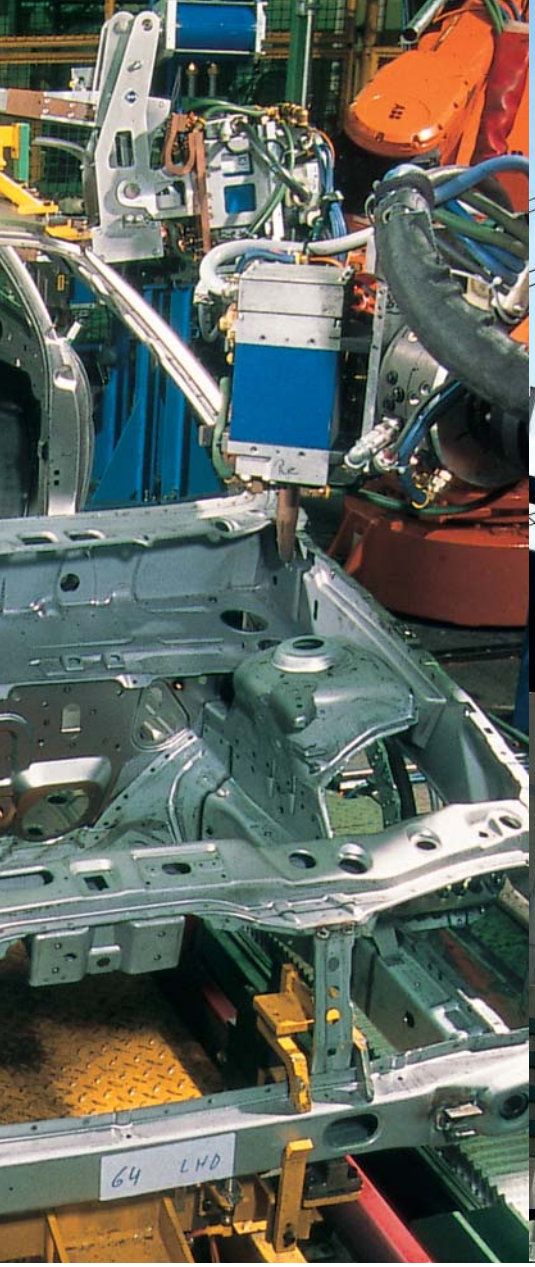
ARCON® –
The Lightning Fast Airbag for Your Switchboard.

Powering Business Worldwide



The continuous supply of electrical energy is an inherent requirement of today's society. The power outages in North America and Europe have shown how dependent we are on this. Everything came to a standstill.

Arc faults represent some of the risks to a reliable supply of electrical energy. Even today, they still occur in electrical power distribution systems, despite all the precautionary measures that are given due consideration and implemented in advance. They are caused by human error when work is carried out on the switchboard, as well as by contamination or condensation, overvoltages or similar occurrences. This type of event occurs more often than you would expect, and any damage caused has serious consequences.



Herbert Schmolke, VdS Loss Prevention, Cologne

The arc fault protection system offered by Eaton is based on the principle of "prevention instead of limitation". Due to the proven effectiveness of ARCON, the GDV Gesamtverband der Deutschen Versicherungswirtschaft (German Insurance Association) and the VdS Schadenverhütung (VdS Loss Prevention), in their guidelines for fire insurances – known as VdS 2344:2012-07 "Procedures for testing, approving and certifying products and systems for fire prevention and safety technology" - have defined an effectively functioning arc fault protection system as one in which "no destructive energy can occur in the event of an arc." Eaton's arc fault protection system passed all the relevant tests with flying colours. The certificate was extended in 2014.


Zertifikat Certificate

Anerkennung
von Bauteilen und Systemen
Approval
of Components and Systems

VdS

Eaton Industries GmbH
Hein-Moeller-Straße 7 - 11
53115 Bonn

G 604001 | 4 | 18.06.2014 | 17.06.2018

Störlichtbogenschutzsystem/ Arc Fault Protection System
ARCON

in Niederspannungsschaltanlagen der Elektrischen Energieverteilung (TSK/ PTSK)

VdS 2344:2012-07
Prüfvereinbarung EFL-P-04-001 (12.04.2004)

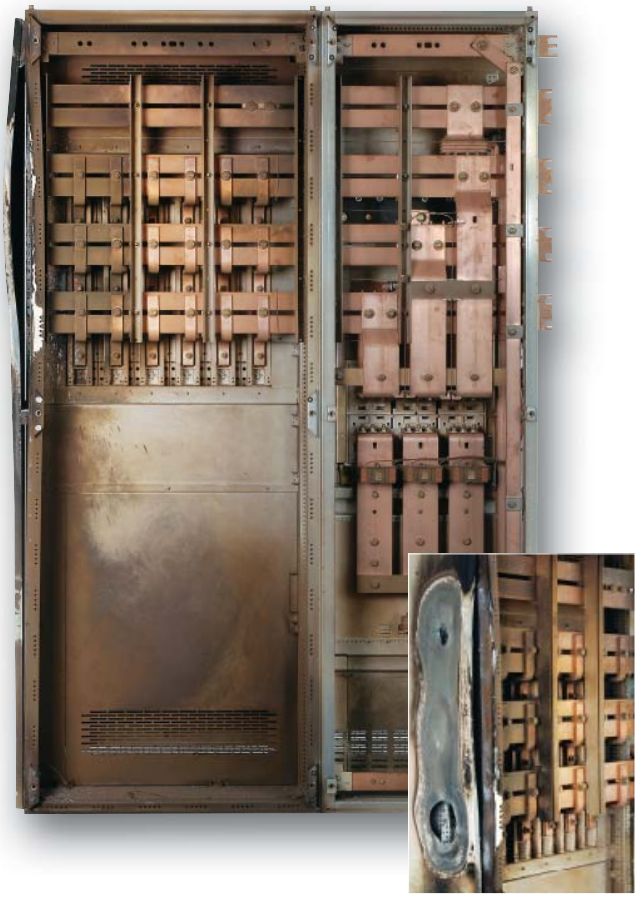
Köln, den 18.06.2014

DAkkS

Reinermann

i.V. Grundmann

Preventing Damage, Ensuring Service Continuity.



- Arc fault was initiated by means of a glow wire according to IEC/TR 61641.
- Arcon quenched after 2 ms.
- Only combustion traces.
- Immediate restoration of service.

The effects of an arc fault are very similar to those of an explosion. This ranges from the risk of death and injury to persons, extensive damage to switchboard systems, to several weeks of downtime or even the exchange of the damaged switchboard system. In the worst case, the production downtime can even lead to bankruptcy as customers have found other suppliers during this period.

In today's competitive environment availability is a very important factor for which suitable protective measures must be implemented. The main applications to date for ARCON® have been IT centres, tunnel supply systems and power supply systems for continuous manufacturing processes in the chemical industry.

Sources of danger

Failure to observe the five safety rules

When a shielded control current cable was being drawn in, the shield that was earthed at one end touched the live main busbar and initiated an arc fault that caused considerable damage to the system.

Contamination and condensation

In an animal feed plant, an arc fault occurred in a switchboard that had been in operation for several years. The cause was considerable contamination and condensation that reduced the insulation gap.

Installation remains in the insulation gaps

A test run of the standby generators caused the switchboard to vibrate. A previously unnoticed wire was found on the trunking to the circuit-breaker. This fell between the phases on account of the vibration and initiated an arc fault.

Working under live conditions

As part of the extensive commissioning work required, an electrical fitter removed the fuse cartridges on a section of switch-fuse strips in order to connect the outgoing cables better. He forgot to cover the live dropper bar and touched it with a cable to be connected. This contact initiated an arc fault which fortunately could be disconnected by the installed ARCON system. It was thus possible to prevent injury to persons and damage to the installation.

Personnel protection

Errors when working on live switchboard installations can be fatal. All reputable manufacturers of low-voltage switchgear assemblies now offer an arc-fault proof design of their switchboard. However, the testing of personnel protection design is carried out with the switchboard closed and not in field conditions. The statistics of the employers' liability insurance association for the precision engineering and electrical industry in Germany shows that 2 out of every 3 accidents occur on the switchboard when opened. This must be taken into account and dealt with using technical solutions that ensure effective protection, even when the switchboard is open. For this reason, Eaton carried out fundamental research in collaboration with the Technical University of Ilmenau and came to the conclusion that "genuine personnel protection" could only be achieved with exceptionally fast protection systems. With arc fault quenching times of only 2 ms ARCON therefore offers an unprecedented level of personnel protection.

System protection

Low-voltage switchboard systems are put out of operation for several weeks due to the effects of an arc fault. If a redundant power supply is not available, this also results in unwanted production downtimes. Only an effective system protection can provide a solution here, so that the effects of the arc fault can be minimised and an immediate restoration of service is possible. Using ARCON restricts the effects of the arc fault to its footpoints. After the cause of the fault has been rectified and the quenching device has been exchanged, the system can be made ready for operation in the shortest possible time in order to ensure the required availability.

Chemical industry

Continuous manufacturing processes require the provision of an uninterruptible power supply. Whether this is in the refinery, in granulate production or other manufacturing processes that chose MCC technology years beforehand in order to optimise the electrical power supply. What is better than preventing the risk of damage from arc faults directly?

IT centres

Whether this be for payroll accounting, cash debits at the cash dispenser or other services in this sector. The supply of electric power must be ensured in all circumstances – even in the event of an arc fault.

Glass and aluminium works

If the power supply failure is longer than 30 minutes the liquid raw material in production solidifies and the entire production facility is only worth its scrap value. For this reason, the supply of electric power must be given special protection. All risks need to be identified and suitable countermeasures taken, naturally also with regard to arc fault protection.

Tunnel power supply

Without a functioning power supply tunnels have to be shut down. Like the rock fall at the St. Gotthard Tunnel demonstrated, the blockage of important transfer route with today's level of traffic can lead to general traffic chaos.

Nuclear power stations

Faults occur in nuclear power stations from time to time. Since the Chernobyl disaster public sensitivity to this has been particularly heightened. The operators are required to deal with operational safety with the highest priority, particularly in the context of the planned lifetime extension. A suitable arc fault protection system is therefore indispensable.

Shipping applications

A considerable proportion of containers on container ships are refrigerated. The power supply required for this must be available during the entire passage without any interruption. Modern cruiser liners also place high demands on a continuous power supply. The electrical energy requirement is equivalent to that of a small town.

Wind turbines

Arc faults can also occur in wind turbines. In this case the entire hub can be destroyed by fire. This type of system then normally has to be replaced completely. The cost of the damage can be in millions. An effective arc fault protection system is a solution.

Hospitals

The power supply of a hospital must be ensured in all circumstances. If only the redundant section of the installation is in operation due to a malfunction, maximum safety must be ensured even in emergency operation. One only has to think of the running of operating theatres and intensive care units to understand why.

Controlling Arc Faults Safely.

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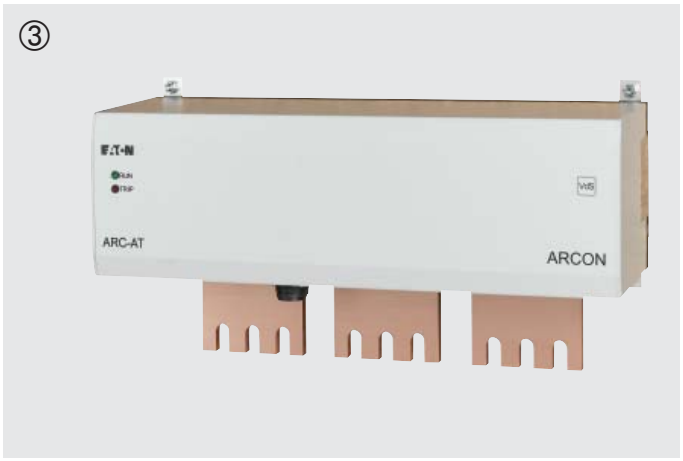
③ 

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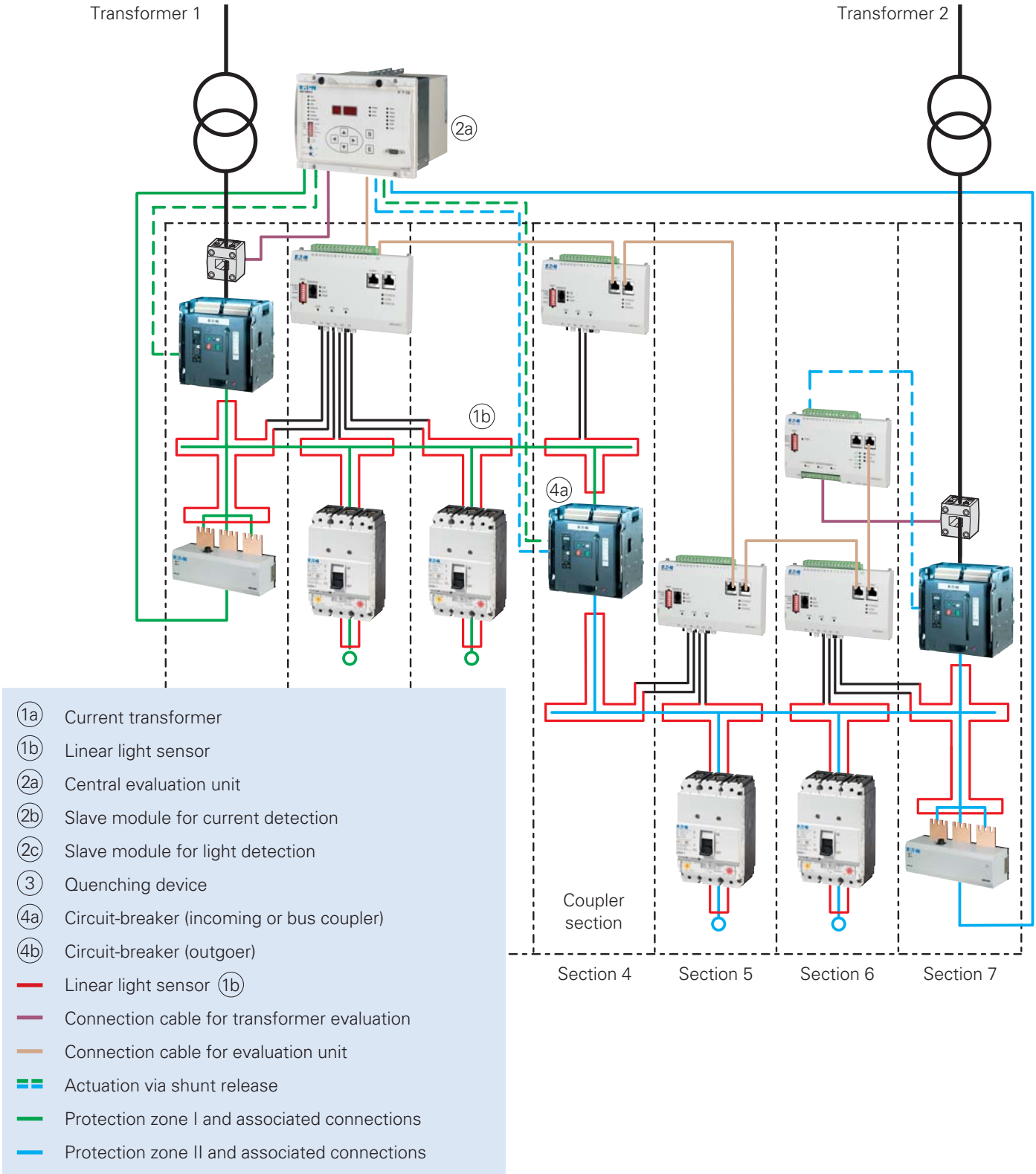
1. Detection
The arc fault is reliably detected by means of two separate detection variables. The arc fault produces an overcurrent which is detected by means of measuring transducers. The second detection variable is the extremely intense light emitted from an arc fault. This light is detected with fibre optic sensors. Some of this intense light emission enters the core of the fibre optic cable radially. This signal can then be evaluated at the end of the fibre optic cable. Any incorrect releases due to flashes or welding arcs are prevented by evaluating both signals together.

2. Evaluation
The analog sensor signals are converted to digital signals in so-called slave modules and then passed on to the central evaluation unit. For this a special bus was created which has the principal task of transferring any triggering information at ultra-high speed. The slave modules are also fed with power via this line. The slave modules are assigned addresses so that they can be assigned to different busbar sections, the so-called protection zones. A central unit is able to monitor two busbar sections independently of each other.

3. Quenching
The quenching device ensures extremely fast quenching times. A three-phase short-circuit is produced in less than 1 ms in order to remove energy from the arc fault. A pyrotechnically initiated actuator, as used in airbag systems, fires a copper bolt that penetrates an insulation plate to establish electrical contact.

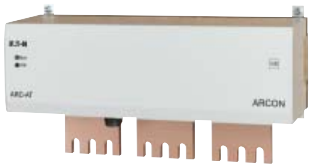
4. Disconnection
The incoming circuit-breaker has the task of disconnecting the affected busbar section from the mains supply. This is initiated by the short-circuit release. Each incoming circuit-breaker on this busbar section is sent an additional disconnection command to the shunt release as a backup measure. Busbar sections that are not affected remain operational.

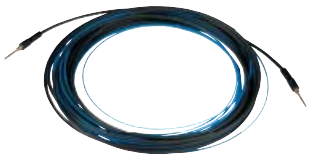


This block diagram shows an overview of a typical application. The installation consists of two busbar sections that each have an incoming supply and can be interconnected via the bus coupler. An ARC-EM/2.0 central unit is required for monitoring the system. An ARC-AT quenching device is required for each busbar section. Each panel is provided with an ARC-SL linear light sensor, apart from the coupler section which requires two light sensors. Three light sensors belonging to the same busbar section can each be connected to an ARC-EL3/2.0 slave module.

Whilst the overcurrent monitoring in incoming section 1 is connected directly to the central unit, an ARC-EC1/2.0 slave module is required for the second incoming section which acts on the shunt release of the second incoming circuit-breaker. Only the busbar section affected by the arc fault is disconnected. This is implemented using the natural selectivity of the circuit-breakers and the activation of the associated shunt release. The unaffected switchboard section remains operational.

Range Overview

Product	Description	Type	Ordner No.
Central unit 	– Display of system status via display and LEDs – There are 2 different tripping criteria that can be selected: light detection only --> activation of the trip relays (without quenching device) light and current detection --> activation of the quenching device + trip relays – Separate monitoring of two busbar sections – Separate actuation of two quenching devices Reaction time ~ 1 ms – Per busbar section, two potential-free normally-open contacts (Trip Relays) for shunt release actuation – One potential-free normally-open contact as a group signal in the event of an arc fault – One potential-free normally-open and normally-closed contact each for fault indication – Continuous self monitoring of the system – Connection of three current transformers for overcurrent measurement (L1/L2/L3) – Up to 16 slave modules can be connected (Depending on the length of the lines, slave modules need a separate voltage supply)	**ARC-EM/2.0**	172749
Slave for taking the linear light sensors 	– Can take up to 3 linear light sensors – Connection of mobile light sensor possible – Display of activated or faulty sensors – Assignment to busbar sections by addressing – 1 configurable, potential-free normally-open contact for activating the operating-current trip	**ARC-EL3/2.0**	172751
Slave for taking the point light sensors 	– Can take up to 10 point light sensors – Connection of mobile light sensor possible – Display of activated or faulty sensors – Assignment to busbar sections by addressing – 1 configurable, potential-free normally-open contact for activating the operating-current trip when using ARC-EP10/2.0 – 3 configurable, potential-free normally-open contacts for activating the operating-current trip when using ARC-EP10-2/2.0	**ARC-EP10/2.0** **ARC-EP10-2/2.0**	172752 172753
Slave for overcurrent detection 	– Connection of three current converters for measuring any over-current (L1/L2/L3) – Display of over-current at the corresponding current-converter contact – 1 configurable, potential-free normally-open contact for activating the operating-current trip	**ARC-EC1/2.0**	172750
Quenching device 	– Causes a three-phase short circuit in less than 1 ms – Current-carrying capacity (tested): 65 kA / 500 ms @ 725 V 100 kA / 150 ms @ 725 V 150 kA / 200 ms @ 440 V – Fast exchange possible thanks to open copper connections – LEDs for operation and triggering - Easy handling during assembly thanks to key-holes in the fastening brackets	**ARC-AT-T** **ARC-AT-B**	283712 283713

Product	Description	Type	Ordner No.
Linear light sensor			
	– Outstanding tripping response – Very high tripping accuracy – Continuous self monitoring via monitor signal – Transparent protective hose of the active light sensor – Total length / active sensor length		
	10 m / 5 m	**ARC-SL10**	283702
	11 m / 6 m	**ARC-SL11**	283703
	12 m / 7 m	**ARC-SL12**	283704
	13 m / 8 m	**ARC-SL13**	283705
	15 m / 10 m	**ARC-SL15**	283706
	17 m / 12 m	**ARC-SL17**	283707
	20 m / 15 m	**ARC-SL20**	283708
	25 m / 20 m	**ARC-SL25**	283709
	– Blue protective hose for increased filter effect and reduced sensitivity to interfering light – Temperature stability up to a max. of 125°C (active sensor range) – Total length / active sensor length		
	10 m / 5 m	**ARC-SL10/BL**	179679
	11 m / 6 m	**ARC-SL11/BL**	179680
	12 m / 7 m	**ARC-SL12/BL**	179681
	13 m / 8 m	**ARC-SL13/BL**	179682
	15 m / 10 m	**ARC-SL15/BL**	179683
	17 m / 12 m	**ARC-SL17/BL**	179684
	20 m / 15 m	**ARC-SL20/BL**	179685
	25 m / 20 m	**ARC-SL25/BL**	179686
Point light sensor			
	– For use in an arc fault detection system (Pay attention to protection against unintended tripping!) – Localisation of fault – Simple installation – Continuous self monitoring – Total length		
	6 m	**ARC-SP**	283710
	20 m	**ARC-SP20**	172756
Mobile light sensor			
	– Light sensor for temporary use – Improvement of personnel protection when working under live conditions – Added to the system without reconfiguration necessary – Can be connected to all optical detection units	**ARC-SM**	283711
Accessories			
	– Communication lines for master-to-slave and slave-to-slave connection		
	0,5 m	**ARC-CC00**	286390
	1 m	**ARC-CC01**	286391
	2 m	**ARC-CC02**	286392
	3 m	**ARC-CC03**	170488
	5 m	**ARC-CC05**	286393
	7 m	**ARC-CC07**	170489
	10 m	**ARC-CC10**	286394
	15 m	**ARC-CC15**	286395
	20 m	**ARC-CC20**	286396
	– Communication lines for master-to-quenching device connection		
	5 m	**ARC-CCAT05**	100038
	10 m	**ARC-CCAT10**	100039
	15 m	**ARC-CCAT15**	100040
	20 m	**ARC-CCAT20**	100041

Eaton is a power management company with 2014 sales of $22.6 billion. Eaton provides energy-efficient solutions that help our customers effectively manage electrical, hydraulic and mechanical power more efficiently, safely and sustainably. Eaton has approximately 102,000 employees and sells products to customers in more than 175 countries.

For more information, visit **www.eaton.com.**

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