

## Protective devices overview

- Residual current protection from Doepke
- In case of emergency: switch OFF!
- Mobile personal protection
- Safety for high currents
- Protection for 400 Hz networks
- Compact safety: residual current operated circuit-breakers with integral overcurrent protection
- Safety<sup>3</sup>: fire protection switches
- Expert line protection



# Doepke Academy



## Online seminars



- 20–45 minute interactive webinars
- Topics covered: recognising potential hazards, preventative protection technology, up-to-date information on safety guidelines and requirements
- The Doepke talk series: experts respond to your questions live and discuss the latest issues.

Dates and recordings available at: [akademie.doepke.de](https://akademie.doepke.de)



# Residual current protection from Doepke

Type F:  
mixed frequency  
sensitive

Type of residual current	A	F	B+	B
For sinusoidal AC residual currents = AC sensitive	■	■	■	■
For pulsating DC residual currents = pulsating current sensitive and AC sensitive	■	■	■	■
For residual currents with mixed frequencies = mixed frequency sensitive		■	■	■
For smooth DC residual currents = AC-DC sensitive			■	■
Short-time delayed = less faulty tripping, e.g. in response to inrush currents or surge currents during thunderstorms		■	■	■
Residual current detection up to 20 kHz			■	■
Residual current detection up to 150 kHz				■

**DFS Type A** — Standard protection for circuits with a frequency of 50 Hz. Suitable for scenarios where there is no risk of residual currents with a mixed frequency component, or of smooth DC residual currents (> 6 mA).

**DFS Type F** — Single-phase frequency converters generate mixed frequencies and are found in many everyday appliances in homes, workshops and offices (e.g. in washing machines, concrete vibrating tools, hammer drills). Consequently, Type F RCCBs provide future-proof protection for homes, offices and industry.

# The right circuit-breaker for any requirements

## AC-DC sensitive RCCBs

In the event of a fault, smooth DC residual currents can be generated by multi-phase operated or frequency-controlled electronic equipment such as cranes, pumps, fans, compactors or concrete vibrating tools. These can only be reliably detected by AC-DC sensitive RCCBs. They are also the optimum form of protection when using loads with operating frequencies that extend into the kilohertz range. They are stipulated by many standards and make a particularly important contribution to electrical safety on construction sites.

### Type B NK

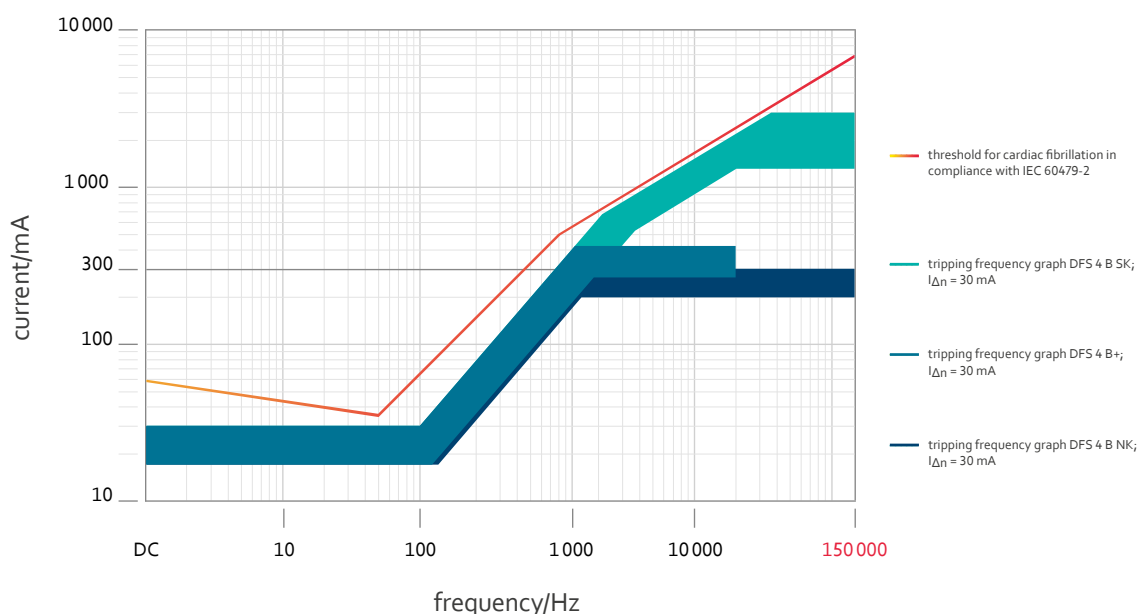
- For facilities at risk of fire
- Preventive fire protection up to max. 150 kHz
- Upper tripping limit of max. 300 mA
- Satisfies the standards DIN VDE 0664-10 and DIN VDE 0664-40
- Exceeds the requirements of standard DIN VDE 0664-400 (Type B+)

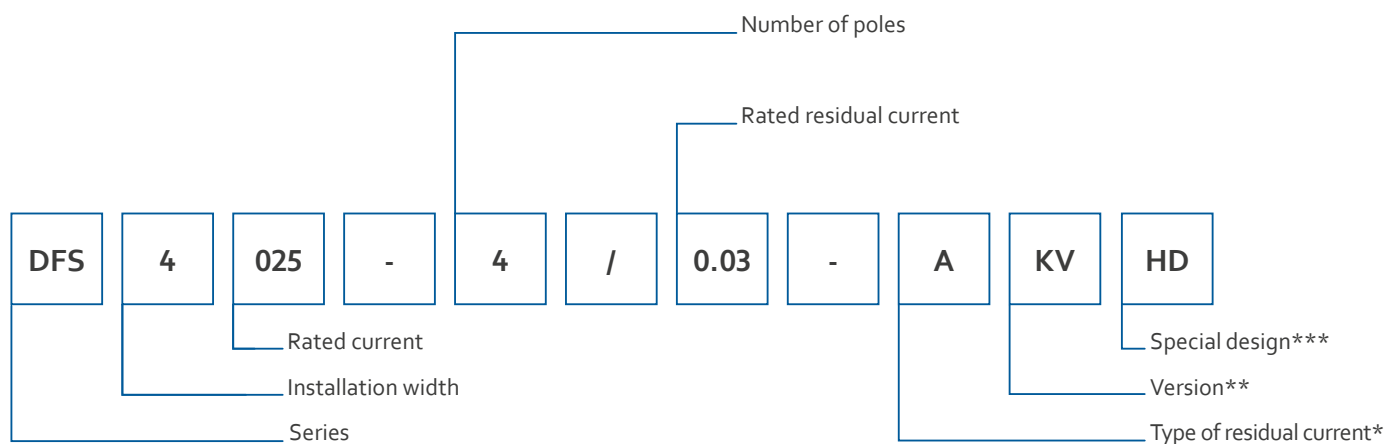
### Type B+

- For facilities at risk of fire
- Fire protection up to max. 20 kHz
- Satisfies standard DIN VDE 0664-400
- Upper tripping limit of 420 mA

### Type B SK

- High system availability
- Tripping characteristic curve optimised for systems with high operational leakage currents
- Satisfies the standards DIN VDE 0664-10 and DIN VDE 0664-40
- With the ability to detect residual currents up to 150 kHz, it exceeds the requirements of the relevant device standard





#### \*Type of residual current

- AC — Type AC (AC sensitive)
- A — Type A (pulsating current sensitive and AC sensitive)
- F — Type F (mixed frequency sensitive)
- B — Type B (AC-DC sensitive)
- B+ — Type B+ (AC-DC sensitive)

#### \*\*Possible versions

- KV — Increased surge current strength: considerably less sensitive to short-term pulsed surge currents
- S — Selective: when RCCBs are connected in series
- FT — With remote tripping: enables functional testing from a distance
- V — Rated voltage  $\neq$  230/400 V
- Hz — For frequencies  $\neq$  50 Hz
- W — Point heater circuit-breaker, voltages up to 500 V
- SK — Tripping threshold of 3 A for frequencies greater than 1 kHz
- NK — Meets the conventional fire protection requirement of 300 mA up to a frequency of 150 kHz
- PV — For photovoltaic systems
- HP — For heat pumps
- EV — For electromobility
- MI — For mobile installations
- NA — Emergency switching-off function according to DIN VDE 0100-723
- FANA — Remote actuator with emergency switching-off function
- IS $\Omega$  HD — Insulation testing without the need for disconnection
- R — Neutral conductor on the right
- Twin — Two RCCBs in one device

#### \*\*\*Special designs

- HD — Heavy-duty design for harsh environmental conditions





# In case of emergency: system OFF!

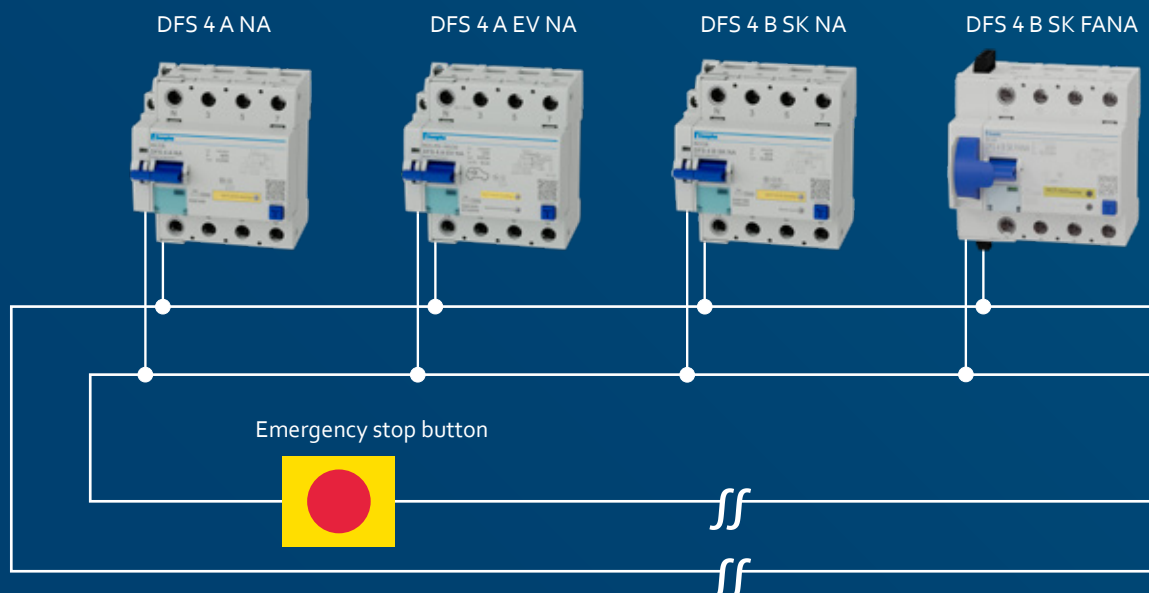
## NA

### – Emergency switching-off

Whenever locations contain circuitry for experiments and tests, it is advisable and sometimes even mandatory (as stipulated by DIN VDE 0100-723) to incorporate an emergency switching-off function into the circuits. In addition to an AC-DC sensitive RCD, there must be a remote-controlled emergency switching-off circuit. The technical requirements stipulate the use of a device that will disconnect all active conductors, including the neutral conductor. Our DFS 4 B NA products accommodate all these requirements in one compact device.

- Continuous monitoring of the external emergency switching-off circuit
- Allows the connection of emergency stop equipment, e.g. a button
- Prevents reclosing of the RCCB while the emergency stop button is activated
- LED signals status of the emergency switching-off circuit
- Auxiliary contact signals that the RCCB has tripped
- Available as Type A and Type B
- Suitable for use in accordance with the requirements of DIN VDE 0100-723

Safe and reliable disconnection with the emergency switching-off function



Product video

## Versions: DFS 4 A EV NA, DFS 4 B SK FANA and DHS 4 FANA

The DFS 4 A EV NA has been developed specifically for use in electric vehicle charging equipment. It offers detection of 6 mA direct currents and an emergency switching-off function in one unit.

### Reliable switching-off and easy switch on

The DFS 4 B SK FANA RCCBs and the DHS 4 FANA switch-disconnectors combine an emergency switching-off function and remote operation in one compact protective device. As soon as a connected emergency stop button is pressed, they fully disconnect all poles of the electrical supply from the connected system components. It's easy to switch back on using the remote control, without having to go a long way to the electrical distribution board.

Remain closed in the event of a voltage drop

Multiple emergency stop buttons can be connected

Meet the requirements of DIN VDE 0100-723  
(DHS FANA when used in combination with a Type B RCCB)

nction.



DHS 4 NA



DHS 4 FANA



Other  
DFS 4 NA or DHS 4 NA

Emergency stop button



# MI

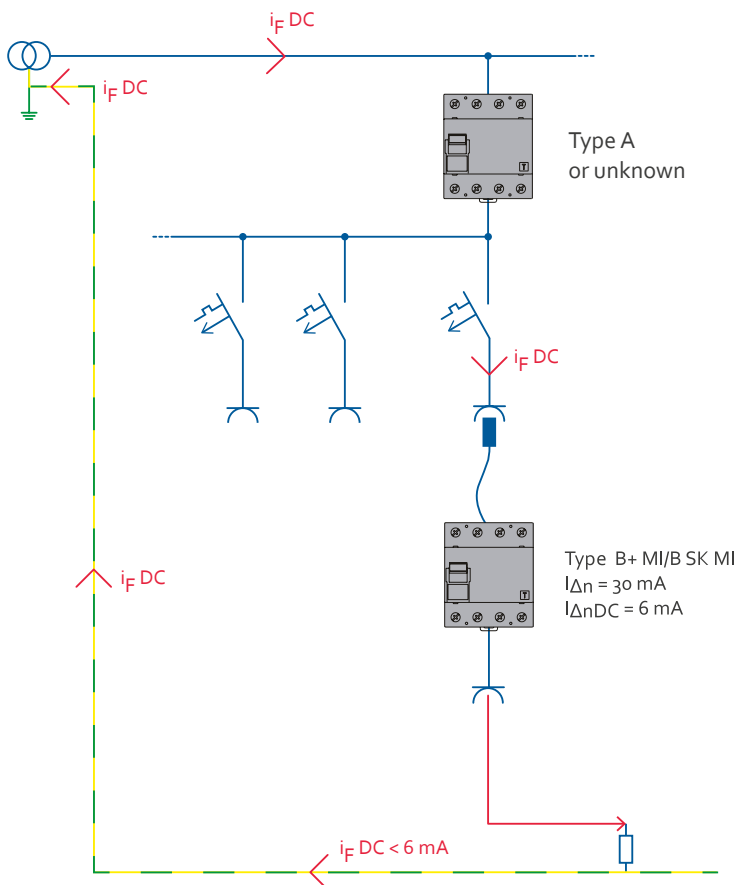
## – For mobile installations

Multi-phase frequency converters are used in mobile installations on construction sites, at festivals, fairs or in similar settings. These applications require Type B RCDs. However, these must not be connected downstream of a Type A RCCB or a device of an unknown type.

The DFS B MI is the only Type B RCCB that can be installed downstream of a Type A RCCB or an unknown-type RCCB. This makes it the ideal solution in cases where smooth DC residual currents may occur, but the upstream protective device is either insufficient or of an unknown type.

- Trips from a DC residual current of 6 mA
- Prevents pre-magnetisation of upstream Type A RCCBs or those of an unknown type and safeguards their protective function
- The only Type B residual current circuit-breaker that can be connected downstream of a Type A or F RCD
- Ideal for electrical loads that can cause DC residual currents and are used in different locations
- DFS 4 B+ MI for use in facilities at risk of fire
- DFS 4 B SK MI for high system availability: perfect for construction sites

Series connection of different types







## Special environmental conditions require special protective measures

### HD

#### – Heavy duty

- The specialist for harsh environments
- Virtually all DFS 2/4 devices are available in the HD special design
- Ideal for construction sites, farms, swimming pools, paint shops, electrical vehicle charging stations
- Less susceptible to corrosive gases, temperature fluctuations, corrosion
- Permanently protected by special alloys and a stainless steel latch – even when de-energised.
- Ready for action 24/7/365



Frost



Heat



Dust



Moisture



Corrosive gases



Mobile  
personal  
protection



## DPRCD-M – the core component for personal protection switches

*The DPRCD-M is a compact module for assembling a five-pole personal protection switch. Installed in a suitable housing, it becomes a mobile PRCD that can be connected between three-phase socket and load. The DPRCD-M combines an AC-DC sensitive residual current device with network and protective conductor monitoring. For increased safety in mobile applications where upstream protective measures are unknown.*

- Protective conductor monitoring
- Undervoltage release
- Mains conductor monitoring
- External residual current detection
- Optional counter-clockwise rotating field interlock
- All-pole disconnection, including protective earth conductor
- Single toggle operation
- Subsidised through BG Bau



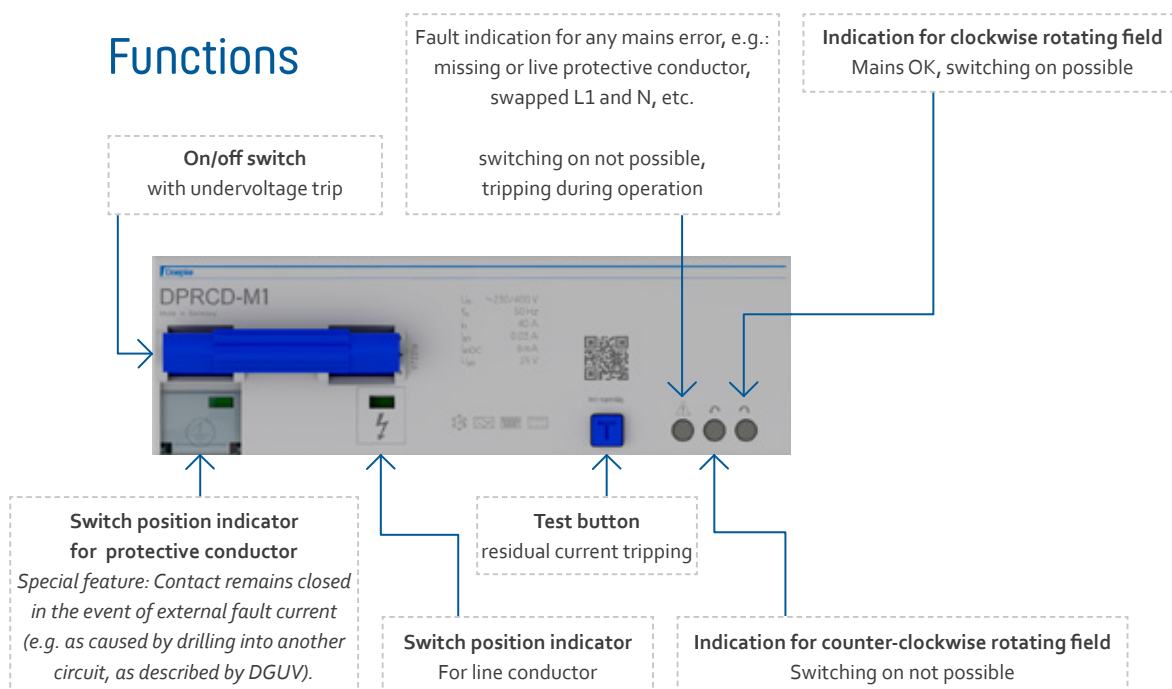
## The safe way to use three-phase current

The DPRCD-M offers an extra level of safety for all applications involving the mobile use of 400 V equipment. From public power connections to mobile generators – a mobile personal protection device with a DPRCD module at its core ensures the safe use of high-voltage current in every situation.

Typical fields of application:

- Fairs
- Concerts
- Event technology
- Rescue operations
- Construction sites
- And many more

## Functions



# DFL 8 – residual current protection for high currents

*The DFL 8 circuit breakers with residual current protection (CBRs) provide reliable protection against residual currents at rated currents up to 250 A.*

*This makes them ideal for use in hospitals with MRI scanners and high current systems requiring selectivity between CBRs connected in series, for industrial and purpose-built buildings.*



- Integrated auxiliary switch
- Conductor cross-sections up to 185 mm<sup>2</sup> connectible
- high short-circuit switching capacity
- Adjustable response delay
- Residual current type A for pulsating currents and AC
- Available as AC-DC sensitive type B with SK and NK tripping characteristics
- Fixed rated residual current of 30 mA or adjustable rated residual current (0.30 A / 0.50 A / 1.00 A / 3.00 A)







# Twin design – RCCB test without switching off

*The DFS 2 Twin combines two fully independent residual current circuit-breakers, enabling function testing without switching off the power supply. When both devices are switched on, one of the circuit-breakers can be triggered via the test button while the other conducts the current and provides the protective function.*

- \_\_\_\_\_ Function test for residual current circuit-breaker without interrupting power
- \_\_\_\_\_ Facilitates the regularly required testing
- \_\_\_\_\_ Standard-compliant residual current protection even during testing
- \_\_\_\_\_ No costs due to system downtime
- \_\_\_\_\_ High system availability
- \_\_\_\_\_ For production facilities, test laboratories, IT systems, and much more

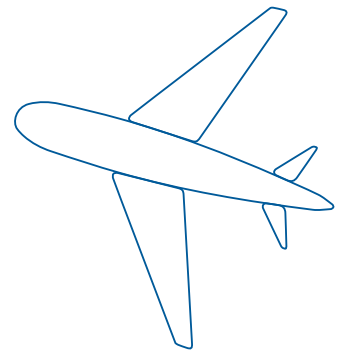


# AC-DC sensitive residual current protection for 400 Hz networks

*The AC-DC sensitive DFS 4 B Hz 400 is ideal for all applications in networks with a 400 Hz mains frequency where smooth DC residual currents may occur.*

## A quick overview of the DFS 4 B Hz 400

- Reliable protection against pulsating and AC residual currents, residual currents with a mixed frequency component and smooth DC residual currents
- For networks with 400 Hz mains frequency
- Suitable for personal protection: tripping threshold adapted to 400 Hz in accordance with IEC 60497
- Energy-efficient thanks to low power loss



For aviation,  
maritime and  
aerospace  
applications

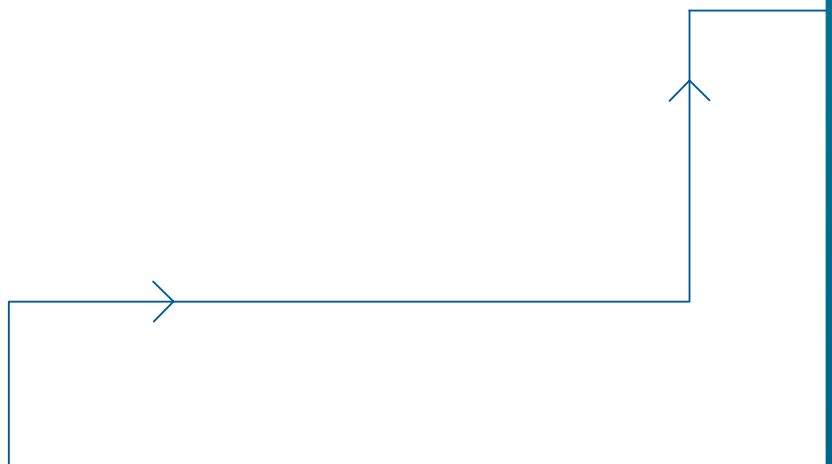
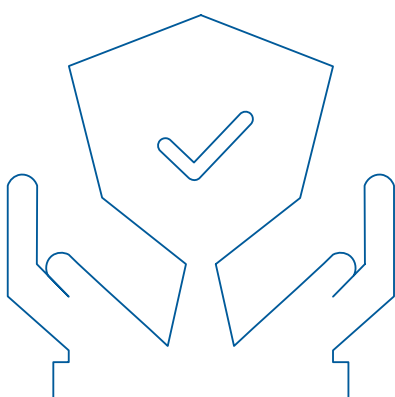




# Heat-resistant residual current protection

*The DFS 4 A HT (high temperatures) is particularly resistant to high temperatures. This makes the pulsating current and AC sensitive RCCB ideal for use in outdoor distribution boards that are exposed to strong solar irradiation and at other locations exposed to high temperatures.*

- Operates reliably at temperatures up to 75 °C
- Delivers full rated current of 40 A even under heat
- No derating required up to 75 °C
- With enhanced resistance to cold, dust, corrosive gases and humidity



# Safe and sound – premium audio quality guaranteed

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*The DFS Audio ensures maximum sonic transparency in circuits designed for audio systems. It is used in recording and television studios as well as in concert halls and is increasingly making its way into the private fuse boxes of musicians, sound engineers and audiophile music and hi-fi enthusiasts. After all, the trained ear of a sound expert can detect even the slightest audio aberrations. As a result, Hi-Fi fans may notice a loss of sound quality in their high-end audio systems when they use standard residual current circuit-breakers. The DFS Audio combines safety and superior sound quality.*

**Protecting sound quality** — The DFS Audio has a special skill: in acoustic terms, it acts as though it's not even there. This is made possible by its construction using high-quality components:

- Silver-plated terminals for conductors up to 50 mm<sup>2</sup>,
- large switching contacts,
- a summation current transformer designed as a push-through transformer,
- and solid silver-plated conductors ensure an extremely low-impedance design, unrestricted current flow, and thus undisturbed sound quality.

**Protection for people and systems** — The DFS Audio is designed as a type F device, meaning it is mixed frequency sensitive. Most audio devices are equipped with transformer-based or switching power supplies, which can generate not only a 50 Hz load current but also additional, significantly deviating components – mixed frequencies. This is no problem for the DFS Audio: In normal operation it withstands mixed frequency fractions and surge currents, and even with mixed frequency residual currents it reliably trips in the event of a fault.

The DFS Audio is available in a two (DFS 2 F Audio) or four-pole design (DFS 4 F Audio) with a rated residual current of 30 mA and for rated currents up to 63 A.



Flawless sound



# Voices on the DFS Audio

Since its launch, the DFS Audio has been extensively tested, reviewed and discussed.

The verdict: Those who have tested the DFS Audio are convinced.

## “Impressively innovative.

The DFS Audio deserves to be heard.

The difference is clear to anyone that uses it.”

(Werner Ero, Home Emotions magazine, the Netherlands)

“The Doepke DFS 2 does not affect the sound.

**Bravo, Doepke!”**

(Mariusz Zielmachowicz,  
post in various audio forums, Poland)

“I’m listening to Harry Belafonte – and immediately I’m transported to Carnegie Hall. Between me and the young Harry Belafonte there are no barriers – physical, electronic or acoustic.

I feel like I’m listening to Harry Belafonte more authentically than ever before.”

(Wolfgang Saul, Audiosaul HiFi studio, Oberhausen)

“I never imagined that an RCCB could have such an  
**impact on the sound.**”

(Michael Helmke, electrician and audiophile)

Read  
the story  
behind it >



“It’s truly **impressive**. A bigger sound stage, more PRaT (pace, rhythm and timing) and the bass is to die for  
**the bass is to die for.”**

(Rocoa, Spanien, user on whatsthebesteforum.com)

“The music became a **force of nature**:

fast, powerful and, in all honesty,  
a little **overwhelming.**”

(Blackmorec, user of whatsthebestforum.com)

“This accessory improves the performance of a sound system so much that I can only think of one drawback – once you’ve installed it,  
**you can never live without it again.”**

(Jorge G., Audio & Cinema em Casa magazine, Portugal)



# Residual current and line protection: residual current operated circuit-breakers with integral overcurrent protection

*Residual current operated circuit-breakers with integral overcurrent protection (RCBOs) are devices that offer combined residual current and line protection. They are the number one choice for reliable protection against residual currents, short-circuits and overloads when it comes to circuits in residential and purpose-built buildings. RCBOs can be used to divide up electrical installations so that only the affected circuit is switched off in the event of a fault.*

## DRCBO 3 A and DRCBO 4 A

- Mains voltage independent protection against AC residual currents and pulsating DC residual currents at the mains frequency
- Conventional residual current protection in residential and purpose-built buildings
- Ideal for socket outlet circuits and conventional lighting
- Available with tripping characteristics B and C
- Optionally available in a short-time delayed and lightning-resistant version (KV)
- Rated residual currents of 10 mA, 30 mA, 100 mA and 300 mA
- Rated currents up to 40 A



Also  
available as a  
mixed frequency  
sensitive Type F



We make the use of electricity safe and provide exciting innovations and developments.

Gerold Roofls, Head of Research and Development

## DRCBO 4 B

### — Compact double protection —

Doepke now offers its residual current operated circuit-breaker with integral overcurrent protection in an even more compact form: The DRCBO 4 B has a module width of just 2.5 units in the two-pole variant, and 4.5 units in the four-pole design. In the event of an overload, short-circuit or residual current, only the faulty circuit is switched off.

In addition to the tripping characteristics already available, B SK and B NK, the residual current operated circuit-breaker with integral overcurrent protection is now also available in a B+ version.

- Significant space savings
- Rated currents up to 32 A
- Rated residual currents of 30, 100 and 300 mA
- VDE-certified

## Even more compact design



Module width of 2.5 instead of 4



Module width of 4.5 instead of 6



# Safety<sup>3</sup> = DAFDD

*The DAFDD arc fault detection devices (AFDDs) combine residual current protection and line protection with reliable arc fault detection – all in one compact unit. These space-saving devices help reduce fire hazards caused by electrical installations and provide dependable safety in bedrooms within care facilities, in locations with elevated fire risk, and in museums.*

- DAFDD**
- Three functions in a single device: RCCB + MCB + AFD
  - Measures just three module widths
  - Simple troubleshooting: Signal indicates cause of tripping (LED flashing code, indicator triggered by fault current, indicator shows contact position)
  - Last AFD fault code is saved,
  - can be read out again
  - Integrated overvoltage protection (> 270 V)
  - Self-monitoring of AFD unit – no manual
  - function test required
  - Residual current type A (pulsating current sensitive and AC sensitive)
  - and A KV (short-time delayed)
  - Line protection: tripping characteristics B and C available





## More than just fire protection: one device, three functions

### Electric arcs and arc faults in series and parallel

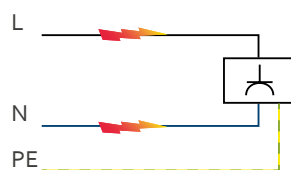
Electric arcs can occur for operational reasons when opening or closing mechanical contacts. These do not present any hazard.

However, even minor damage or insulation faults on conducting lines can cause undesirable arc faults. If these go unnoticed, they can become a fire risk in the electrical installation. Parallel arc faults are detected by MCBs and RCCBs, but series arc faults can go unnoticed if no AFD unit is present.

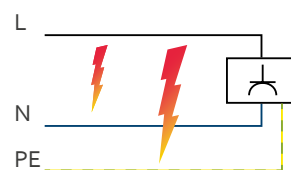
If these dangerous arc faults keep occurring for days, months or even years, they exert thermal stresses on the surrounding material, causing it to undergo changes and, in the worst-case scenario, leading to devastating fires.

### Types of arc fault

Series fault:



Parallel fault:



*DIN VDE0100-420 recommends using arc-fault detection devices in:*

- Premises with sleeping accommodation
- Rooms or places where there is a particular risk of fire
- Rooms or places made from flammable building materials
- Rooms or places where irreplaceable goods may be at risk
- The planner and/or constructor must carry out a risk assessment as early as the planning phase in order to determine whether the use of AFDDs needs to be considered.



# Expert line protection to keep you safe at all times

Our DLS 6 miniature circuit-breakers (MCBs) protect cables, lines and installation devices against overloads and short circuits and – in turn – from damage and premature ageing. They are available in a wide range of versions for use in residential and purpose-built buildings as well as in the industrial sector. Thanks to their compact design and large clamping area, the DLS 6 units are easy to install. A wide range of accessories ensures versatile application options.

**Protection elements** — The structure of the MCB consists of two protection elements.

## Electromagnetic tripping

If the overcurrent increases to the point that it enters the short-circuit range (higher than or equal to the magnetic threshold), the magnet system instantly reacts.

## Thermal tripping

The circuit is interrupted if the rated current is exceeded for a prolonged period and is below the magnetic tripping threshold. The miniature circuit-breaker will not react in the event of brief, minor exceedances.



**Easy to spot** — Our red miniature circuit-breakers:  
— According to DIN VDE 0100-560 (Equipment for safety purposes)  
— switchgear and control gear must be clearly labelled.  
— This applies to final circuits such as  
— Safety lighting  
— Fire alarms  
— Smoke and heat ventilation systems





## Product range

————— The fact that the system components are designed for different functions and levels of performance means that the range offers the ideal solution for a wide variety of applications:

**DLS 6h** ————— The DLS 6h design for skilled trade applications and conventional residential buildings features a rated switching capacity of 6 kA, making it ideal for distributor and final circuits.

**DLS 6h** ————— The DLS 6hsl screwless design for industrial/commercial applications features a rated switching capacity of 6 kA, making it ideal for distributor and final circuits. It is particularly easy to handle thanks to the screwless plug-in terminals at the top.

**DLS 6hdc** ————— The DLS 6hdc design features a rated switching capacity of 6 kA, making it ideal for applications in DC networks of up to 250 V DC.

**DLS 6i** ————— The DLS 6i design features a high rated switching capacity of 10 kA, making it perfect for industrial and mechanical engineering applications.



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