

## Safety Upgrade Solutions

Innovations and measures to increase personal and plant protection.



# Active arc fault protection

Why everything is under control again in about 2 milliseconds.

## ACTIVE ARC FAULT PROTECTION SYSTEM

The technology is based on the “prevention, not limitation” principle. The pioneer in this area is ARCON® – this system has successfully passed all tests of the General Association of German Insurance Companies GDV and VdS Damage Prevention GmbH and been certified according to the fire insurance guidelines VdS 2349 “Malfunction-Free Electrical Installations”.

An active arc fault protection system effectively limits the existing arc energy and quickly extinguishes the accidental arc. After the elimination of faults and quenching device exchange, the system is immediately ready for operation again.

Exchanging system parts, components and equipment within the output range of the switchgear as a result of the effect of the accidental arc is not necessary.

## FUNCTIONAL PRINCIPLE

- **Recognition of arc fault emergence:**  
Detection of light flash in connection with overcurrent
- **Extinguishing of the accidental arc:**  
Generation of a 3-phase short circuit within 2ms to concentrate the fault energy within a defined range
- **Determination of the place of origin of the accidental arc:**  
Monitoring of the individual bus bar sections
- **Isolation of the affected area:**  
Deactivation of the affected incoming circuit breaker



# Active arc fault protection

KÖHL switchgears for medium and low voltage already have impressive values with regards to passive arc fault protection, far beyond the requirements of the latest standard to some extent.

To counter the physical forces of an accidental arc with an additional barrier for the protection of people and equipment and prevent the development of a dangerous flue gas mixture, KÖHL has been offering its customers a technical solution with active arc fault protection systems for many years. This solution can be directly installed in new systems at delivery or retrofitted into endangered existing systems.

## In the process, the additional protection is divided into two intensity levels:

<b>LEVEL 1</b>	Detection of the light flash in case of an accidental arc coming from an optical fibre in connection with the measurement of a rapid current increase.
<b>ACTION</b>	Triggering of the circuit breaker through a command signal.
<b>EFFECT</b>	The system is switched off in a defined manner - the switch time element must be observed in relation to the accidental arc development. A false triggering through external light flashes (e.g. breaking arcs, photography, thunderstorms, etc.) is not possible.
<b>AREA OF APPLICATION</b>	Low voltage switchgears, medium voltage switchgears

<b>LEVEL 2</b>	Detection of the light flash in case of an accidental arc coming from an optical fibre in connection with the measurement of a rapid current increase and safe extinguishing of the accidental arc.
<b>ACTION</b>	Ultrafast generation of a three-phase short circuit (2ms) by using a quenching device and simultaneously triggering of the circuit breaker through a command signal.
<b>EFFECT</b>	The system is switched off defined and extremely quick. A false triggering through external light flashes (e.g. breaking arcs, photography, thunderstorms, etc.) is not possible. A destruction of the system is prevented; recommissioning can take place within a very short period of time after the cause of the fault has been eliminated.
<b>AREA OF APPLICATION</b>	Low voltage switchgears

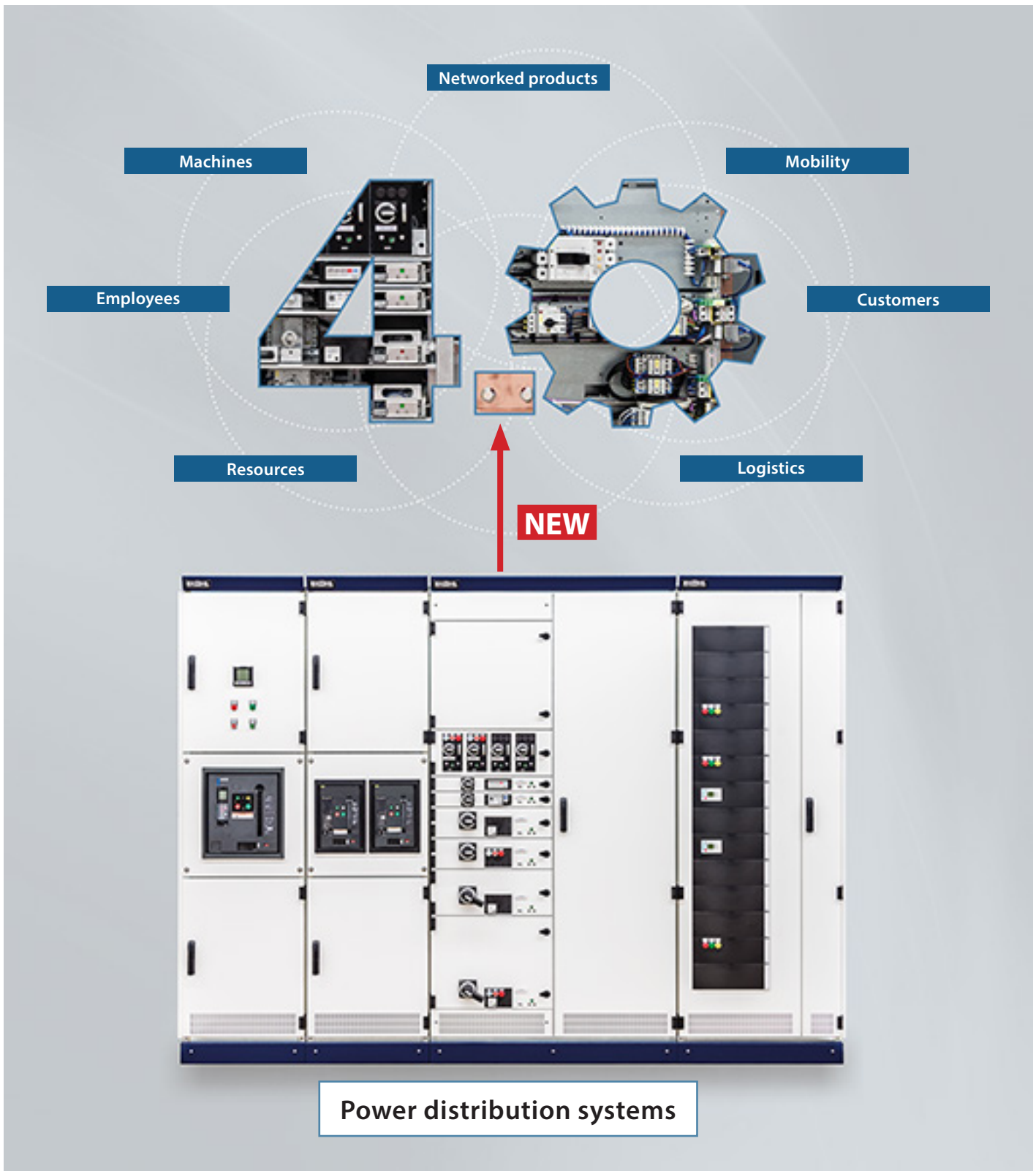
## KÖHL is certified service provider for the EATON system ARCON®



# Permanent condition monitoring of switchgears

Everyone is talking about “Industry 4.0” – the absence of automated condition monitoring with resulting calls for maintenance requirements or predictive fault elimination measures is now unimaginable within state-of-the-art production processes.

One of the most important links in this chain, however, is still seldom taken into consideration: The power supply! Even though in the process, a sudden blackout of the power distribution system due to an internal fault results in complete production units coming to an interruption and being forced into cost-intensive unproductiveness despite an immense degree of automation.



# The path to predictive maintenance

With its innovative **TOR** system, KÖHL offers an easy opportunity for permanent condition monitoring of power distribution systems, which then assume a key position in the “Smart Factory” concept.

The system reports the risk of internal faults early on and offers the opportunity to the user to perform corresponding maintenance and/or servicing work within regular shutdown times without the necessity of additional cost-intensive production standstills.



**TOR**  
THERMO OBSERVATION RFID

## BACKGROUND

Nowadays, the operating characteristic of a power distribution system clearly differs from conventional models: While an almost even load was used as the basis earlier, permanent activity is spoken of today – entire system units are even switched on or off as required for energy efficiency reasons to some extent.

The result is a considerably higher dynamic load of the live connections, mainly in the area of the bus bar, which usually consists of massive copper. The permanent temperature change due to various load cycles introduces an active movement to this system which especially concerns the connecting points fixed by defined torques, for example between the panels or to circuit breakers.

In state-of-the-art switchgears, the affected areas are not accessible due to high degrees of separation according to the standards and can thus not be tested for possible sources of faults as a result of the described dynamics using usual monitoring methods such as infrared cameras.

## TECHNOLOGY

**TOR - Thermo Observation RFID** monitors the switchgear wireless, basing on modern RFID technology using TEMPERATURE as status indicator.

In the process, the sensors called “TAG” are directly connected to the critical connecting points of the bus bars and cyclically send the current values to a parent diagnosis software. An own energy supply for this purpose is not required – the TAGs receive their power from the antenna signal.

In case of a loosened screw connection, the temperature increase resulting from the transition resistance that occurs is detected in relation to the current load of the system and reported to the user with a detailed location description. The user can thus react in an early and efficient manner to the pending fault.

## ADVANTAGES

- **System availability:** The shutdown times for maintenance and inspections are minimized.
- **Energy efficiency:** Heat losses from expensive energy are reliably discovered and prevented.
- **Personal protection:** Sources for potentially severe faults are diagnosed early on.
- **Transparency:** The gapless system status can be analysed across the entire service life cycle.

# Maintenance and retrofit

Industrial production facilities, power plants, data centres or refineries all have one thing in common: They depend on an uninterrupted, reliable supply of electric power – a failure has severe consequences in any case!

The proper condition of the switchgears in the low voltage and medium voltage ranges thus plays a primary role – not only for technical reasons, but also from a legal point of view. According to current legislation, the operator is also responsible for any consequences resulting from incorrectly or improperly maintained systems.

**KÖHL provides support with its profound know-how from more than 45 years of experience in manufacturing and servicing of electrical systems – in the process, our service portfolio is coordinated to comprehensive requirements from all areas of electrical and power engineering:**

## MAINTENANCE, INSPECTION AND TESTING

All measures for the servicing of switchgears are offered and settled according to the legal specifications from a single source. Regular expert maintenance increases both the availability and the service life of the systems.

## TROUBLESHOOTING AND OPTIMIZATION

If needed, the KÖHL After-Sales-Service provides fast and uncomplicated help up to the reactivation of the affected systems. In addition, optimization measures based on the fault analysis can be implemented to prevent similar events in future.

All work is performed by certified personnel according to the strict regulations of SCC\*\* (Safety Certificate Contractors) and proven with corresponding protocols.

## RETROFITTING AND EXPANSION

The exchange of older switchgears for a new system is sometimes not feasible for economic reasons even if the existing technology no longer corresponds with requirements.

For this case, KÖHL assumes the technical equipping of the existing system using circuit breaker retrofitting kits of various manufacturers or even through additional panels based on state-of-the-art components and up-to-date control and protection concepts.



# Professional system protection through intelligent measures

KÖHL's After-Sales-Service offers qualified support in the following scope of services, practically independently of brand and design of the switchgears:

## Low voltage power distribution systems

- Commissioning (support)
- Repairs
- Maintenance
- Expansion

## Medium voltage power distribution systems

- Commissioning (support)
- Protection relay programming (depending on brand and type)
- Parametrization testing of protection relays (depending on brand and type)

## Control systems

- Commissioning support
- Repairs
- Maintenance
- Expansion

## Low voltage ACBs and MCCBs

- Maintenance
- Secondary testing (depending on brand and type upon request)
- Repairs
- Conversion / retrofitting

## Active arc fault protection systems

- Commissioning
- Maintenance
- Retrofitting
- Revision

## Permanent condition monitoring systems for switchgears

- Commissioning
- Maintenance
- Retrofitting
- Revision

## Tests according to DGUV Regulation 3 (BGV A3) for mobile electrical equipment

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