Electrically Ignited Fires in Low-voltage Electrical Installations

Guidance to the world of standards IEC 60364

Low-voltage electrical installations
IEC 60364-4-42
Protection for safety - Protection against thermal effects

Powering Business Worldwide

Hidden fire hazards ...

Help! Fire!

Electrically ignited fire

Fire next to the tallest building in the world

On New Year's Eve 2016, a fire broke out in a hotel (Address Downtown Dubai) and residential building in the vicinity of the famous Burj Khalifa, currently the world's tallest building.
According to police officials, the direct cause of the fire in the 63-storey building was an electric short-circuit, which occurred in between the 14th and 15th floor at approximately 9:30 pm local time. Flames shot up towards the sky from one side of the building and pieces of blazing debris later rained down, yet fortunately only minor injuries were reported during the evacuation process, even though people had gathered in the area for the New Year's fireworks display at the Burj Khalifa only a few hundred metres away.
The evacuation proceeded quickly and smoothly, so the authorities decided to go through with the fireworks display, as planned.

(Source: Reuters, 20 January 2016)

Did you know: 95 per cent of fire victims die as a result of smoke inhalation?
(Source: GDV)

Major fire in apartment building

Centuries-old apartment building destroyed by electrical fire

A massive fire tore through a nearly 200-year-old residential building in Bourne, Massachusetts (USA) on 29 May 2019.
The building had a wooden structure which quickly caught fire and promoted the further spread of the fire into the attic, leading to the collapse of the roof.
All residents of the building holding 9 apartments were safely evacuated, however, a 65-year old man required further treatment at the hospital due to smoke inhalation.
Although it is impossible to determine the exact cause, a spokesperson for the state Department of Fire Services said the fire started in an interior wall and since the only heat source there is electrical, it was ruled that the fire was electrically caused.
According to the State Fire Marshal, electrical fires are the second leading cause of home fire deaths in Massachusetts and the best way to prevent electrical fires is to have all electrical work done by a licensed electrician, have your electrical installation reviewed every 10 years and avoid overloads in outlets.

(Source: The Bourne Enterprise, 30 May 2019)

Did you know: 70 per cent of fire victims are killed in accidents at night in their own home.
(Source: GDV)

Office tower caught fire

Skyscraper collapsed after blaze

Madrid, ES - On a Saturday around midnight, a fire was detected on the 21st floor. The fire spread rapidly throughout the entire building leading to the collapse of the outermost steel parts of the upper floors. Firefighters needed almost 24 hours to extinguish it. While seven firefighters were injured, fortunately nobody was killed in the fire, which was arguably the worst fire in Madrid's history. The city council of Madrid covered the cost of demolishing the remains of the building, estimated at approximately € 22M ($ 32.5M). A new tower called Torre Titania was finished in 2011, replacing the collapsed Windsor Tower. After subsequent investigation the fire was blamed on an electrical fault.

(Source: Wikipedia, Torre Windsor)

Electrical fault in a cultural heritage building

Electrical fault leads to devastating fire in a cultural heritage building

An electrical fault that occurred in a storage room was identified as the cause for the fire that engulfed the first floor of a cultural heritage residential building in the metropolitan area of Quito, Ecuador.
The staircase - including the handrail - of the building were completely destroyed and the wooden flooring of the first floor was also damaged, yet apparently there was no damage to the ground floor of the house, apart from the carbonized wood and debris. The house was overpopulated by some 20 tenants of foreign nationality who were transferred to one of the municipal shelters. According to witness accounts, some desperate residents even jumped out of windows when they realized the building was on fire.

(Source: La Hora, 09 May 2019)

Family home in fire

Electrical problems cause fatal fire

The life of a 37-year old man was claimed by a fire that broke out in a 2-family home in Chelsea, Massachusetts, causing also considerable material damage.

Investigators ruled as cause for the fire an electrical event, since the fire origin was located in an area where there were numerous electrical circuits. In addition, according to the residents' reports, the lights in the first-floor kitchen went out just before the fire was discovered.

What is more, the house's smoke alarms, carbon monoxide alarms and heat detectors were either disconnected, not functional, too old or simply missing, which is why no sounding alarms were heard by first responders.

(Source: Chelsea Record, 10 May 2019)

32 % of all fires are caused by electricity [1)]

16.808 fire deaths in 34 countries (2017) [2)]

$ 11.1 billion damages due to fires in structures not related to wildfires (USA, 2018) [3)]

[1)] Institut für Brandursachenstatistik (2018) and applicable for the fires that were reported between 2002 and 2018
[2)] CTIF (Center of Fire Statistics) report Nr. 24 from 2019 (World Fire Statistics for the year 2017)
[3)] Insurance Information Institute, Facts + Statistics: Fire

Hidden fire hazards ...

The task: reducing the risk of fire

"Fire and water, they are good servants, but bad masters."
Roger L'Estrange

Even today, fire poses a great threat to people and their belongings. Fortunately, the consistent use of technical aids can reduce the risk of fire and its effects.

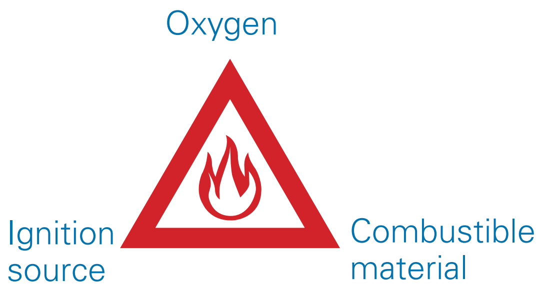
Thank goodness for smoke detectors
A good example of successful risk mitigation is the increased use of smoke detectors, which has reduced the number of annual deaths by fire in Germany over the past 15 years from over 800 to around 400 victims. Smoke detectors enable people in hazard zones to recognize the danger within the critical 2- to 4-minute time window after fire onset, during which the residents can evacuate to safety relatively unharmed. Smoke inhalation is the first negative health effect of fires and can often be fatal which is why it is classified as one of the main fire threats. Consequently, all federal states in Germany have already decided on the mandatory use of smoke detectors.

Increased risk of fire

People
Difficult conditions of evacuation due to:
- Mobility of people
- Number of people
- Special locations

Items
- Combustible materials
  - Storage
  - Processing
- Combustible construction materials
- Assets and goods of significant value

Conditions for a fire



Hidden fire hazards ...

Cause of fire: electric current

How can the risk of electrically ignited fires be reduced?

To answer this question, it helps to pull up some statistics on causes for fire.
Around 32 % of fires are electrically ignited. At this point, a number of technical measures using automatic disconnection are in force, which have proven their effectiveness:
(Source: Institut für Brandursachenstatistik)

Possible cause of fire: excessive current

- A miniature circuit breaker (MCB) recognizes faults whereby a critical treshold value for current is exceeded. MCBs can prevent the thermal destruction of installation parts caused either by short-circuits or overcurrents.

Possible cause of fire: residual current

- A residual current device (RCD) detects if there is a current flowing back to the source through other paths (hence the term "residual") and earth, e.g. a human or animal body or a conductive object not part of the installation. They are essential if protection against electric shock makes disconnecting the circuit necessary and are considered an incomplete solution for protection against electrically ignited fires. Even relatively small residual currents that are, for instance, caused by people making contact with an electrical circuit, can trigger ventricular fibrillation or cause fires respectively.

Possible cause of fire: arc fault

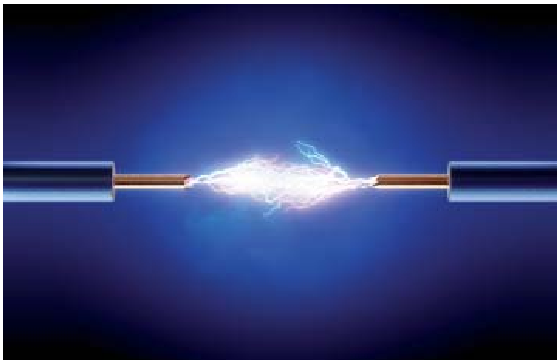
- An Arc Fault Detection Device (AFDD) in accordance with IEC 62606 now fills the major gap in the protection against thermal effects and is able to recognize currents created by an arc fault and disconnect them. These currents are somewhat smaller or the same size as the nominal current, but have a decisive characteristic that distinguishes them from conventional fault currents and short-circuits. High frequencies which are superimposed on the normal nominal current can be reconized using a digital detection device. Therefore arcing currents from serial or parallel faults that cannot be detected by the two above-mentioned protection devices (MCBs and RCDs), but can easily cause fires, can be detected and disconnected by an AFDD.

New: Arc Fault Detection Device

Technical innovation is the solution

Arcs in electrical installations occur quite often and can be a cause of fire. However, so far they remained undetectable by analogue technology. Yet now an innovative device exists, enabling the detection of arc faults. Such arcs are often the spark that ignites fires and have been identified as preventable.
The widespread use of Arc Fault Detection Devices is an important measure to significantly reduce the risk of fire. This simple-to-apply measure prevents the ignition of fires and thus minimises and even eliminates fire damages.

Lightning can cause severe damage.



Even small arc faults, micro-lightning, can ultimately lead to large fires and devastating damage.

Serial and parallel arc faults

Protection against micro-lightning

Severe weather with lightning and rolling thunder makes people uneasy for a good reason – it is dangerous. If these electrical charges come into contact with combustible materials, they can cause fires and severe damage.

However, it is not just large lightning that can cause considerable damage. Small lightning too, so-called arc faults, which can occur within electrical installations, exhibit enormous damage potential.

WHERE
Such micro-lightning can occur in any cable or wire, be it in fixed installations and in cables of directly connected devices or devices connected via sockets.

WHEN
They occur when there are faults or damage to the wires, caused by external influences or ageing. However, a loose terminal connection or careless handling of electrical devices can also be the cause. Such faults and damages can be immediate, or they can occur over longer periods of time of months or even years, creating an undetected fire hazard.

WHY
What type of defect can lead to such micro-lightning and what are the most frequent causes of arc faults?

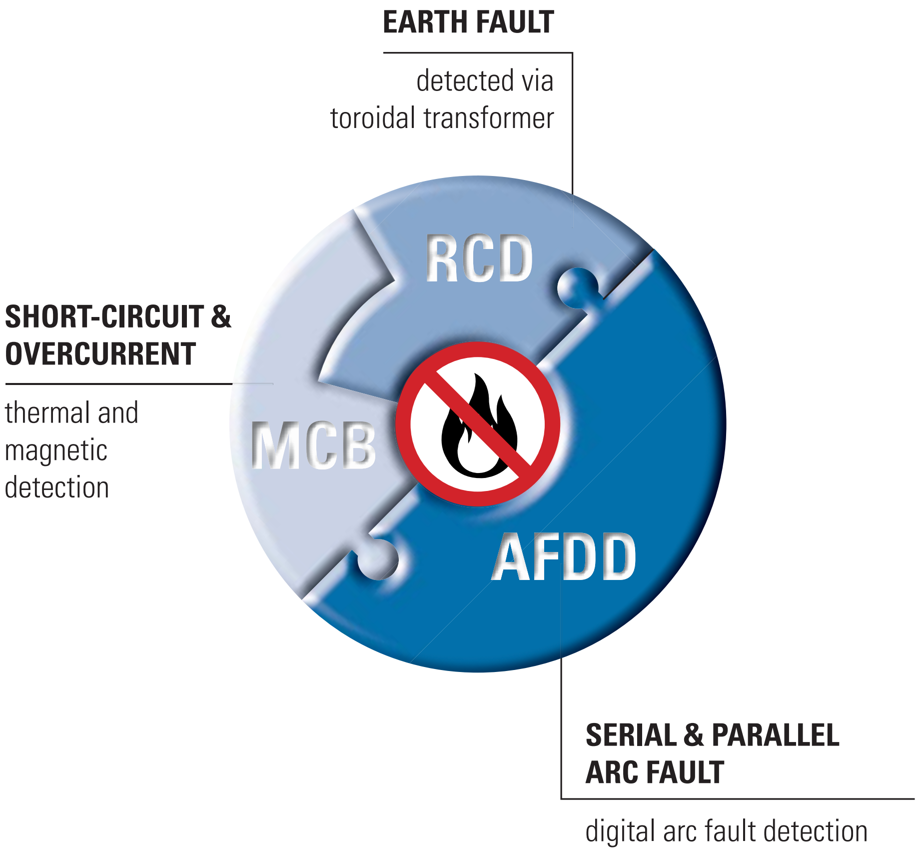
- Crushed wires
- Damage to wire insulations caused by nails, screws, deterioration etc.
- Ageing of installation
- Broken cables or discontinuities in a wire
- UV rays and rodent bites
- Loose contacts and connections
- Bent plugs and wires

Comprehensive protection to reduce fire hazards

Complete protection

Now, there is finally a protective device that can recognize micro-lightning by “listening in“ to the wire. Unlike in short-circuits and earth fault cases, the occurrence of an arc fault still leads to and permits the flow of a normal operating current making its detection more difficult and requiring technical finesse.

Of course, arc fault detection alone cannot protect against all hazards such as short-circuits, overcurrent and earth faults. Therefore, it is reasonable to combine arc detection with circuit breakers and residual current devices in order to fully minimise the risk of electrically caused fires.



IEC 60364-4-42:2010+AMD1:2014

Changes in the standard for low-voltage electrical installations

What has changed in the IEC 60364-4-42 and when did the change become effective?

In comparison with the edition from 2010, in Amendment 1 of 60364-4-42 significant changes were made in November 2014. These are, amongst others:

a) inclusion of additional recommendations for automatic disconnection in case of dangerous electric arcs via arc fault detection devices (AFDDs);

b) inclusion of an informative Appendix A for arc fault detection devices (AFDDs).

These changes have been effective since the 13th of November 2014.

What are the new recommendations?

Arc Fault Detection Devices (AFDDs) in accordance with IEC 62606 are now recommended in final circuits:

• In premises with sleeping accommodations:	e.g. hotels and hostels, daycare centres for children, nurseries, facilities that care for the elderly and sick, schools, residential buildings and apartments
• In locations with risks of fire due to the nature of processed or stored materials:	e.g. barns, wood-working shops, stores of combustible materials, paper and textile processing factories, agricultural premises
• In locations with combustible materials:	e.g. wooden buildings, buildings where the majority of the constructional material is combustible
• In fire propagating structures:	e.g. high-rise buildings, forced ventilation systems
• In locations with endangering of irreplaceable goods:	e.g. museums, national monuments, public premises and important infrastructure such as airports and train stations

Why was a change necessary and why were these recommendations introduced?

So far, the electrical protection concept was incomplete – the detection and effective disconnection of serial arc faults in installations was not possible. The danger substantiated by the fire damage and fire victim statistics can now be combatted – as there is now a new solution that fills this gap.

Was the change to the standard unexpected?

The approach to apply and recommend AFDDs with respect to IEC 60364-4-42 was not unexpected. So far, no protective device being able to detect and effectively disconnect serial arc faults had been identified in IEC 60364, i.e. no device having the capability to significantly lower the risk of electrically ignited fire hazards was mentioned. Although the AFDD product standard was published in 2013 and the first such products were already available in 2012, the IEC 60364 series published in 2014 is the first standard for low-voltage electrical installations that actively recommends the AFDD.

What is the effective date of application for the new IEC 60364-4-42 standard?

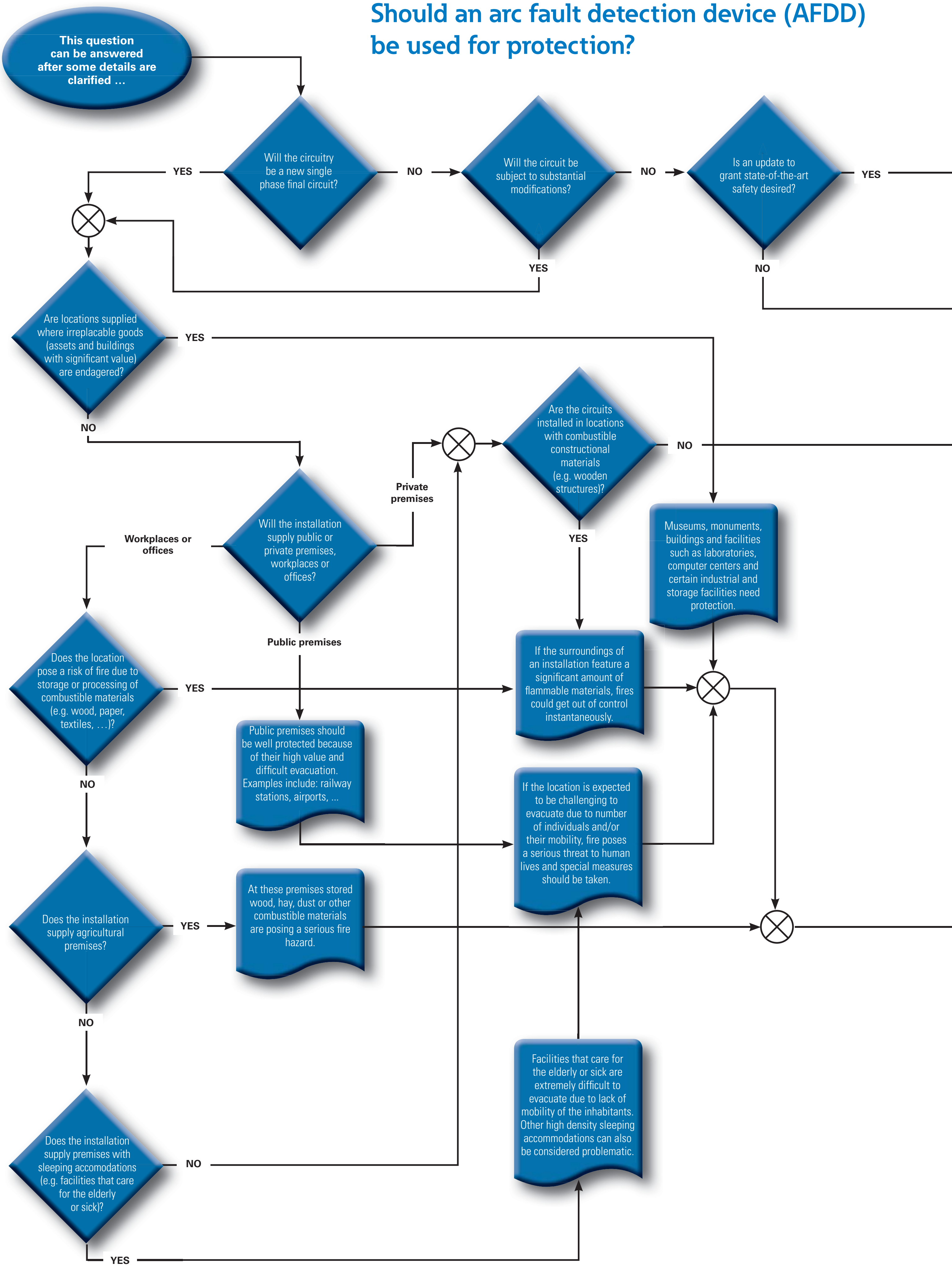
IEC 60364-4-42:2014 represents the state-of-the-art standard for the protection against thermal hazards, and, if not conflicting with any national regulations and laws, it can be applied in any IEC member state worldwide effective immediately. Therefore, its recommendations and technical advice shall be applied immediately if state-of-the-art protection is desired or required. Furthermore, electricians normally follow their national standards based on IEC 60364 or HD 60364 to ensure conformity with legal requirements and low-voltage regulations. If national standards do not yet refer to the application of AFDDs in low-voltage electrical installations, IEC 60364-4-42 represents a suitable framework to increase the safety level for protection against thermal hazards.

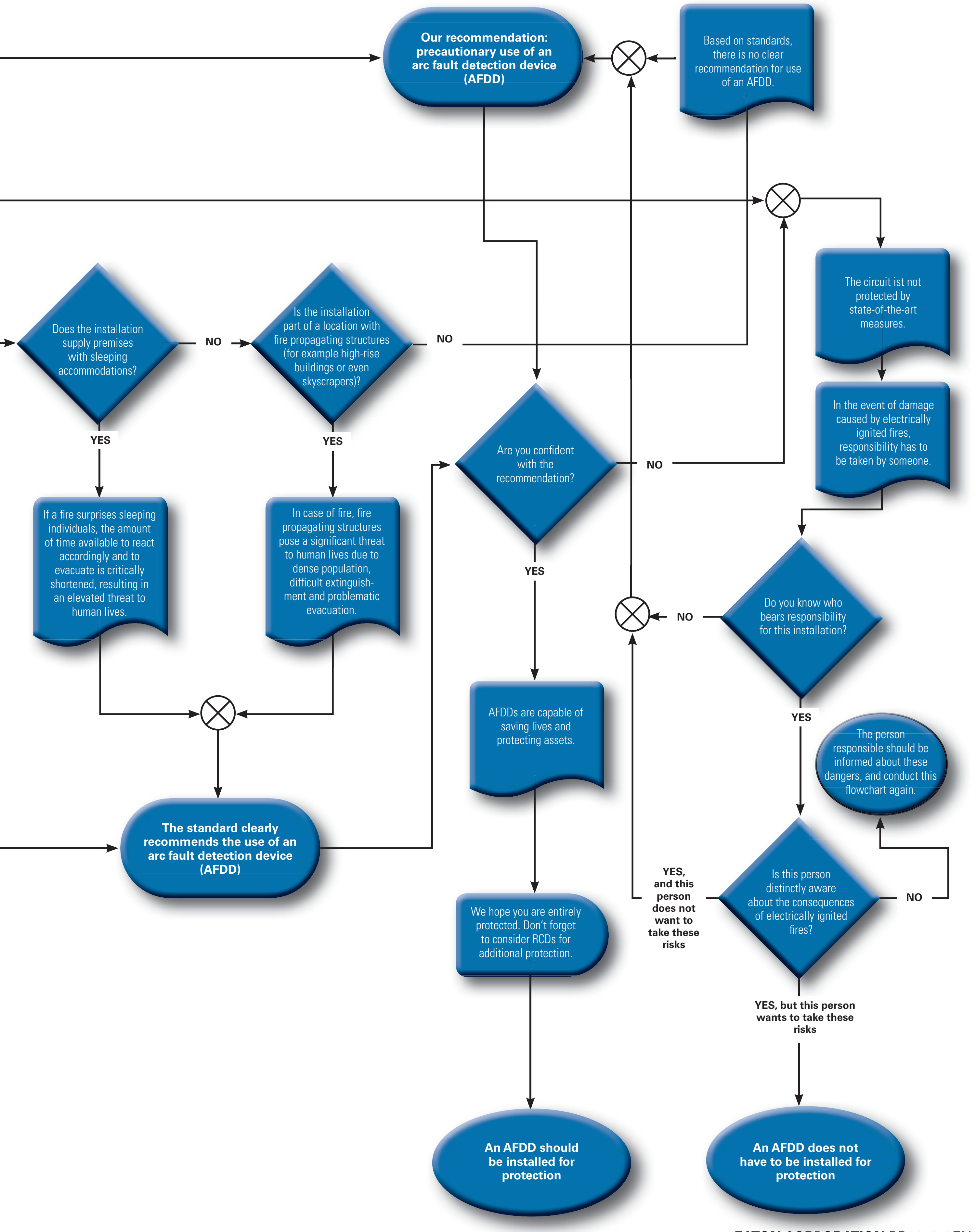
Is there a transition period?

Yes, any IEC standard has a date of publication and a date of withdrawal. The transition period is the time between the date when a new standard has to be implemented on national level and the date when the „old“ conflicting national standards have to be withdrawn.

Possible uncertainties for planners and constructors of electrical systems can be avoided if new standards are applied from the date of publication.

Should an arc fault detection device (AFDD) be used for protection?



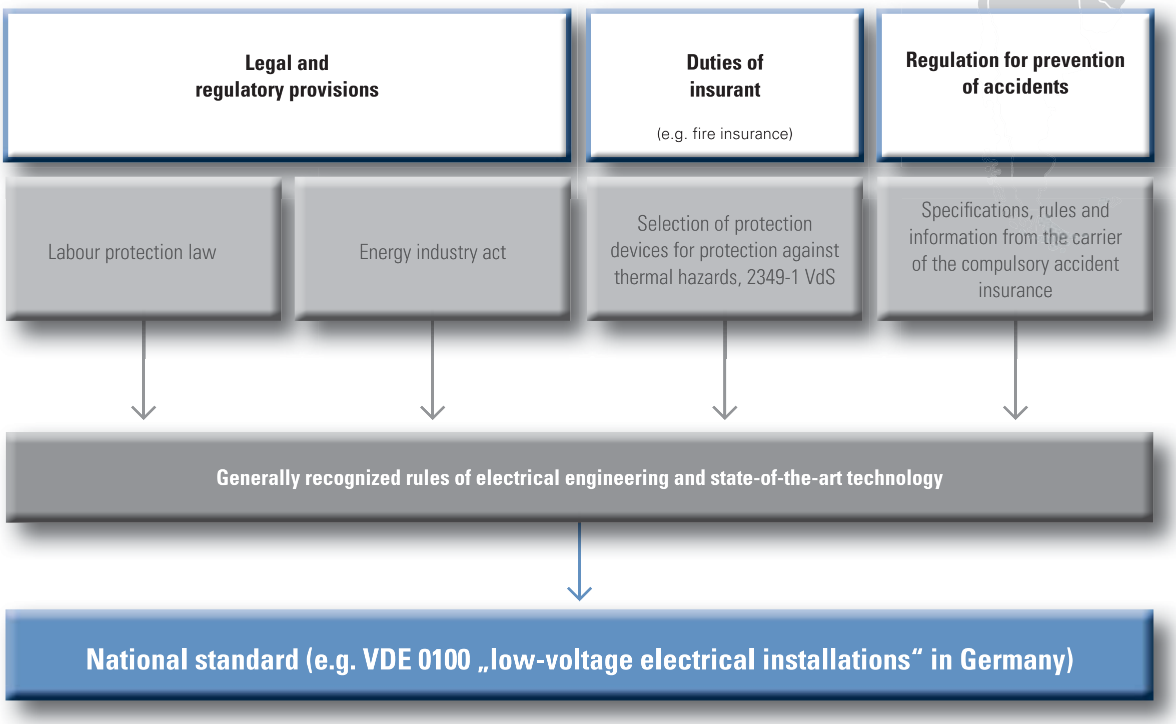

Our recommendation: precautionary use of an arc fault detection device (AFDD)
Based on standards, there is no clear recommendation for use of an AFDD.
The circuit ist not protected by state-of-the-art measures.
In the event of damage caused by electrically ignited fires, responsibility has to be taken by someone.
Does the installation supply premises with sleeping accommodations?
NO
Is the installation part of a location with fire propagating structures (for example high-rise buildings or even skyscrapers)?
NO
YES
YES
If a fire surprises sleeping individuals, the amount of time available to react accordingly and to evacuate is critically shortened, resulting in an elevated threat to human lives.
In case of fire, fire propagating structures pose a significant threat to human lives due to dense population, difficult extinguish-ment and problematic evacuation.
Are you confident with the recommendation?
NO
YES
NO
Do you know who bears responsibility for this installation?
YES
AFDDs are capable of saving lives and protecting assets.
The person responsible should be informed about these dangers, and conduct this flowchart again.
The standard clearly recommends the use of an arc fault detection device (AFDD)
YES, and this person does not want to take these risks
Is this person distinctly aware about the consequences of electrically ignited fires?
NO
We hope you are entirely protected. Don't forget to consider RCDs for additional protection.
YES, but this person wants to take these risks
An AFDD should be installed for protection
An AFDD does not have to be installed for protection

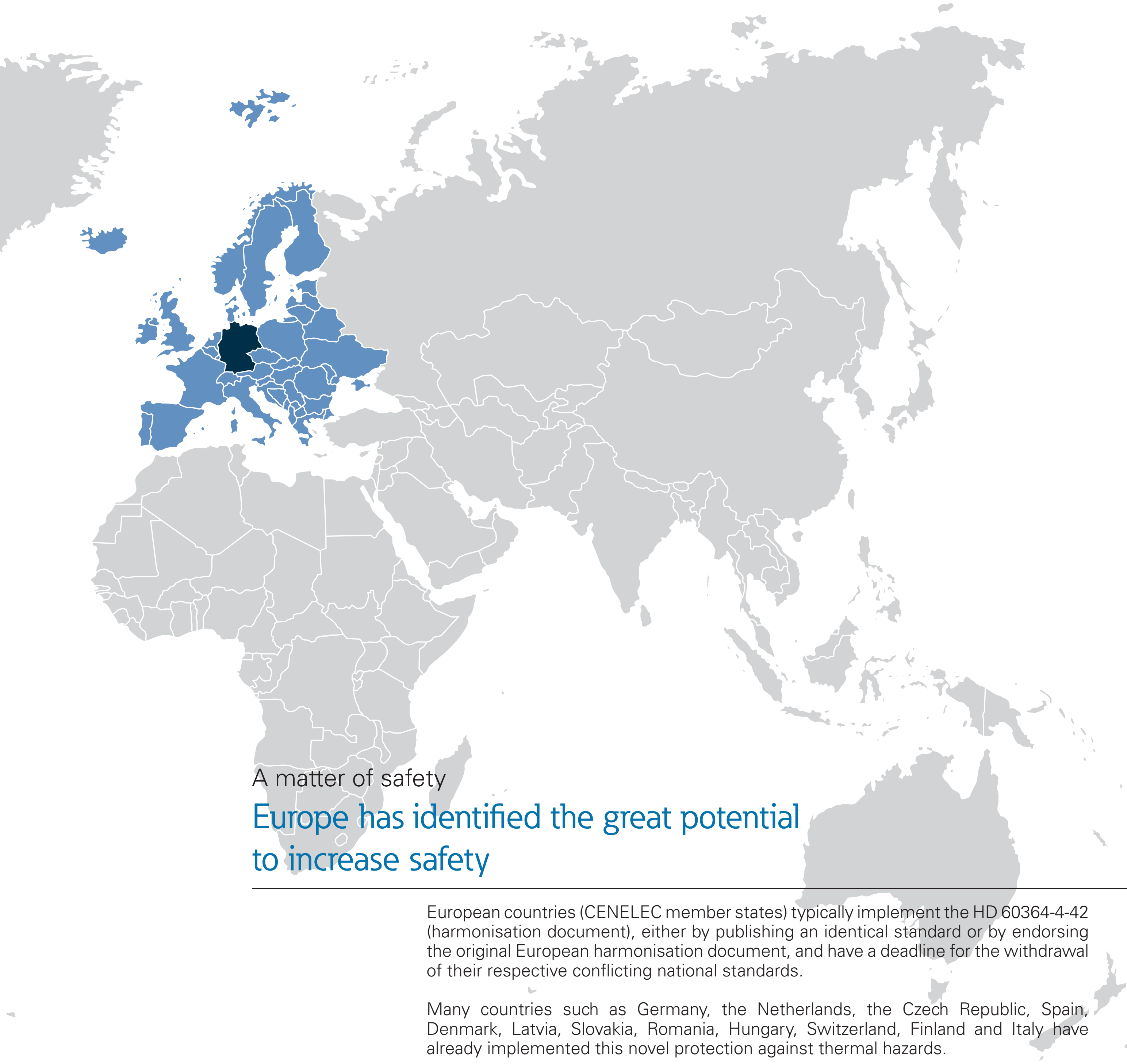
Exemplary provisions in Germany

Legal framework and obligations

The German standards series VDE 0100 "Low-voltage electrical installations" is a distinguished example of how different provisions and obligations build a framework which is based on, and refer to, state-of-the-art technology, such as AFDDs. For low-voltage electrical installations, the German electrician can assume legal compliance and conformity to regulations for all different aspects of electrical installations when following the VDE 0100 series.

By following the recommended installation of AFDDs as stated by VDE 0100-420 "Protection against thermal effects", the legal and regulatory provisions, duties of insurants and regulations for the prevention of accidents are satisfied.





A matter of safety

Europe has identified the great potential to increase safety

European countries (CENELEC member states) typically implement the HD 60364-4-42 (harmonisation document), either by publishing an identical standard or by endorsing the original European harmonisation document, and have a deadline for the withdrawal of their respective conflicting national standards.

Many countries such as Germany, the Netherlands, the Czech Republic, Spain, Denmark, Latvia, Slovakia, Romania, Hungary, Switzerland, Finland and Italy have already implemented this novel protection against thermal hazards.

National standardization committees have been permitted by CENELEC and IEC to introduce the recommendation for the use of the arc fault detection device (AFDD) in low-voltage electrical installations, while cascading down the IEC standard series IEC 60364 to regional standards and national guidelines and regulations.

global	regional	national
IEC — IEC 60364-4-42	CENELEC — HD 60364-4-42	VDE — VDE 0100-420

IEC 60364-4-42

Frequently asked questions about the application of the standard

What is the scope of the standard?

The standard applies to electrical installations with regard to measures for the protection of persons, livestock and property against

- thermal effects, combustion or degradation of materials, and risk of burns caused by electrical equipment,
- flames in case of a fire hazard being propagated from electrical installations to other fire compartments segregated by barriers which are in the vicinity, and
- the impairment of the safe functioning of electrical equipment including safety services.

The use of AFDDs satisfies as special measure to protect against arc faults in final circuits

- in premises with sleeping accommodation,
- in locations with risks of fire due to the nature of processed or stored materials,
- in locations with combustible constructional materials
- in fire propagating structures,
- in locations with endangering of irreplaceable goods.

Where does the standard recommend the installation of AFDDs?

AFDDs are recommended to be installed in final circuits of hotel rooms, sleeping rooms in kindergartens or homes for the elderly, barns, wood-working shops, stores of combustible materials, wooden buildings (e.g. mountain cabins), national monuments, museums and other public buildings, such as railway stations and airports, but also laboratories, computer centres and certain industrial and storage facilities.

Do I have to retrofit my installation?

Retrofitting is only legally required if the system is being technically changed, i.e. in the case of a significant change to the system as well as to parts of existing systems that may be influenced by an extension or modification process.
However, retrofitting should be considered in all cases if there is a chance of damage and an effective protection is technically feasible.

Does an AFDD have to be installed in general in IT systems?

The installation standard does not distinguish between TN, TT and IT networks with respect to the risk of fire. Even in IT networks, serial arc faults can occur.

Despite all this information, I am not sure whether to have an AFDD installed in my electrical system or not. What can I do now?

According to IEC60364-4-42 AFDDs are recommended in final circuits. However, the national committees can implement stricter provisions which may result in having AFDDs required in certain final circuits. When in doubt seek appropriate expert advice.

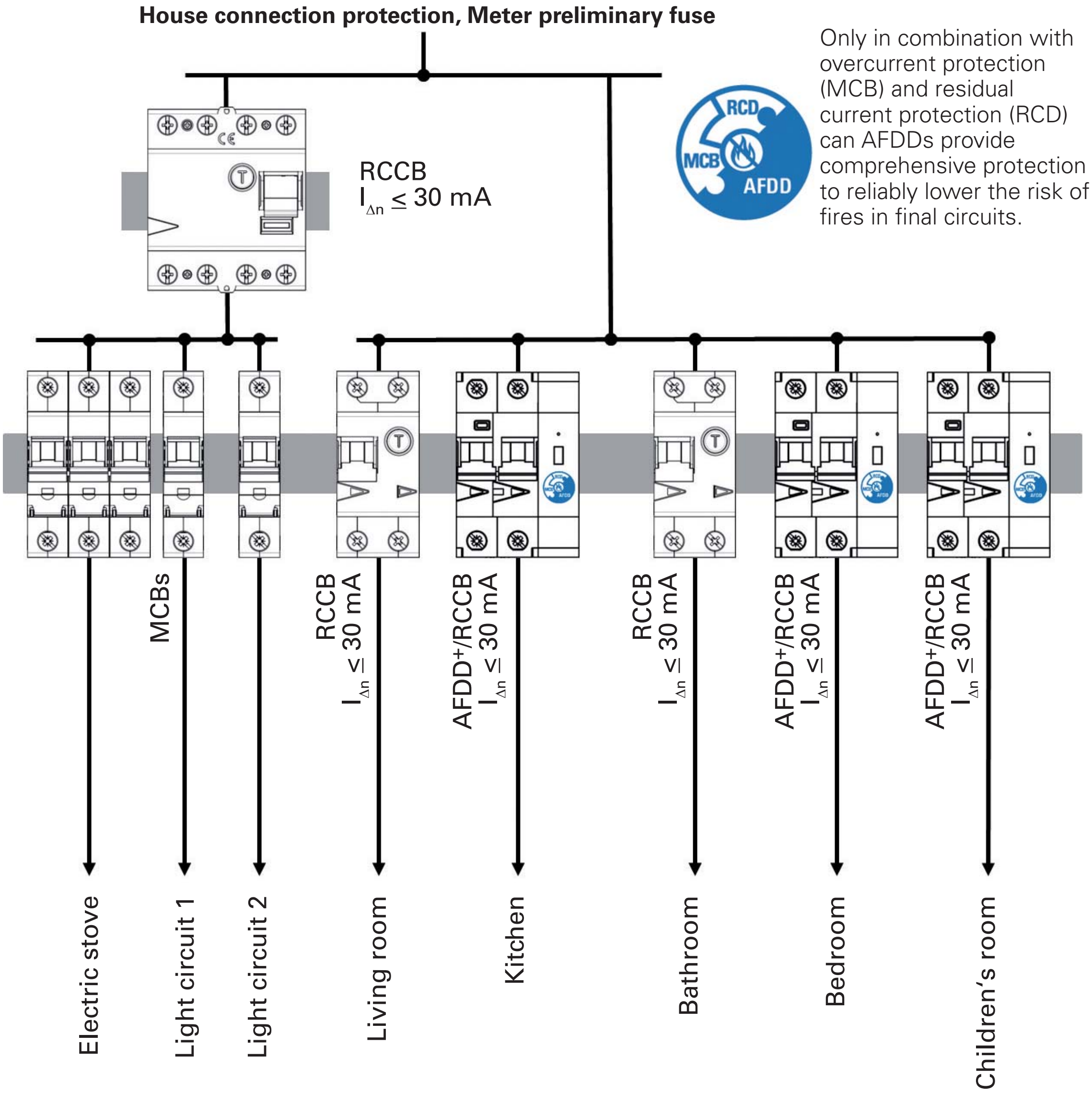
AFDD+, the comprehensive protection for all electrical faults.

Complete protection against all faults occurring in single-phase final circuits in just one single device.
It is not sensitive to:
- Arcs formed due to opening or closing of contacts
- Brush sparking in motors of vacuum cleaners, drilling machines and other handheld power tools
- Welding machines, plasma cutters

Nor is the AFDD+ influenced by high frequency noise such as:
- PowerLAN
- PowerNET

Prevention: lowering the risk of electrically ignited fires

Example: apartment (TN system)



* Please note that the AFDD+ has a defined line and load side.

Questions about installation

Do AFDDs only have to be used in final circuits?

AFDDs are recommended to protect against the effects of arc faults in final circuits only. If used, AFDDs shall be placed at the origin of the final circuit to be protected.

Is there a limitation to amperage?

The IEC 60364 series does not limit the application of AFDDs to amperage in final circuits.

What about protecting three-phase final circuits?

IEC 60364 does not distinguish between single- and three-phase final circuits. The AFDD product standard IEC 62606 covers single-phase devices, three-phase devices are under consideration.
As the majority of installations are provided with single-phase final circuits, it is clear that today's focus is on single-phase final circuits and their protection.

Why is it not wise to combine AFDDs with miniature circuit breakers (MCBs) only?

The combination of AFDDs with MCBs only is protecting against short-circuits, overcurrents and arc faults which can be an ignition source for fires. However, this combination cannot protect against all electrical hazards.
A higher level of protection can be achieved if the AFDD is equally combined with short-circuit, overcurrent and residual current protection.
This combination offers the most reliable and most comprehensive protection in final circuits. Combining the AFDD with an RCBO (combination of RCCB and MCB) is today's most convenient way of offering complete protection and lowering the risk of electrically ignited fires.

Questions about retrofitting

I already have an electrical installation, but I would still like to protect my home. Can I retrofit it with an AFDD?

No problem; an AFDD can be built into an installation at any time. Usually, there are additional slots available for an extension. When retrofitting a home installation with an AFDD, the introduction of a combination device with a residual current and an MCB function is worth considering.

However, the retrofitting needs to be performed by an electrically skilled person.

Is it really necessary to install an AFDD?

With older electrical installations, it was not yet possible to install an arc fault detection device, so these systems had no way of detecting active arc faults. Therefore, electrically caused fires used to occur, injuring and killing many people and causing countless millions, even billions of euros worth of damage to building structures, machines, installations and goods. Oftentimes retrofitting or installation is not legally mandatory, but it is possible, and it is the only way of protecting homes, property and goods actively. The decision of whether or not to install this protective device, if there is no legal requirement to do so, lies with each individual.

Questions about added value and cost factor

What added value emerges from the use of an AFDD?

The additional protection against electrically caused fires provides comprehensive protection for electrical systems and their supplied premises. This simple measure can actively prevent damage to human beings and goods.

What additional costs must be planned for projects?

As additional costs do not affect every circuit, but only the final circuits for which the AFDDs will be installed, the added value gained is clearly higher than the additional costs incurred.

Arc faults or arc flashes

What is the difference between an arc flash and an arc fault?

In practice, the term „arc flash“ classically refers to an arc that occurs in high-power systems, in areas with a low or even high voltage. The causes are mostly parallel fault currents between multiple phases, phase and neutral (conductor) or phase and earth. However, arc flashes can also occur as breaking sparks on railways, for example.

The term arc flash comes about due to the high current (25-150 kA or higher) that leads to an explosive increase in pressure and temperature. So-called arc flash detection devices (e.g. ARCON®) are protection devices that create an intentional mechanical short-circuit within a few milliseconds in order to dissipate the energy from the arc flash as quickly as possible via an induced voltage drop. This short-circuit is created in the physical close proximity of the main switch and is maintained until the main switch is disconnected, so typically a few hundred milliseconds.

Arc faults describe arcing currents within the nominal or operating current of a system (mostly less than 125 A). These appear mostly in low-voltage installations and can remain undetected for a long time. They can occur, for instance, due to broken, crushed or damaged cables and wires, as well as loose contact points and isolation faults. Arc faults typically occur as serial arcs along a wire or termination clamp. Under certain circumstances, they also occur as parallel arcs between phase and neutral conductors. Arc faults can only be effectively detected and disconnected by AFDDs. Even arc faults of currents as little as a few amperes can ignite materials surrounding the location of the fault.

Questions about the initial testing of the installation

As an electrically skilled person, how can I ensure the effectiveness of the protective measures, test the AFDD and document the testing?

The AFDD+ combines the AFD-unit, RCCB and MCB functionalities. The EATON AFD-unit can be tested with the test button, this triggers a built-in self-test function to check the AFD-unit electronics and finally triggers the RCCB part, too. In addition, the EATON AFD-unit periodically performs a self-test and checks all electronic functions. The MCB and RCCB parts need initial testing. The MCB part has to be chosen according to the nominal current and the possible short-circuit current of the final circuit. The latter has to be checked with an installation tester. Finally, the RCCB part needs tripping with an installation tester. The verifications of the MCB and RCCB parts have to be documented in a test protocol.

Arc Fault Detection Device AFDD+

sg06416

Description

- Arc Fault Detection Device acc. to IEC/EN-62606
- Detects and quenches arc faults in final circuits
- Fully combined with residual current circuit breaker (RCCB) and miniature circuit breaker (MCB)
- 2-pole: Both clearances between open contacts are protected
- Variable installation of N either to the left or right
- Rated currents from 6 to 40 A
- Contact position indicator red – green
- Tripped indication: MCB, RCCB or AFDD
- LED indication for arc faults
- Permanent self-monitoring
- Overvoltage and overheat monitoring
- Guide for secure terminal connection
- 3-position DIN rail clip, permits removal from existing busbar system
- Comprehensive range of accessories suitable for subsequent installation
- 10 and 30 mA rated residual currents
- Tripping characteristics B, C
- Rated breaking capacity up to 10 kA
- The -OL types are specifically designed to fullfill the tripping characteristic requirements of $I_2 \leq I_z$ in the Norwegian electrotechnical standard NEK 400-8-823.

Type F, 10 kA, Surge current-proof 3 kA, sensitive to residual pulsating DC

sg06416

Characteristic B

$I_n/I_{\Delta n}$ (A)	Type Designation	Article No.	Units per package
10OL/0.03	AFDD-10/2/B/003-F-OL	MB-300184	1/40
13OL/0.03	AFDD-13/2/B/003-F-OL	MB-300185	1/40
15OL/0.03	AFDD-15/2/B/003-F-OL	MB-300186	1/40
20OL/0.03	AFDD-20/2/B/003-F-OL	MB-300187	1/40
10/0.01	AFDD-10/2/B/001-F	187243	1/40
13/0.01	AFDD-13/2/B/001-F	187253	1/40
16/0.01	AFDD-16/2/B/001-F	187263	1/40
20/0.03	AFDD-20/2/B/003-F	187272	1/40
25/0.03	AFDD-25/2/B/003-F	187278	1/40

Characteristic C

$I_n/I_{\Delta n}$ (A)	Type Designation	Article No.	Units per package
10OL/0.03	AFDD-10/2/C/003-F-OL	MB-300179	1/40
13OL/0.03	AFDD-13/2/C/003-F-OL	MB-300180	1/40
15OL/0.03	AFDD-15/2/C/003-F-OL	MB-300181	1/40
20OL/0.03	AFDD-20/2/C/003-F-OL	MB-300182	1/40
6/0.01	AFDD-6/2/C/001-F	MB-300178	1/40
10/0.01	AFDD-10/2/C/001-F	187249	1/40
13/0.01	AFDD-13/2/C/001-F	187259	1/40
16/0.01	AFDD-16/2/C/001-F	187269	1/40
20/0.03	AFDD-20/2/C/003-F	187275	1/40
25/0.03	AFDD-25/2/C/003-F	187281	1/40

Type F, 6 kA, Surge current-proof 3 kA, sensitive to residual pulsating DC

sg06416

Characteristic B

$I_n/I_{\Delta n}$ (A)	Type Designation	Article No.	Units per package
32/0.03	AFDD-32/2/B/003-F	187284	1/40
40/0.03	AFDD-40/2/B/003-F	187290	1/40

Characteristic C

$I_n/I_{\Delta n}$ (A)	Type Designation	Article No.	Units per package
32/0.03	AFDD-32/2/C/003-F	187287	1/40
40/0.03	AFDD-40/2/C/003-F	187293	1/40

Type G/A, 10 kA, 2-pole, Surge current-proof 3 kA, sensitive to residual pulsating DC

sg06416

Characteristic B

$I_n/I_{\Delta n}$ (A)	Type Designation	Article No.	Units per package
10OL/0.03	AFDD-10/2/B/003-G/A-OL	MB-300163	1/40
13OL/0.03	AFDD-13/2/B/003-G/A-OL	MB-300166	1/40
15OL/0.03	AFDD-15/2/B/003-G/A-OL	MB-300167	1/40
20OL/0.03	AFDD-20/2/B/003-G/A-OL	MB-300172	1/40
10/0.01	AFDD-10/2/B/001-G/A	MB-300194	1/40
13/0.01	AFDD-13/2/B/001-G/A	MB-300195	1/40
16/0.01	AFDD-16/2/B/001-G/A	MB-300196	1/40
10/0.03	AFDD-10/2/B/003-G/A	MB-300162	1/40
13/0.03	AFDD-13/2/B/003-G/A	MB-300165	1/40
16/0.03	AFDD-16/2/B/003-G/A	MB-300168	1/40
20/0.03	AFDD-20/2/B/003-G/A	MB-300170	1/40
25/0.03	AFDD-25/2/B/003-G/A	MB-300173	1/40

Characteristic C

$I_n/I_{\Delta n}$ (A)	Type Designation	Article No.	Units per package
10OL/0.03	AFDD-10/2/C/003-G/A-OL	MB-300148	1/40
13OL/0.03	AFDD-13/2/C/003-G/A-OL	MB-300150	1/40
15OL/0.03	AFDD-15/2/C/003-G/A-OL	MB-300151	1/40
20OL/0.03	AFDD-20/2/C/003-G/A-OL	MB-300154	1/40
6/0.01	AFDD-6/2/C/001-G/A	MB-300188	1/40
10/0.01	AFDD-10/2/C/001-G/A	MB-300189	1/40
13/0.01	AFDD-13/2/C/001-G/A	MB-300191	1/40
16/0.01	AFDD-16/2/C/001-G/A	MB-300192	1/40
6/0.03	AFDD-6/2/C/003-G/A	MB-300138	1/40
10/0.03	AFDD-10/2/C/003-G/A	MB-300147	1/40
13/0.03	AFDD-13/2/C/003-G/A	MB-300149	1/40
16/0.03	AFDD-16/2/C/003-G/A	MB-300152	1/40
20/0.03	AFDD-20/2/C/003-G/A	MB-300153	1/40
25/0.03	AFDD-25/2/C/003-G/A	MB-300155	1/40

Type G/A, 6 kA, 2-pole, Surge current-proof 3 kA, sensitive to residual pulsating DC

sg06416

Characteristic B

$I_n/I_{\Delta n}$ (A)	Type Designation	Article No.	Units per package
32/0.03	AFDD-32/2/B/003-G/A	MB-300174	1/40
40/0.03	AFDD-40/2/B/003-G/A	MB-300222	1/40

Characteristic C

$I_n/I_{\Delta n}$ (A)	Type Designation	Article No.	Units per package
32/0.03	AFDD-32/2/C/003-G/A	MB-300158	1/40
40/0.03	AFDD-40/2/C/003-G/A	MB-300159	1/40

$I_n/I_{\Delta n}$ (A)	Type Designation	Article No.	Units per package

Type A, 10 kA, 2-pole, Short-time delayed, sensitive to residual pulsating DC

sg06416

Characteristic B

$I_n/I_{\Delta n}$ (A)	Type Designation	Article No.	Units per package
6/0.01	AFDD-6/2/B/001-Li/A	MB-300210	1/40
10/0,01	AFDD-10/2/B/001-Li/A	187166	1/40
13/0,01	AFDD-13/2/B/001-Li/A	187178	1/40
16/0,01	AFDD-16/2/B/001-Li/A	187202	1/40
6/0.03	AFDD-6/2/B/003-Li/A	MB-300226	1/40
10/0,03	AFDD-10/2/B/003-Li/A	187169	1/40
13/0,03	AFDD-13/2/B/003-Li/A	187181	1/40
16/0,03	AFDD-16/2/B/003-Li/A	187205	1/40
20/0,03	AFDD-20/2/B/003-Li/A	187220	1/40
25/0,03	AFDD-25/2/B/003-Li/A	187226	1/40

Characteristic C

$I_n/I_{\Delta n}$ (A)	Type Designation	Article No.	Units per package
6/0.01	AFDD-6/2/C/001-Li/A	MB-300207	1/40
10/0,01	AFDD-10/2/C/001-Li/A	187172	1/40
13/0,01	AFDD-13/2/C/001-Li/A	187184	1/40
16/0,01	AFDD-16/2/C/001-Li/A	187208	1/40
6/0.03	AFDD-6/2/C/003-Li/A	MB-300223	1/40
10/0,03	AFDD-10/2/C/003-Li/A	187175	1/40
13/0,03	AFDD-13/2/C/003-Li/A	187187	1/40
16/0,03	AFDD-16/2/C/003-Li/A	187211	1/40
20/0,03	AFDD-20/2/C/003-Li/A	187223	1/40
25/0,03	AFDD-25/2/C/003-Li/A	187229	1/40

Type A, 6 kA, 2-pole, Short-time delayed, sensitive to residual pulsating DC

sg06416

Characteristic B

$I_n/I_{\Delta n}$ (A)	Type Designation	Article No.	Units per package
32/0,03	AFDD-32/2/B/003-Li/A	187232	1/40
40/0,03	AFDD-40/2/B/003-Li/A	187238	1/40

Characteristic C

$I_n/I_{\Delta n}$ (A)	Type Designation	Article No.	Units per package
32/0,03	AFDD-32/2/C/003-Li/A	187235	1/40
40/0,03	AFDD-40/2/C/003-Li/A	187241	1/40

Type A, 10 kA, 2-pole, short-time delayed, sensitive to residual pulsating DC

sg06416

Characteristic B

$I_n/I_{\Delta n}$ (A)	Type Designation	Article No.	Units per package
6/0.01	AFDD-6/2/B/001-A	MB-300209	1/40
10/0.01	AFDD-10/2/B/001-A	187165	1/40
10OL/0.03	AFDD-10/2/B/003-A-OL	MB-300217	1/40
13OL/0.03	AFDD-13/2/B/003-A-OL	MB-300221	1/40
13/0.01	AFDD-13/2/B/001-A	187177	1/40
15OL/0.01	AFDD-15/2/B/001-A-OL	187189	1/40
16/0.01	AFDD-16/2/B/001-A	187201	1/40
6/0.03	AFDD-6/2/B/003-A	MB-300225	1/40
10/0.03	AFDD-10/2/B/003-A	187168	1/40
13/0.03	AFDD-13/2/B/003-A	187180	1/40
15OL/0.03	AFDD-15/2/B/003-A-OL	187192	1/40
16/0.03	AFDD-16/2/B/003-A	187204	1/40
20OL/0.03	AFDD-20/2/B/003-A-OL	187213	1/40
20/0.03	AFDD-20/2/B/003-A	187219	1/40
25/0.03	AFDD-25/2/B/003-A	187225	1/40

Characteristic C

$I_n/I_{\Delta n}$ (A)	Type Designation	Article No.	Units per package
6/0.01	AFDD-6/2/C/001-A	MB-300206	1/40
10/0.01	AFDD-10/2/C/001-A	187171	1/40
10OL/0.03	AFDD-10/2/C/003-A-OL	MB-300215	1/40
13OL/0.03	AFDD-13/2/C/003-A-OL	MB-300216	1/40
13/0.01	AFDD-13/2/C/001-A	187183	1/40
15OL/0.01	AFDD-15/2/C/001-A-OL	187195	1/40
16/0.01	AFDD-16/2/C/001-A	187207	1/40
6/0.03	AFDD-6/2/C/003-A	MB-300199	1/40
10/0.03	AFDD-10/2/C/003-A	187174	1/40
13/0.03	AFDD-13/2/C/003-A	187186	1/40
15OL/0.03	AFDD-15/2/C/003-A-OL	187198	1/40
16/0.03	AFDD-16/2/C/003-A	187210	1/40
20OL/0.03	AFDD-20/2/C/003-A-OL	187216	1/40
20/0.03	AFDD-20/2/C/003-A	187222	1/40
25/0.03	AFDD-25/2/C/003-A	187228	1/40

Type A, 6 kA, 2-pole, short-time delayed, sensitive to residual pulsating DC

sg06416

Characteristic B

$I_n/I_{\Delta n}$ (A)	Type Designation	Article No.	Units per package
32/0,03	AFDD-32/2/B/003-A	187231	1/40
40/0,03	AFDD-40/2/B/003-A	187237	1/40

Characteristic C

$I_n/I_{\Delta n}$ (A)	Type Designation	Article No.	Units per package
32/0,03	AFDD-32/2/C/003-A	187234	1/40
40/0,03	AFDD-40/2/C/003-A	187240	1/40

Type AC, 10 kA, 2-pole, non-delayed, alternating-current-sensitive

sg06416

Characteristic B

$I_n/I_{\Delta n}$ (A)	Type Designation	Article No.	Units per package
6/0.01	AFDD-6/2/B/001	MB-300208	1/40
10/0.01	AFDD-10/2/B/001	187164	1/40
13/0.01	AFDD-13/2/B/001	187176	1/40
15OL/0.01	AFDD-15/2/B/001-OL	187188	1/40
16/0.01	AFDD-16/2/B/001	187200	1/40
6/0.03	AFDD-6/2/C/003	MB-300224	1/40
10/0.03	AFDD-10/2/B/003	187167	1/40
13/0.03	AFDD-13/2/B/003	187179	1/40
15OL/0.03	AFDD-15/2/B/003-OL	187191	1/40
16/0.03	AFDD-16/2/B/003	187203	1/40
20OL/0.03	AFDD-20/2/B/003-OL	187212	1/40
20/0.03	AFDD-20/2/B/003	187218	1/40
25/0.03	AFDD-25/2/B/003	187224	1/40

Characteristic C

$I_n/I_{\Delta n}$ (A)	Type Designation	Article No.	Units per package
6/0.01	AFDD-6/2/C/001	MB-300205	1/40
10/0.01	AFDD-10/2/C/001	187170	1/40
13/0.01	AFDD-13/2/C/001	187182	1/40
15OL/0.01	AFDD-15/2/C/001-OL	187194	1/40
16/0.01	AFDD-16/2/C/001	187206	1/40
6/0.03	AFDD-6/2/C/003	MB-300197	1/40
10/0.03	AFDD-10/2/C/003	187173	1/40
13/0.03	AFDD-13/2/C/003	187185	1/40
15OL/0.03	AFDD-15/2/C/003-OL	187197	1/40
16/0.03	AFDD-16/2/C/003	187209	1/40
20OL/0.03	AFDD-20/2/C/003-OL	187215	1/40
20/0.03	AFDD-20/2/C/003	187221	1/40
25/0.03	AFDD-25/2/C/003	187227	1/40

Type AC, 6 kA, 2-pole, non-delayed, alternating-current-sensitive

sg06416

Characteristic B

$I_n/I_{\Delta n}$ (A)	Type Designation	Article No.	Units per package
32/0,03	AFDD-32/2/B/003	187230	1/40
40/0,03	AFDD-40/2/B/003	187236	1/40

Characteristic C

$I_n/I_{\Delta n}$ (A)	Type Designation	Article No.	Units per package
32/0,03	AFDD-32/2/C/003	187233	1/40
40/0,03	AFDD-40/2/C/003	187239	1/40

Specifications | Arc Fault Detection Device AFDD+, 2-pole

- Arc Fault Detection Device acc. to IEC/EN-62606
- Line-voltage-independent RCBO (combined switch) acc. to IEC/EN 61009
- 2-pole: Both clearances between open contacts are protected
- Variable installation of N either to the left or the right
- Tripped indication: MCB, RCCB or AFDD
- LED indication for arc faults
- Compatible with standard busbar
- Twin-purpose terminal (lift/open-mouthed) above and below
- Busbar positioning optionally above or below
- Free terminal space despite installed busbar
- Guide for secure terminal connection
- Switching toggle (MCB component) in colour designating the rated current
- Contact position indicator red - green
- Comprehensive range of accessories can be mounted subsequently
- The test key “T” must be pressed every 6 months. The system operator must be informed of this obligation and their responsibility in a way that can be proven (self-adhesive RCD-label enclosed). The test interval of 6 months is valid for residential and similar applications. Under all other conditions (e.g. damp or dusty environments), it’s recommended to test in shorter intervals (e.g. monthly).
- Pressing the test key “T” serves the only purpose of function testing the residual current device (RCD). This test does not perform an earthing resistance measurement (R_E), nor does it render the check of the earth conductor condition redundant, which means both tests must additionally be performed separately.
- The cable length (one-way) from the AFDD+ to the socket outlet should not exceed 70 m. This guarantees that arc faults can be detected reliably.
- **Type -A:** Protects against special forms of residual pulsating DC which have not been smoothed.
- **Type -Li/A:** As Type –A, but in addition it is short-time delayed. Highly reliable against unwanted tripping.
- **Type -F:** Sensitive to pulsating DC residual current and detection of multi-frequency residual currents up to 1 kHz
  -Increased protection due to the detection of mixed frequencies
  -Higher load rating with DC residual currents up to 10 mA
  -Reduction of nuisance tripping thanks to time delayed tripping and increased current withstand capability of 3 kA
  Recommended for washing machines, dish washers, or motor applications with single-phase drives.
- **Type -G/A:** Additionally protects against special forms of residual pulsating DC which have not been smoothed.
- **Type -G:** High reliability against unwanted tripping. Compulsory for any circuit where personal injury or damage to property may occur in case of unwanted tripping (ÖVE/ÖNORM E 8001-1 § 12.1.6). Additionally protects against special forms of residual pulsating DC which have not been smoothed.
- **OL types:** Specifically designed to fulfill the tripping characteristic requirements of $I_2 \leq I_z$ in the Norwegian electrotechnical standard NEK 400-8-823. 10:28.

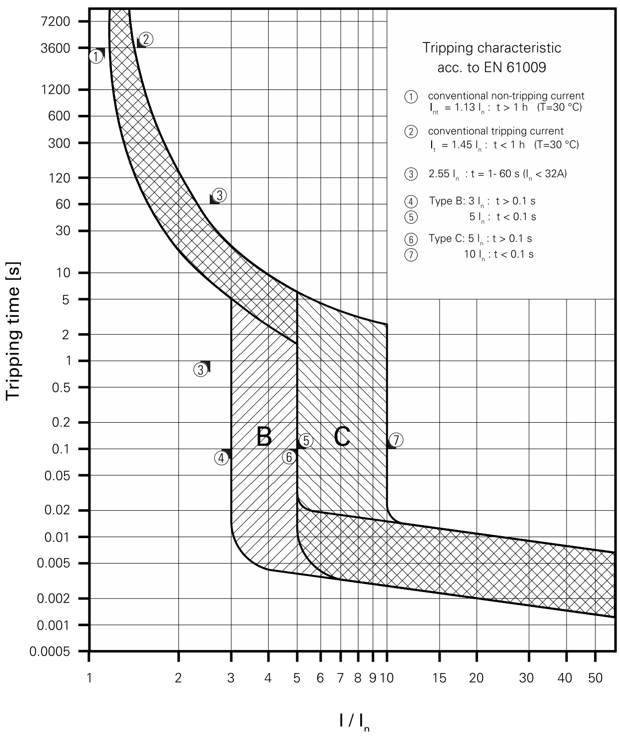
Error memory:

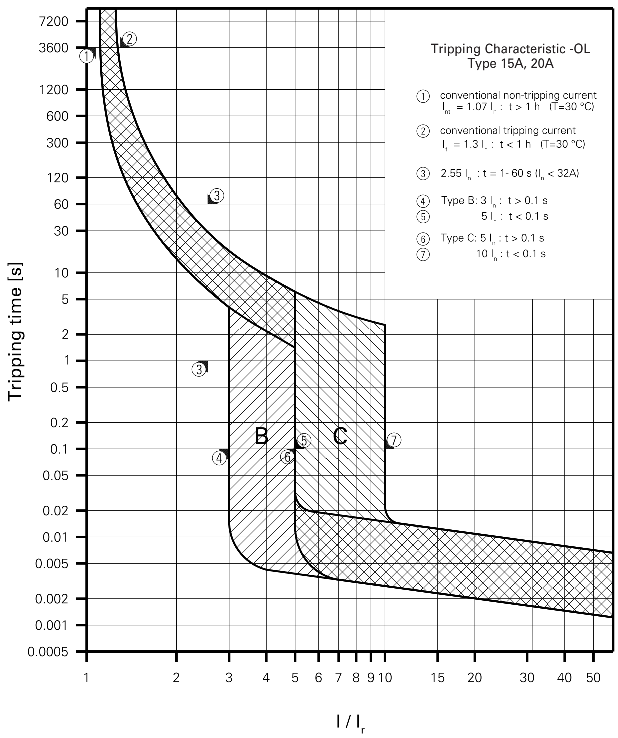
The AFDD+ saves the last tripping reason/cause. If the device is in the open position (turned off), press and hold the test button “T” and simultaneously turn on the device. This causes the in-built LED to flash in a sequence that will reveal the tripping cause.

Accessories:

Auxiliary switch for subsequent installation	ZP-IHK	286052
Auxiliary switch	ZP-NHK	248437
	ZP-WHK	286053
Shunt trip release	ZP-ASA/..	248438 248439
Busbars:	EVG-2PHAS/4AFDD, ZV-SS; ZV-L1/N; ZV-L2/L3; ZV-ADP; ZV-AEK	

Tripping Characteristic AFDD+, Characteristics B and C

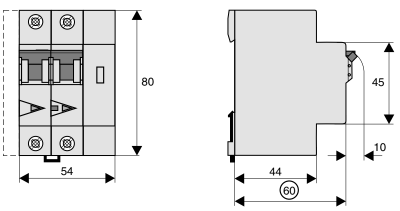




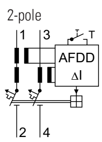
Technical Data

		AFDD+
Electrical		
Design according to Relevant effective certification marks as printed onto the device		IEC/EN 62606 IEC/EN 61009 IEC/EN 62423 Type G acc. to ÖVE E 8601
Line voltage-independent tripping		instantaneous surge current proof 250 A (8/20 µs) surge current proof 3 kA (F, -F-OL, -G/A, -G/A-OL) (8/20 µs)
Rated voltage	U_n	240 V AC; 50 Hz
Operational voltage range		180-264 V
Self-consumption		< 0.8 W
Rated residual operating current	$I_{\Delta n}$	10, 30 mA
Rated residual non-operating current	$I_{\Delta no}$	0.5 $I_{\Delta n}$
Sensitivity		AC and pulsating DC, Type F
Selectivity class		3
Rated breaking capacity		
AFDD 6-25 A		10 kA
AFDD 32-40 A		6 kA
Rated current		6 - 40 A
Rated insulation voltage	U_i	440 V
Rated impulse withstand voltage	U_{imp}	4 kV (1.2/50 µs)
Rated residual making and breaking capacity	$I_{\Delta m}$	
EN 61009		3 kA
IEC 61009		6-16 A: 3 kA 20-40 A: 500 A
Arc fault tripping times after load current (acc. to IEC/EN 62606)		
Load current (A)		Tripping time (s)
2.5		<1
5		<0.5
10		<0.25
16		<0.15
32		<0.12
40		<0.12
Characteristic		B, C, B(-OL), C(-OL)
Maximum back-up fuse (short circuit)		100 A gL (>10 kA)
Endurance		
electrical components		≥ 4,000 switching operations
mechanical components		≥ 20,000 switching operations
Mechanical		
Frame size		45 mm
Device height		80 mm
Device width		54 mm (3MU)
Mounting		3-position DIN rail clip, permits removal from existing busbar system
Degree of protection, switch		IP20
Degree of protection, built-in		IP40
Upper and lower terminals		open-mouthed/lift terminals
Terminal protection		finger and hand touch safe, EN 50274
Terminal cross section (capacity)		1 - 25 mm²
Busbar thickness		0.8 - 2 mm
Operating temperature		-25 °C to +40 °C
Storage and transport temperature		-35 °C to +60 °C
Resistance to climatic conditions		according to IEC/EN 61009

Dimensions (mm)

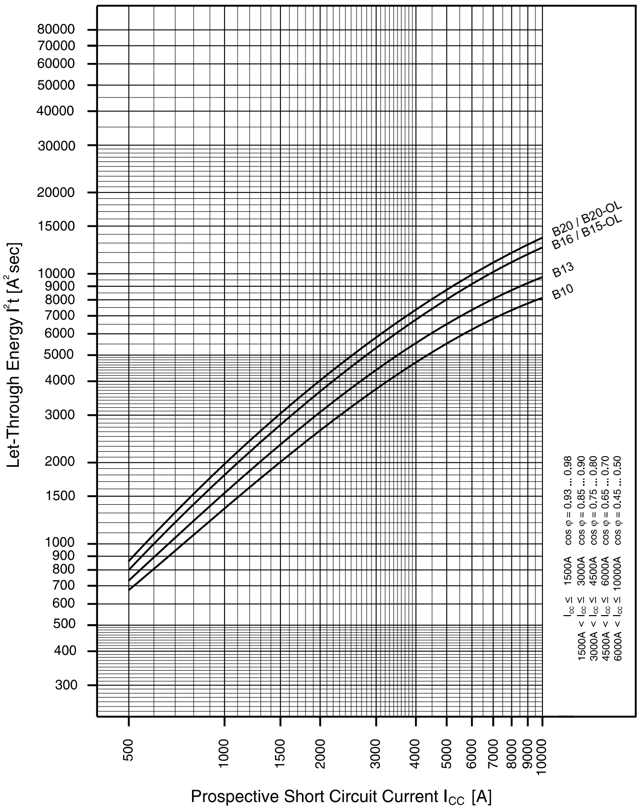


Connection diagram

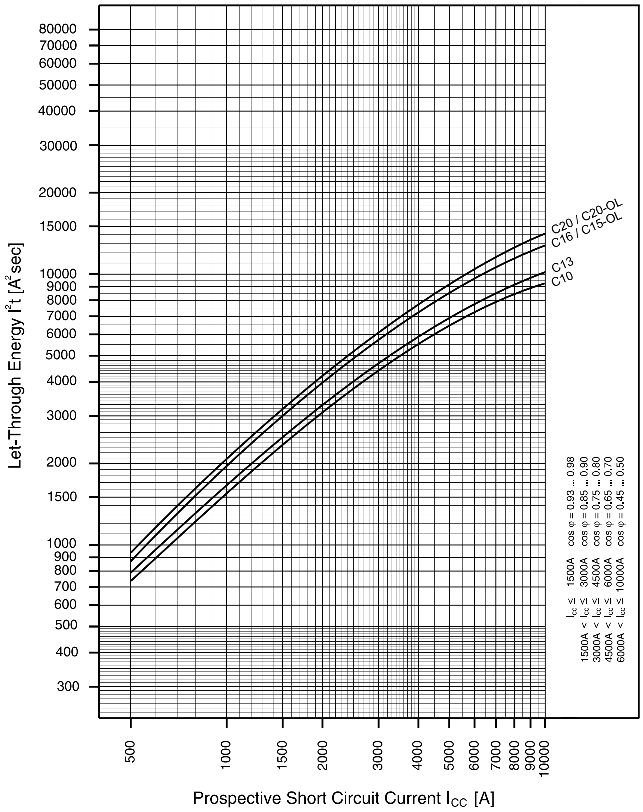


Let-through Energy AFDD+

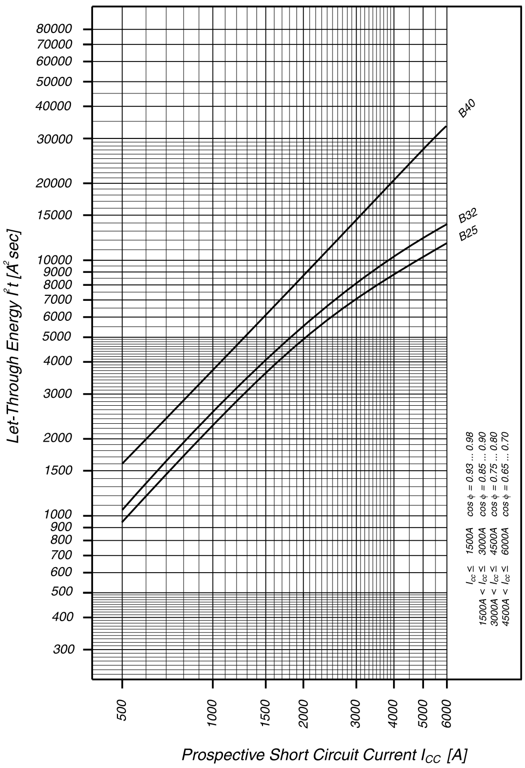
Let-through Energy AFDD+, Characteristic B, 2-pole, 10-20 A



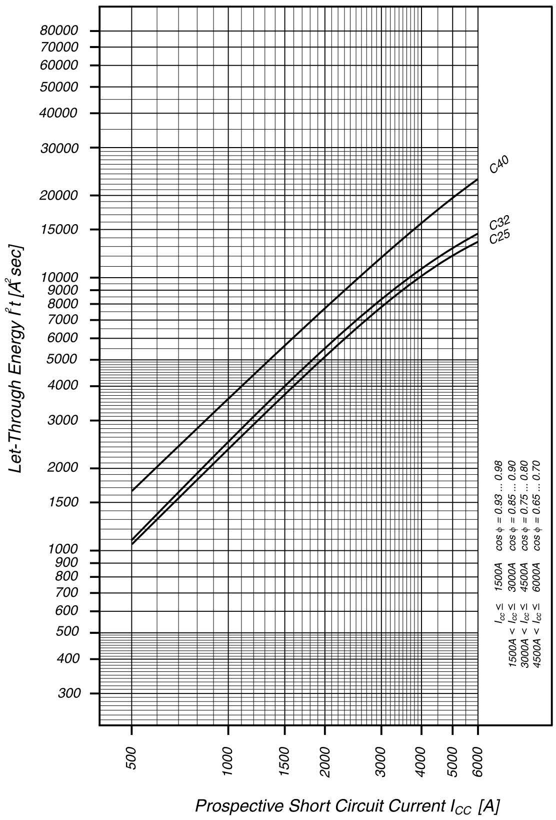
Let-through Energy AFDD+, Characteristic C, 2-pole, 10-20 A



Let-through Energy AFDD+, Characteristic B, 2-pole, 25-40 A



Let-through Energy AFDD+, Characteristic C, 2-pole, 25-40 A



Short-Circuit Selectivity AFDD+ 10-20 A towards Neozed[1)] / Diazed[2)] / NH00[3)]

Shor-circuit currents in kA, rated currents of fuses in A

Short-circuit selectivity AFDD+ towards Neozed [1)]

AFDD+	**Neozed [1)]**									
I_n [A]	**16**	**20**	**25**	**32**	**35**	**40**	**50**	**63**	**80**	**100**
B10/B10-OL	<0.5	0.5	0.9	2	2.3	3.7	8	10	10	10
B13/B13-OL	<0.5	0.5	0.8	1.7	1.9	3	6	10	10	10
B16/B15-OL		0.5	0.7	1.5	1.7	2.4	4.4	6.8	10	10
B20/B20-OL			0.7	1.4	1.5	2.2	3.9	6	9.2	10
C10/C10-OL	<0.5	0.5	0.8	1.7	1.9	3	6.1	10	10	10
C13/C13-OL	<0.5	0.5	0.7	1.6	1.8	2.8	5.5	9.5	10	10
C16/B15-OL		<0.5	0.7	1.3	1.5	2.2	4	6.2	10	10
C20/C20-OL			0.6	1.3	1.4	2.1	3.7	5.6	8.5	10

Short-circuit selectivity AFDD+ towards Diazed [2)]

AFDD+	**Diazed [2)]**								
I_n [A]	**16**	**20**	**25**	**32**	**35**	**50**	**63**	**80**	**100**
B10/B10-OL	<0.5	0.5	0.9	1.8	2.9	5.6	10	10	10
B13/B13-OL	<0.5	0.5	0.8	1.5	2.4	4.5	10	10	10
B16/B15-OL		0.5	0.8	1.3	2	3.4	8	10	10
B20/B20-OL			0.7	1.3	1.9	3.1	7.1	10	10
C10/C10-OL	<0.5	0.5	0.8	1.5	2.4	4.4	10	10	10
C13/C13-OL	<0.5	0.5	0.8	1.4	2.3	4.2	10	10	10
C16/B15-OL		<0.5	0.7	1.2	1.9	3.2	7.6	10	10
C20/C20-OL			0.7	1.2	1.8	2.9	6.5	9.7	10

Short-circuit selectivity AFDD+ towards NH00 [3)]

AFDD+	**NH00 [3)]**											
I_n [A]	**16**	**20**	**25**	**32**	**35**	**40**	**50**	**63**	**80**	**100**	**125**	**160**
B10/B10-OL	<0.5	<0.5	0.8	1.5	2.3	3.2	5.7	9.1	10	10	10	10
B13/B13-OL	<0.5	<0.5	0.8	1.3	1.9	2.7	4.4	6.5	10	10	10	10
B16/B15-OL		<0.5	0.7	1.1	1.6	2.2	3.4	4.8	8	10	10	10
B20/B20-OL			0.6	1	1.4	2	3.1	4.3	7	10	10	10
C10/C10-OL	<0.5	<0.5	0.7	1.3	1.9	2.7	4.5	6.9	10	10	10	10
C13/C13-OL	<0.5	<0.5	0.7	1.2	1.8	2.5	4.1	6.1	10	10	10	10
C16/B15-OL		<0.5	0.6	1	1.5	2	3.1	4.4	7.5	10	10	10
C20/C20-OL			0.6	0.9	1.4	1.9	2.9	4.1	6.5	10	10	10

Darker areas: no selectivity

1) SIEMENS Type 5SE2; Size: D01, D02, D03; Operating class gG; Rated voltage: AC 400 V/DC 250 V

2) SIEMENS Type 5SB2, 5SB4, 5SC2; Size: DII, DIII, DIV; Operating class gG; Rated voltage: AC 500 V/DC 500 V

3) SIEMENS Type 3NA3 8, 3NA6 8, 3NA7 8; Size: 000, 00; Operating class gG; Rated voltage: AC 500 V/DC 250 V

Short-Circuit Selectivity AFDD+ 25-40 A towards Neozed[1)] / Diazed[2)] / NH00[3)]

Short-circuit currents in kA, rated currents of fuses in A

Short-circuit selectivity AFDD+ towards Neozed [1)]

AFDD+	**Neozed [1)]**									
I_n [A]	**16**	**20**	**25**	**32**	**35**	**40**	**50**	**63**	**80**	**100**
B25				1.2	1.3	1.8	3.1	4.7	6	6
B32					1.2	1.7	2.7	3.8	5.5	6
B40						1.3	1.7	2.2	2.7	4.2
C25				1.1	1.3	1.8	2.8	3.9	5.6	6
C32					1.2	1.7	2.6	3.6	5.1	6
C40						1.3	1.9	3.3	3.2	5.8

Short-circuit selectivity AFDD+ towards Diazed [2)]

AFDD+	**Diazed [2)]**								
I_n [A]	**16**	**20**	**25**	**32**	**35**	**50**	**63**	**80**	**100**
B25				1.1	1.5	2.4	5.5	6	6
B32					1.4	2.1	4.3	6	6
B40						1.4	2.4	2.9	5.1
C25				1.1	1.5	2.3	4.4	6	6
C32					1.4	2.2	4.1	5.6	6
C40						1.6	2.8	3.6	6

Short-circuit selectivity AFDD+ towards NH00 [3)]

AFDD+	**NH00 [3)]**											
I_n [A]	**16**	**20**	**25**	**32**	**35**	**40**	**50**	**63**	**80**	**100**	**125**	**160**
B25				0.9	1.2	1.6	2.4	3.4	5.5	6	6	6
B32					1.1	1.4	2.1	2.9	4.3	6	6	6
B40							1.4	1.9	2.8	4.1	6	6
C25				0.9	1.2	1.6	2.3	3	4.6	6	6	6
C32					1.1	1.5	2.1	2.8	4.3	6	6	6
C40							1.5	2.1	3.1	5.4	6	6

Darker areas: no selectivity

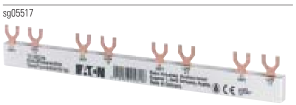
1) SIEMENS Type 5SE2; Size: D01, D02, D03; Operating class gG; Rated voltage: AC 400 V/DC 250 V

2) SIEMENS Type 5SB2, 5SB4, 5SC2; Size: DII, DIII, DIV; Operating class gG; Rated voltage: AC 500 V/DC 500 V

3) SIEMENS Type 3NA3 8, 3NA6 8, 3NA7 8; Size: 000, 00; Operating class gG; Rated voltage: AC 500 V/DC 250 V

Busbar Systems

AFDD Busbar EVG-2PHAS/4AFDD



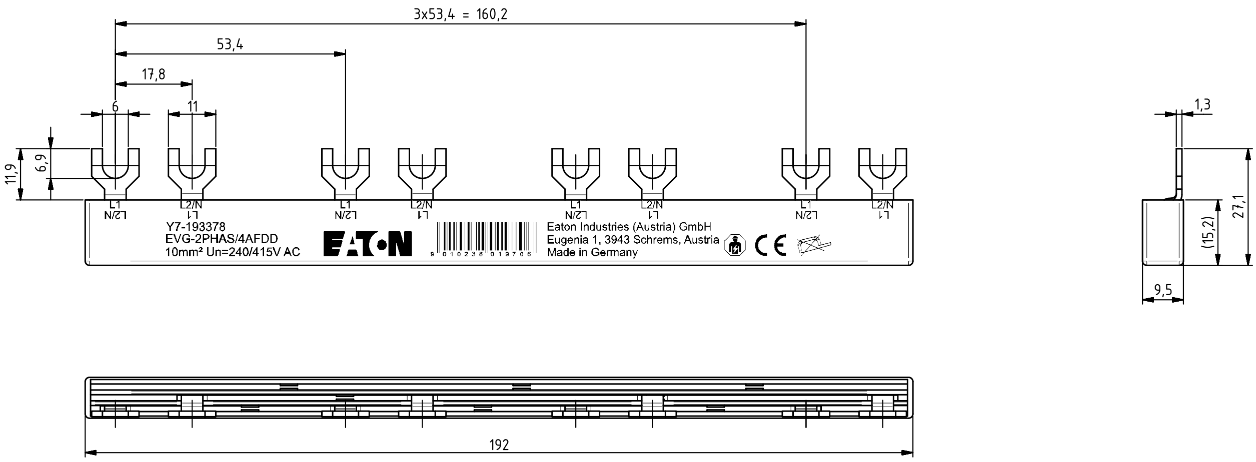
Phases	Cu-factor	Type Designation	Article No.	Units per package
10 mm²				
2-phase	0.114	EVG-2PHAS/4AFDD	193378	10

Technical Data

Products are EU comform and correspond to the REACh and RoHS of the EU

		EVG-2PHAS/4AFDD
General		
Busbar		Copper
Surface busbar		plain
Insulation		PC/ABS
Surface insulation		grey
Standards		EN 60947-1:2007 / IEC 60947-1:2007
Heat deflection temperature		90 °C – UL94 V0
Glow Wire Flammability Index		960 °C / 1 mm
Insulation coordination		Overvoltage category III / Pollution degree 2
Electrical		
Max. operating voltage		690 V AC/DC
Protection class		IP20
Rated impulse withstand voltage	U_{imp}	≥4.5 kV
Max. operating voltage		
1-, 3-phase		690 V IEC 480Y/277V & 240 V AC
Load Capacity at 35°C ambient temperature depending of feeding point		
Max. busbar current feeding at beginning / ending	I_s/Phase	50 A
Busbar cross section		10 mm²
Connection cross section		10 mm²

Dimensions (mm)



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