



ARC FAULT DETECTION MANUAL

Guidance of AFDDs for the installer and homeowner



ACCIDENTAL DOMESTIC FIRES

UK total: Approximately 19,300 Accidental domestic fires of electrical origin

ACCIDENTAL ELECTRICAL DWELLING FIRES

Accidental electrical dwelling Fires: 14,186
(53.4% of all accidental dwelling fires)

Of which caused by faulty appliances and leads: 3667
(25.9% of electrical fires)

(Source: <https://www.gov.uk/government/statistical-data-sets/fire-statistics-incident-level-datasets>)



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ARC FAULT DETECTION DEVICES

RECOMMENDED AS A MEANS OF PROVIDING ADDITIONAL PROTECTION AGAINST FIRE

Regulation 421.1.7 of BS 7671 has been introduced recommending the installation of arc fault detection devices (AFDDs) to mitigate the risk of fire in AC final circuits of a fixed installation due to the effects of arc fault currents.

What is an arc fault?

An arc-fault occurs when loose or corroded connections make intermittent contact and causes sparking or arcing between the connections. This translates into heat, which will break down the insulations of the wire and potentially trigger an electrical fire. Such arc's can range in power and vary a great deal in strength and duration.

What is an AFDD?

Arc Fault Detection Devices use digital electronics to analyse the waveform of an A.C. circuit to detect arc faults.

The device continuously monitors the circuit for different variations including the duration of an arc and the waveform. Once the device detects an irregular fault the device trips and disconnects the circuit, reducing the chance of it over heating and potentially causing an electrical fire.

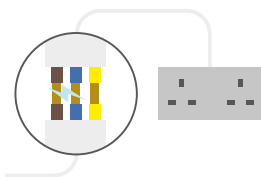
Where should AFDDs be used?

AFDDs are recommended to be fitted in consumer units or distribution boards in premises with sleeping accommodation, locations where there is a risk of fire due to the activity within, premises constructed of combustible materials, fire propagating structures such as high rising buildings and locations where there are irreplaceable goods. See 421.1.7 for further details.

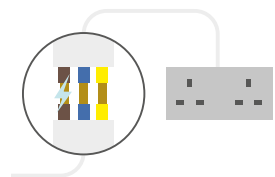
What types of circuits can AFDDs be used on?

The regulations state AC single-phase circuits not exceeding 230V, that includes ring circuits, radials etc.

Types of Arc Faults



Parallel arc faults are found with damage caused to insulation which allows current to flow between conductors, usually between phase and neutral.



Series arc faults are found in loose terminal connections, damaged cords or frayed/damaged conductors. These arc's are created in one conductor only, either phase or neutral.

NEW REGULATION: 421.1.7

Arc fault detection devices conforming to BS EN 62606 are recommended as a means of providing additional protection against fire caused by arc faults in AC final circuits.

If used, an AFDD shall be placed at the origin of the circuit to be protected.

Note: Examples of where such devices can be used include:

- Premises with sleeping accommodation
- Locations with a risk of fire due to the nature of processed or stored materials, i.e. BE2 locations (e.g. barns, wood working shops, stores of combustible materials)
- Locations with combustible construction materials, i.e. CA2 locations (e.g. wooden buildings)
- Fire propagating structures, i.e. CB2 locations
- Locations with endangering of irreplaceable goods

Regulation 532.6

Where specified, arc fault detection devices shall be installed

(i) At the origin of the circuit intended to be protected, and

(ii) In AC single-phase circuits not exceeding 230V.

AFDDs shall comply with BS EN 62606. Coordination of AFDDs with overcurrent protective devices, if necessary, shall take account of the manufacturer's instructions.



Potential causes of arc faults could include:-



Trapped/damaged cables



Loose terminations



Cable wear



Damage caused by construction work

Installer Guidance

If used, an AFDD/AFR shall be placed at the origin of the circuit. Examples of use: premises with sleeping accommodation; where there is risk of fire; combustible construction materials; fire propagating structures; locations with endangering of irreplaceable goods.

What is an AFR?

The Proteus AFR is an arc fault detection device combined with short circuit, overload and earth leakage detection.

ARC FAULT DETECTION DEVICES

SINGLE MODULE COMBINED ARC FAULT DETECTION AND RCBO



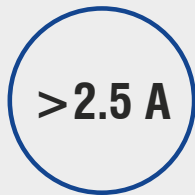
Product Features

- 6-40 A Rated
- Series and parallel arc fault detection
- Combined arc fault detection, short circuit, overload and earth leakage detection
- 30 mA earth leakage detection Type A
- B and C curve tripping characteristics
- Switched Live & Neutral
- Fits existing busbar system
- Self testing (AFDD function only)

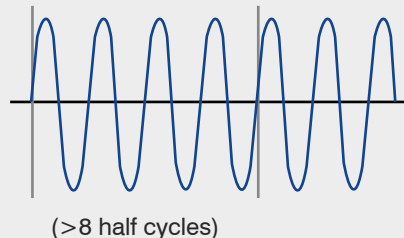
Detection Characteristics

When all three inputs are simultaneously sustained for **at least 100mS**, the AFDD will trip. This maximises arc fault detection whilst minimising the risk of nuisance tripping.

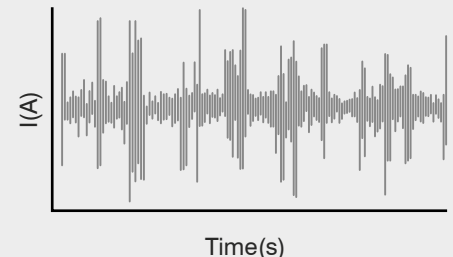
A sustainable current of a certain magnitude



A minimum number of consecutive half cycles of arcing conditions



Presence of Hi-Lo asymmetrical frequency components



Technical

Standard	BS EN 62606, IEC 61009 - RCBO, EMC requirements as specified in IEC 62606
Current Rating	6-40 A
Voltage Rating	230 - 240 V - Single Phase
Frequency Rating	50Hz
Tripping Curve	B & C Options
Material	PBT Case
Colour	Grey
Maximum Operating Voltage	1.1Un
Minimum Operating Voltage	180 V
AFDD Test Means	Automatic test function as per 8.17 IEC 62606
Classification per IEC 62606	4.1.2 - AFD unit integrated in a protective device
Ambient Operating Temperature	-5°C to +55°C
AFDD Ready Indication	Single LED Indication - see table on page 9
Overvoltage Function	Overvoltage condition of 270Vrms to 300Vrms for 10 seconds will cause device to trip. LED indication of over-voltage trip will be provided on product re-latch.
Self Test Interval	1 Hour
Torque Setting	2.5Nm on the bottom (Line) terminal 1.5Nm on the top (Load) terminals

Tripping Characteristics

Earth Fault Current	Trip time limit (typical measured value)
0.5 x I_{dn}	No trip
1 x I_{dn}	<300 ms (nominally <40 ms)
5 x I_{dn}	<40ms (nominally <40 ms)
30 mA	Actual tripping threshold 20 - 25 mA

Part Codes

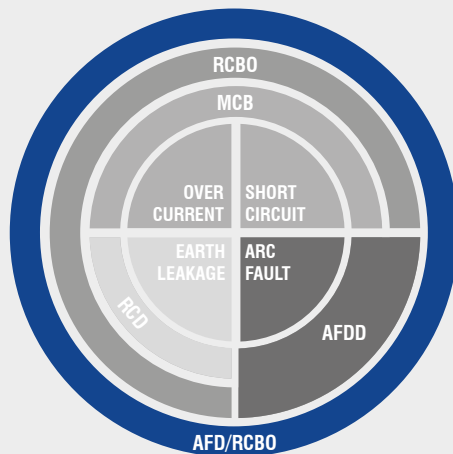
B CURVE

AFR06B1
AFR10B1
AFR16B1
AFR20B1
AFR32B1
AFR40B1

C CURVE

AFR06C1
AFR10C1
AFR16C1
AFR20C1
AFR32C1
AFR40C1

Complete Circuit Protection



RCB

Protection against earth leakage

MCB

Protection against overcurrent and short circuit

RCBO

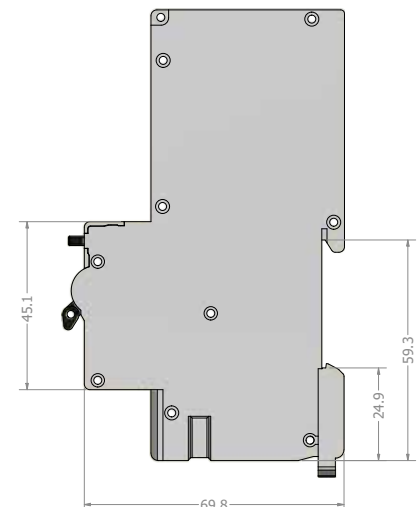
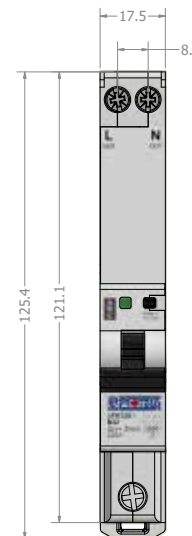
Protection against overcurrent, short circuit and earth leakage

AFDD

Protection against arc fault

AFD/RCBO

Complete comprehensive circuit protection



USER GUIDE

WHAT TO DO IF THE AFDD HAS TRIPPED?



Step 1

Locate the tripped circuit and reset the device by switching the dolly upward



Step 2

If an arc fault is present, the LED status indicator will flash – refer to chart opposite to identify fault mode.



Step 3

If the LED is permanently lit upon reset, then no arc fault is present. Check other possible faults (i.e. overload / earth fault)



Step 4

Where the LED is flashing, the device may re-trip if the fault still exists on the circuit.



Step 5

If the AFDD trips, unplug all equipment / appliances on the circuit and reset device.



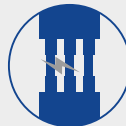
Step 6

Once the LED has stopped flashing, gradually reconnect equipment / appliances until device trips. This will identify the cause of the tripping.



Step 7

Stop using any equipment which causes the AFDD to trip and seek repair / replacement.



Step 8

If in doubt, seek the assistance of an electrically qualified person to assist with fault finding.



Contacting Proteus Technical:

For further guidance on AFDDs, please contact us.

LED INDICATION FOR HOMEOWNER TROUBLESHOOTING

LED Indication

After tripping under a fault condition and upon resetting, the fault status indicator will show the fault nature according to the table.

LED flashing sequence repeats every 1.5 sec for next 10 sec after powering up.

CONDITION	AFTER 10 SEC
Series Arc Fault ● ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ● ● ● ● ● ●	
Parallel Arc Fault ● ○ ○ ○ ● ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ● ● ● ● ● ●	
Over-Voltage Fault ● ○ ○ ○ ● ○ ○ ○ ● ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ● ● ● ● ● ●	
Self-Test Fault ● ○ ● ○ ● ○ ● ○ ● ○ ● ○ ● ○ ● ○ ● ○ ● ○ ● ○ ● ○ ● ○ ● ○ ● ● ● ● ● ●	
No Fault ●	

↑ 1.5 Seconds ↑

The table describes all possible LED states:

Series Arc Fault:

1 Flash - Pause - 1 Flash - Pause - 1 Flash

Parallel Arc Fault:

2 Flashes - Pause - 2 Flashes - Pause - 2 Flashes

Over Voltage Fault:

3 Flashes - Pause - 3 Flashes - Pause - 3 Flashes

Self-Test Fault:

1 Flash - Pause - 1 Flash - Pause - 1 Flash (At Double Rate)



Safety Warning

If you have followed all of the steps in our user guide and still have a faulty AFDD - please ensure that you contact a qualified electrician to carry out any electrical work at your property to avoid risk of serious injury.

CONSUMER UNIT RANGE

ISOLATOR CONTROLLED CONSUMER UNITS

63 A / 100 A Double Pole Switch Disconnecter Incomer
Metalclad Consumer Unit



AYXLM8UT2



LIFT UP
LIDS

18th
COMPLIANT

For TYPE 1 lightning protection replace
suffix T2 for T1

For TYPE 2+3 overvoltage transient
replace suffix T2 for T23

O/G WAYS	ISOLATOR RATING	WITHOUT SPD CAT. NO.	WITH SPD TYPE 2 CAT. NO.	H	W	D
2	63 A	AYXLM2	-	220	115	85
4	100 A	AYXLM4U	AYXLM4UT2	256	201	119
6	100 A	AYXLM6U	AYXLM6UT2	256	273	119
8	100 A	AYXLM8U	AYXLM8UT2	256	273	119
10	100 A	AYXLM10U	AYXLM10UT2	256	309	119
12	100 A	AYXLM12U	AYXLM12UT2	256	381	119
14	100 A	AYXLM14U	AYXLM14UT2	256	381	119
16	100 A	AYXLM16U	AYXLM16UT2	256	417	119
18	100 A	AYXLM18U	AYXLM18UT2	256	489	119
20	100 A	AYXLM20U	AYXLM20UT2	256	489	119
26	100 A	AYXLM26U	AYXLM26UT2	256	597	119



AYXLM8Y4U

DUAL TARIFF CONSUMER UNITS

Contact factory for details on Surge Protection for your
Dual Tariff Consumer Unit



LIFT UP
LIDS

18th
COMPLIANT

For TYPE 1 lightning protection replace suffix T2 for T1

For TYPE 2+3 overvoltage transient replace
suffix T2 for T23

ON PEAK 100 A ISOLATOR	OFF PEAK 100 A ISOLATOR	WITHOUT SPD CAT. NO.	WITH SPD TYPE 2 CAT. NO.	H	W	D
8 Ways	4 Ways	AYXLM8Y4U	AYXLM8Y4UT2	256	381	119
8 ways	6 Ways	AYXLM8Y6U	AYXLM8Y6UT2	256	417	119
10 Ways	4 Ways	AYXLM10Y4U	AYXLM10Y4UT2	256	417	119
12 Ways	4 Ways	AYXLM12Y4U	AYXLM12Y4UT2	256	446	119



AYXLM2JB4JB4UAT2



For TYPE 1 lightning protection replace suffix T2 for T1

For TYPE 2+3 overvoltage transient replace suffix T2 for T23

HIGH INTEGRITY DUAL RCD CONSUMER UNITS

Dual RCD High Integrity Metalclad Consumer Unit

O/G WAYS	ISOLATOR RATING	RCD 1 RATING*	RCD 2 RATING*	WITHOUT SPD CAT. NO.	WITH SPD TYPE 2 CAT. NO.	H	W	D
6	100 A	63 A	63 A	AYXLM1JB2JB3UA	AYXLM1JB2JB3UAT2	256	309	119
10	100 A	63 A	63 A	AYXLM2JB4JB4UA	AYXLM2JB4JB4UAT2	256	381	119
12	100 A	63 A	63 A	AYXLM2JB5JB5UA	AYXLM2JB5JB5UAT2	256	417	119
14	100 A	63 A	63 A	AYXLM2JB6JB6UA	AYXLM2JB6JB6UAT2	256	489	119
20	100 A	80 A	80 A	AYXLM4KB8KB8UA	AYXLM4KB8KB8UAT2	256	597	119
6	100 A	63 A	63 A	AYXLMDSLV6UA	AYXLMDSLV6UAT2	256	309	119
10	100 A	63 A	63 A	AYXLMDSLV10UA	AYXLMDSLV10UAT2	256	381	119
10	100 A	100 A	100 A	AYXLMDSLV10UNA	AYXLMDSLV10UNAT2	256	381	119
12	100 A	63 A	63 A	AYXLMDSLV12UA	AYXLMDSLV12UAT2	256	417	119
12	100 A	100 A	100 A	AYXLMDSLV12UNA	AYXLMDSLV12UNAT2	256	417	119
16	100 A	80 A	80 A	AYXLMDSLV16UA	AYXLMDSLV16UAT2	256	489	119
16	100 A	100 A	100 A	AYXLMDSLV16UNA	AYXLMDSLV16UNAT2	256	489	119
22	100 A	80 A	80 A	AYXLMDSLV22UA	AYXLMDSLV22UAT2	256	597	119
22	100 A	100 A	100 A	AYXLMDSLV22UNA	AYXLMDSLV22UNAT2	256	597	119

* - 30 mA trip rating.



AYXLMSLV12UA



For TYPE 1 lightning protection replace suffix T2 for T1

For TYPE 2+3 overvoltage transient replace suffix T2 for T23







SPLIT LOAD CONSUMER UNITS

Metalclad Consumer Units Split Load

O/G WAYS	ISO RATING	RCD 1 RATING*	WITHOUT SPD CAT. NO.	WITH SPD TYPE 2 CAT. NO.	H	W	D
6	100 A	63 A	AYXLMSLV6UA	AYXLMSLV6UAT2	256	273	110
12	100 A	63 A	AYXLMSLV12UA	AYXLMSLV12UAT2	256	381	110

* - 30 mA trip rating.

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Issue 1.1