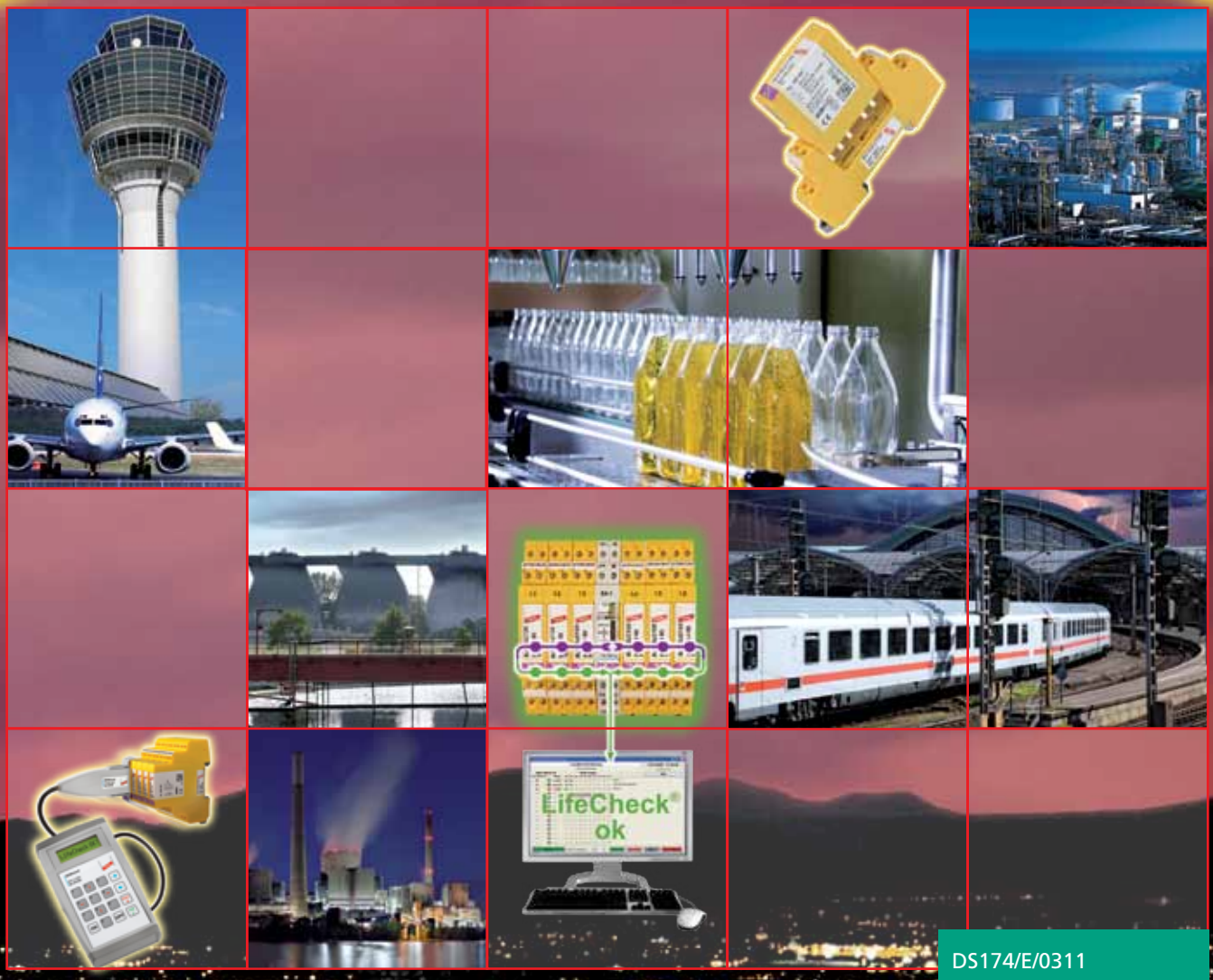
Testing and monitoring

of surge protective devices for information technology systems



DS174/E/0311

Testing and monitoring of surge protective devices

Aims:

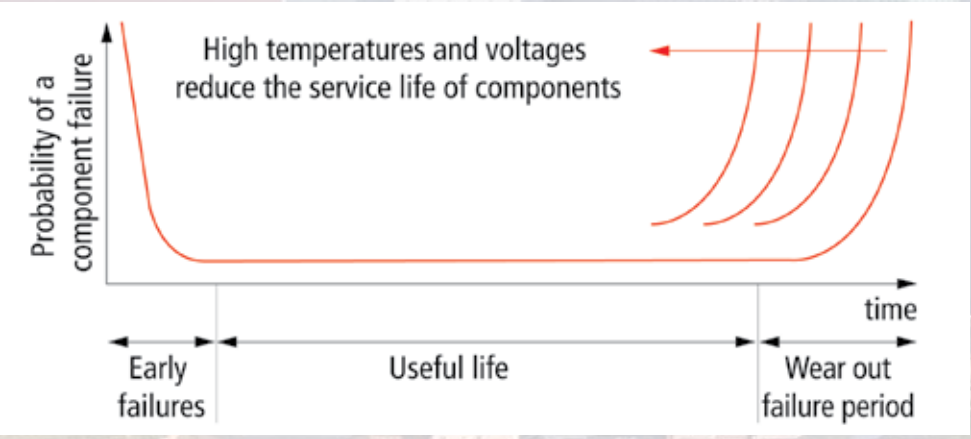
- **Increase of system availability by timely maintenance measures**
- **Reduced maintenance expenditures**

Lightning strikes, which are categorised into distant, nearby or direct lightning strikes, may cause transient overvoltages. Even if the point of strike is several kilometres away, the energy entering the buildings via the conductors might still destruct electrical and electronic consumers.
Lightning current arresters provide protection by safely conducting this high electric energy to the ground via the equipotential bonding system of the building.

Transient overvoltages are not only caused by lightning strikes. Switching operations in high, medium and low-voltage systems are a more frequent cause. They electromagnetically inject interferences into data lines such as those of measuring and control equipment. This means that failure may occur even if the conductors are not directly (galvanically) connected.
These interferences do not present a problem for surge protective devices which reliably discharge these overvoltages.

As with all electrical and electronic devices, components of surge protective devices are subject to ageing. Arresters are overloaded by ageing effects as well as repeated lightning and overvoltage discharge processes due to nearby or direct lightning strikes the energy of which does not comply with the arrester specification. In information technology systems faulty surge protective devices normally interrupt information transmission and the availability of the system to be protected is immediately compromised.

For this reason, it is vital to monitor the status of surge protective devices to ensure protection and availability of the systems.



Failure probability of electronic components as a function of time

Future-oriented surge protection technologies in conjunction with adequate testing and monitoring strategies are an important factor for more efficiency.

DEHN + SÖHNE offers the adequate surge protective device depending on the system availability required.

1. Event-based maintenance

This maintenance strategy accepts failure of surge protective devices. The relevant measures are only taken after the device has failed. This is therefore called event-based maintenance or in some sectors corrective maintenance. The disadvantages are the increased costs due to unexpected downtime, possible overtimes or also the often time-consuming fault diagnostics.

In order to prevent unnecessarily long system downtime, it is essential that surge protective devices have the following three features:

• Fail-safe

Fail: If a surge protective device is damaged by ageing or overload effects, it typically causes a short-circuit and thus interruption of the signal transmission.
Safe: Although information transmission is interrupted and system availability is limited, the system is protected.

A lacking fail-safe characteristic presents a risk for the system to be protected. If a surge protective device is faulty, damage is inevitable in case of the next overvoltage event. Only when signal transmission is interrupted, the system operator has the opportunity to become active. A fault message shows the lacking protection due to the damaged arrester and he can eliminate the fault in due time. More fatal consequences caused by lightning currents or overvoltages can be prevented by means of the fail-safe characteristic.

• Separable surge protective device consisting of protection module and base part

A separable surge protective device consists of a pluggable module comprising all protection components and a base part establishing the connection between the protection module and the data lines. If a surge protective device fails, the electrical components of the protective circuit are damaged. To eliminate the fault it is necessary to replace the faulty parts. In case of non-separable surge protective devices the entire device has to be removed and replaced. The device should be replaced by a licensed electrician and is relatively time-consuming.

BLITZDUCTOR® XT

Moreover, additional faults (e.g. short-circuits) could be generated, which frequently entail consequences and might cause new faults.

Separable surge protective devices allow to re-establish protection in a safe and easy way. The faulty protection module is removed from the base part and is replaced. The easy removal and insertion of the protection module does not require special training and can also be performed by an electrotechnically instructed person.

• Make-before-break switch contact in the base part

If no protection module is plugged into the base part, the integrated switch contact connects the input side of the base part to the output side. Thus, data transmission is also possible without a plugged-in protection module.
If a system fails, fault diagnostics is often relatively difficult. Even if the lacking signal transmission has been recognised, the fault might be hidden somewhere in the signal path. To rule out that a failed surge protective device causes the problem, the surge protective device has to be removed from the signal path and the signal flow has to be re-established. This procedure is very time-consuming and requires detailed knowledge of the system.
If, however, separable surge protective devices with a make-before-break switch contact in the base part are used, fault diagnostics and re-establishment of the signal transmission are much easier. The protection module is removed and the make-before-break switch contact immediately closes the signal circuit. If the signal flow is still interrupted, the protection module can be plugged in again and diagnostics must be continued elsewhere. If the signal is available again, the fault has been found. The availability of the system is immediately re-established. After the protection module has been removed, lightning and/or surge protection of the system is not provided any longer. However, this fact is generally known. To re-establish protection, a new protection module simply has to be plugged into the base part.

In case of event-based maintenance it is important that the surge arrester has a fail-safe characteristic, is separable into base part and protection module and the base part features a make-before-break switch contact, e.g. BLITZDUCTOR® XT. Thus, maintenance is facilitated, the signal flow is consistent, protection is quickly re-established and operation is not compromised by the protection module replacement.

2. Periodic inspection with LifeCheck®

**The surge protective devices are inspected at regular intervals to detect imminent faults thus preventing system downtime.
Already previously damaged surge protective devices are recognised and can be replaced.**

LifeCheck®-monitoring

- **detects thermal or electrical overload of the components,**
- **is easily performed within a matter of seconds,**
- **without removing the module and**
- **can be performed during operation.**

The surge protective devices are inspected at regular intervals and their parameters are measured. These parameters are then assessed according to defined criteria and, if necessary, replaced.

The IEC 62305-3 standard specifies maintenance tests and intervals of a lightning protection system. These are normative minimum requirements.

It is not reasonable to perform visual inspections of surge protective devices for information technology systems since the status of the devices is normally not visible. For this purpose, another procedure has to be selected as is the case for the complete inspection. In the past, costly measuring equipment was used. These measurements required a lot of time, sufficient expertise and were often not very informative as they could not necessarily detect possible previous damage of the components. In addition, system downtime was required.

LifeCheck®-equipped surge protective devices have been available on the market for several years now. They allow to determine the status of the device by means of RFID technology. A monitoring circuit with a transponder in the protection module permanently checks the protective circuit for impermissible overload due to thermal overheating or electrical impulse currents. It is galvanically isolated from the protective circuit and does not require an external energy supply.

In order to read out the status information from the transponder, a RFID reader is required. This RFID reader is integrated in the hand-held device. It contactlessly transmit electromagnetic energy to the transponder via an antenna which is plugged onto the protection module used, reads out its status and indicates it on an LCD display: “SPD OK” or “Replace SPD”. The inspection can be very easily performed within a matter of seconds without removing the arrester. Moreover, it can be performed during operation since it does not interfere with signal transmission.

LifeCheck® already detects previous damage and warns of imminent failure of the surge protective device.

No special expertise is required to perform this easy and fast inspection. The user-friendly reader facilitates the documentation of the inspection required by the IEC 62305-3 standard. The test data (date, time, results) of all surge protective devices are stored and can be transmitted via USB interface to a PC for printing or storage in a database.

DRC MCM XT monitoring device with visual status indication installed next to an arrester with LifeCheck®

The periodic inspection with LifeCheck® already detects overload of the components thus ensuring system availability. The inspection is easy, fast and cost-effective and can be performed at any time during operation.

To be able to detect imminent failure of surge protective devices earlier, the test intervals can be shortened without significantly increasing the required effort.

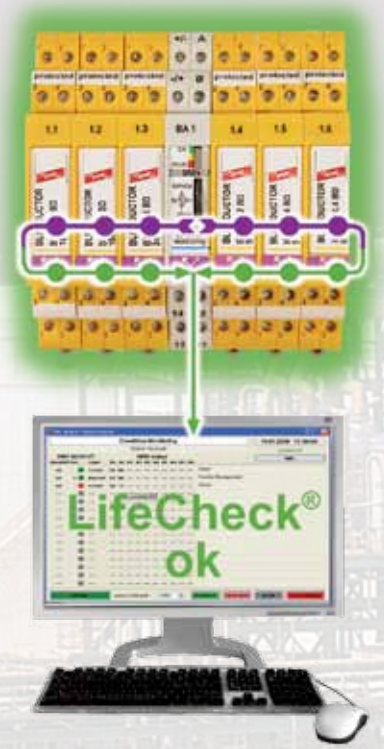
3. Condition monitoring using DEHNrecord MCM

- **Permanent condition monitoring of surge protective devices via LifeCheck® technology**
- **Early detection system detects overload and warns of imminent failure of surge protective devices**
- **Remote signalling option via RS485 and remote signalling contacts**
- **Allows connection to a higher-level control system or another bus system**

The highest degree of protection and permanent availability of systems and installations is indispensable where a relatively high threat to the life or physical condition of persons and/or high economic risks are present (e.g. nuclear power plants, chemical plants, railway systems, air traffic control, highly modern production facilities).

It is of great importance that uninterrupted protection from lightning currents and overvoltages is ensured. In this case, permanent condition monitoring of the surge protection measures is required.

Based on LifeCheck® technology with RFID the surge protective devices can be pretty easily monitored on a permanent basis. Instead of the hand-held test device used for the periodic inspection, DEHNrecord MCM XT, a reader permanently installed in the distribution board, is used for reading out the transponder.



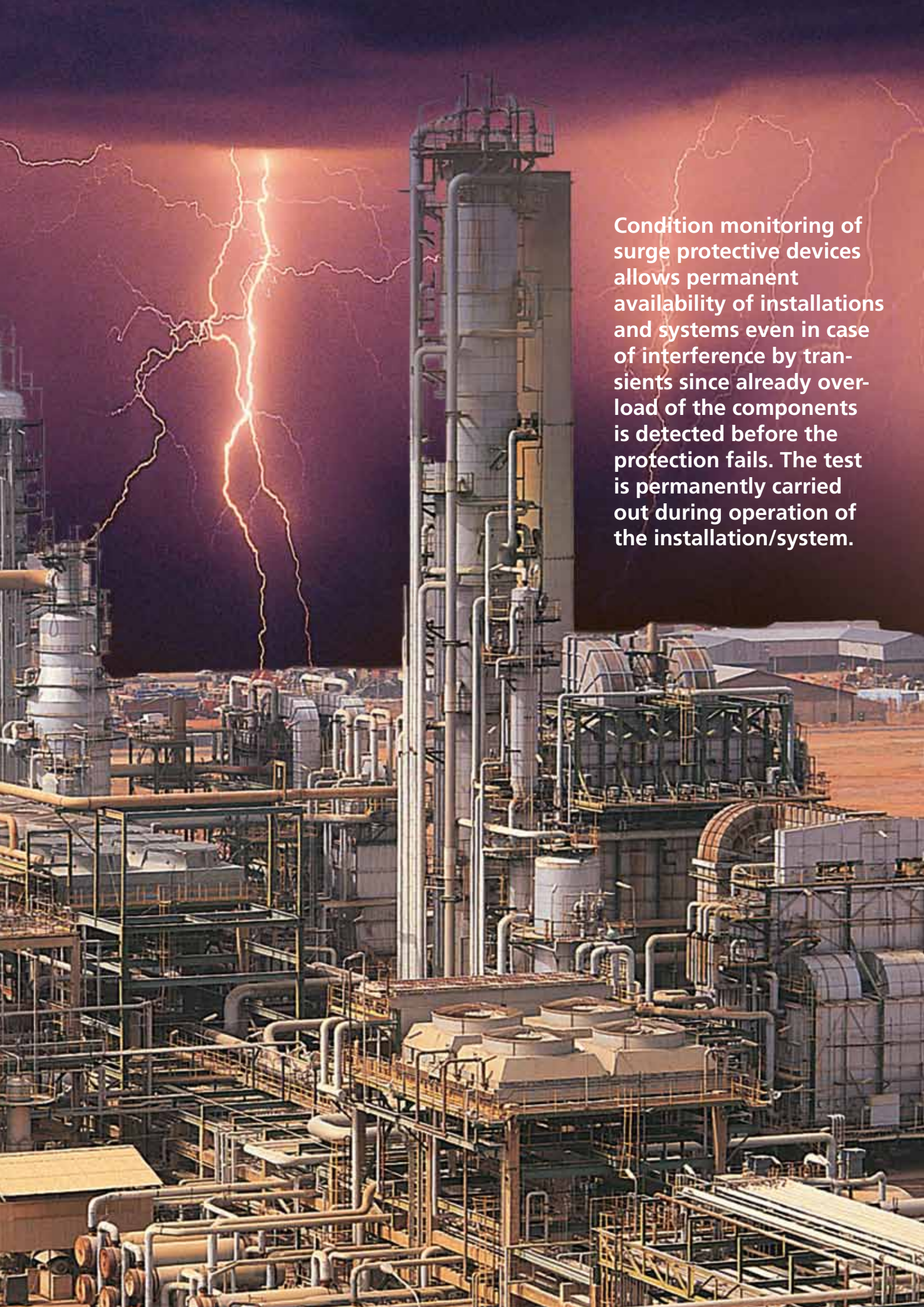
DEHNrecord MCM XT is a DIN rail mounted device which is able to monitor ten BLITZDUCTOR® XT surge protective devices (max. 40 cores) at the same time. In large-scale installations up to 150 surge protective devices can be monitored at the same time by connecting several DRC MCM XT condition monitoring units.

Signalling option:

The status of the monitored devices can be read out by means of the visual indication of the DEHNrecord MCM XT in the junction box. Green means OK and red means that one or several surge protective devices should be replaced. At the push of a button the device indicates the protection module(s) to be replaced. Alternatively the fault message can be transferred to a higher-level control system via a **floating remote signalling contact**. The detailed status of all surge protective devices can also be displayed on a PC via RS485 interface using a software which is available free of charge from DEHN + SÖHNE. This information can optionally be transferred to the PLC or control room via gateway by means of Profibus or another bus system to ensure that the protection modules are replaced in time.

No matter which type of signalling is preferred, once the signal is activated, the arrester does not have to be replaced immediately after receiving this message. Since already previous damage of an arrester is indicated, there normally is still some time left between the fault message and the actual failure of the overloaded arrester. This time can be used to replace the arrester at the next opportunity so that protection and availability of the system are ensured in the future.

DRC MCM XT monitoring device with visual status indication installed next to a BLITZDUCTOR® XT with LifeCheck®



Condition monitoring of surge protective devices allows permanent availability of installations and systems even in case of interference by transients since already overload of the components is detected before the protection fails. The test is permanently carried out during operation of the installation/system.

Selection criteria for testing and monitoring

Risk in case of failure of the system / installation to be protected	Low risk	Average economic risk	High threat to life and physical condition, high economic risk
Acceptable downtime	Few hours/days	Few minutes/hours	None
Application examples	Domestic and commercial systems and devices, buildings	Commercial systems and devices, authorities, public buildings, production sites	Traffic engineering, power supply, databases, computer centres, expensive production sites

Type of testing and monitoring of surge protective devices	EVENT-BASED by means of BLITZDUCTOR® XT*	PERIODIC by means of BLITZDUCTOR® XT and LifeCheck®	PERMANENT Condition Monitoring by means of BLITZDUCTOR® XT with LifeCheck® and DEHNrecord MCM

* All BLITZDUCTOR® XT surge protective devices are already equipped with LifeCheck® so that the surge protective devices of the relevant system can be periodically inspected or permanently monitored at any time without excessive additional expenses.

The more complex and important companies are, the more reliable must be the technology used.

Whatever testing and monitoring measures you will take, surge protective devices from DEHN + SÖHNE provide better protection and thus a higher degree of availability of your systems.

DEHN – your safety is our concern.

Surge protection
Lightning protection / Earthing
Safety equipment

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For information material and services e.g.

- Publication 143:
  BLITZDUCTOR® XT with LifeCheck®
- Main catalogue
  Surge Protection
- Main catalogue
  Lightning Protection / Earthing
- Seminar schedule
- Lightning Protection Guide
- Appointment with our local partner

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