# Photovoltaic fuses

## gPV curve

10 to 600 A, up to 1000 VDC


### The solution for

> Photovoltaic protection

### Strong points

> High breaking capacity up to 1000 VDC
> Product designed for photovoltaic systems
> Increased reliability
> Improved safety

### Extended range

> Range of switches and sockets, combs and dedicated connection accessories

### Compliance with standards

> IEC 60269-6
> IEC 60269-1
> IEC 60269-2

## Function

SOCOMEC's **gPV fuses** protect photovoltaic systems against overcurrents caused by the reverse currents that these systems can generate.

## Advantages

**High breaking capacity**
Up to 50 kA at 1000 VDC.

**Product designed for photovoltaic systems**
Operating ranges adapted to low overcurrents specific to photovoltaic systems.

**Increased reliability**
- Absolute protection over time guaranteed by the simplicity of manufacture and function (Joule effect).
- No degradation of fuse characteristics over time.

**Improved safety**
The energy released whilst eliminating the fault (fuse blowing) is contained within the cartridge (no degassing).

## What you need to know

**Characteristics used**
- $I_{SC}$: short circuit current of the string.
- $I_{SC\ MAX}$: short circuit current of the string due to maximum sunlight intensity.
- $I_{RM}$: maximum permitted reverse current.
- $I_n$: rating or nominal current of the fuse (25 °C in an RM socket).
- $N_c$: number of strings in parallel.
- $U_e$: fuse's maximum operating voltage.
- $U_{OC\ MAX}$: maximum open circuit voltage in the lowest temperature conditions.

**When to protect**
A PV string requires overcurrent protection when its own maximum admissible reverse current characteristic (Irm) is less than the current generated by the rest of the installation (current generated by the other "Nc-1" strings).

**How to protect**
Protecting from overcurrents involves ensuring that both polarities are functionally grounded whether the DC is connected or not.

## How to choose the right fuse protection

### Voltage

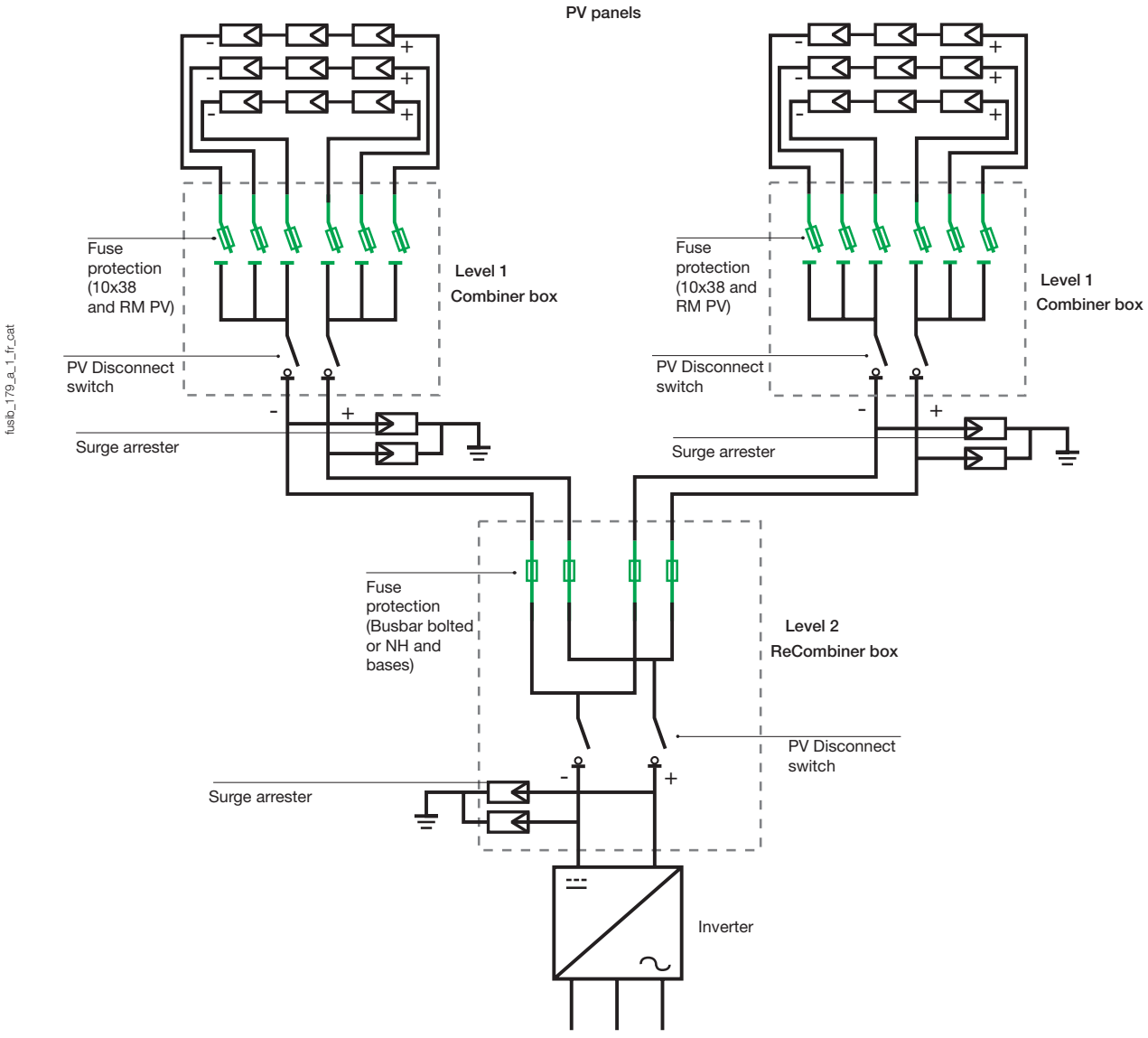
$U_e > U_{OC}$ MAX

Unless indicated otherwise, use $U_{OC\ MAX} = 1.2\ U_{OC}$

### Determining the fuse rating

Determining the fuse rating involves choosing a fuse that can:

- Withstand, without blowing, normal overcurrents during sunlight hours and the ambient temperature of the enclosure in which the fuse is installed, $I_n > I_{SC\ MAX}$ Unless indicated otherwise $ISC\ MAX = 1.4\ I_{SC}$
- Melt reliably before the modules are damaged by the reverse current. $I_n < I_{RM}$



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## References

### Rated voltage 1000 VDC

| Rating (A) | Fuse size | Dissipated power W @ In | Dissipated power W @ 0.8 In | Breaking capacity | Reference |
|---|---|---|---|---|---|
| | | gPV cylindrical fuses | | | |
| 10 | 10 x 38 | 2.58 | 1.51 | 30 kA | 60PV **0010** |
| 12 | 10 x 38 | 2.61 | 1.42 | 30 kA | 60PV **0012** |
| 15 | 10 x 38 | 2.44 | 1.08 | 30 kA | 60PV **0015** |
| 16 | 10 x 38 | 2.70 | 1.56 | 30 kA | 60PV **0016** |
| 20 | 10 x 38 | 2.99 | 1.75 | 30 kA | 60PV **0020** |
| | | gPV knife blade fuse | | | |
| 32 | NH1 | 8.5 | 4.3 | 50 kA | 60PV **0032** |
| 40 | NH1 | 9 | 4.6 | 50 kA | 60PV **0040** |
| 50 | NH1 | 10.5 | 5.4 | 50 kA | 60PV **0050** |
| 63 | NH1 | 12 | 6.1 | 50 kA | 60PV **0063** |
| 80 | NH1 | 15.5 | 7.9 | 50 kA | 60PV **0080** |
| 100 | NH1 | 16.5 | 8.4 | 50 kA | 60PV **0100** |
| 125 | NH1 | 17.5 | 8.9 | 50 kA | 60PV **0125** |
| 160 | NH1 | 24 | 12.2 | 50 kA | 60PV **0160** |
| 200 | NH1 | 25 | 13 | 50 kA | 60PV **1200** |
| 250 | NH2 | 35 | 23 | 50 kA | 60PV **1250** |
| 315 | NH3 | 44 | 27 | 50 kA | 60PV **1315** |
| 400 | NH3 | 50 | 30 | 50 kA | 60PV **1400** |
| 500 | 3 L | 85 | 50 | 50 kA | 60PV **0500** |
| 600 | 3 L | 118 | 92 | 50 kA | 60PV **0600** |

### Accessories

| Accessories | Size NH1 Reference | Size NH2 Reference | Size NH3 Reference | Size 3L Reference |
|---|---|---|---|---|
| Fuse blown auxiliary contact | 56PV **9901** | 56PV **9901** | 56PV **9901** | 56PV **9901** |
| Fuse base recommended | 65PV **1011** | 65PV **1002** | 65PV **1003** | 65PV **1113** |

## Adjustment due to ambient temperature

$$I_{nf} = I_{scgen}/K_t$$

*$I_{nf}$ - gPV fuse rated current.*

*$I_{scgen}$ - short-circuit current of PV generator in STC conditions.*

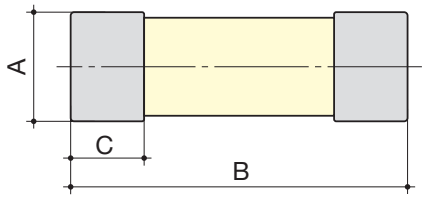
*$K_t$ - correction factor.*

| Max. ambient temperature (°C) | Kt: correction factor |
|---|---|
| 20 | 1 |
| 40 | 0.92 |
| 45 | 0.90 |
| 50 | 0.87 |
| 55 | 0.85 |
| 60 | 0.82 |
| 65 | 0.79 |
| 70 | 0.76 |

## Standard dimensions (mm) as per IEC 60269-2

### gPV cylindrical fuses

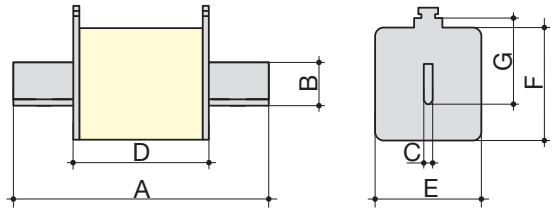
fusib_167_a_1_x_cat




| Fuse size | Striker | A | B | C |
|---|---|---|---|---|
| 10 x 38 | Without | 10.3 | 38 | 10.5 |
| 14 x 51 | Without | 14.3 | 51.5 | 10.10 |
| 10 x 85 | Without | 10.3 | 85 | 10.5 |

### gPV knife edge fuse

fusib-pv_001_a_1_x_cat




| Fuse size | Striker | A max | B | C | D max | E max | F max | G |
|---|---|---|---|---|---|---|---|---|
| NH1 | Without | 137 | 20 | 6 | 68 | 40 | 53 | 40 |
| NH2 | Without | 152 | 25 | 6 | 75 | 60 | 61 | 48 |
| NH3 | Without | 152 | 32 | 6 | 75 | 70 | 75 | 60 |
| 1XL | Without | 190 | 20 | 6 | 128 | 51 | 51 | 40 |
| 3L | Without | 205 | 32 | 6 | 123 | 74 | 74 | 60 |

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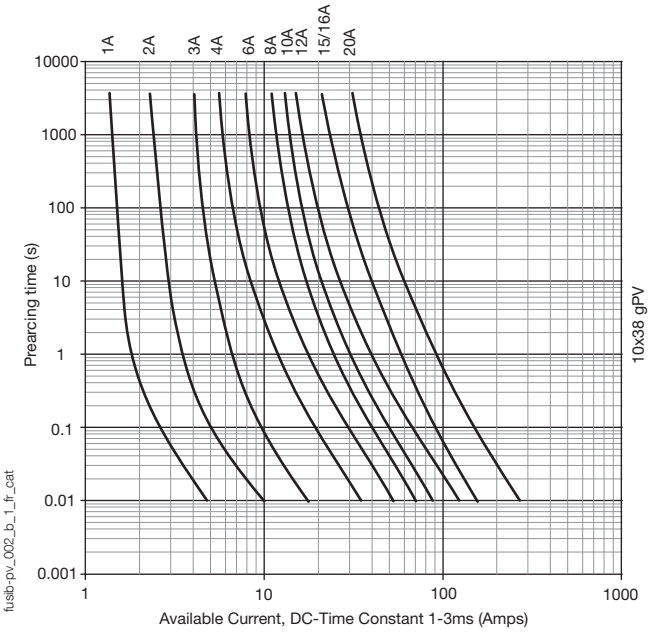
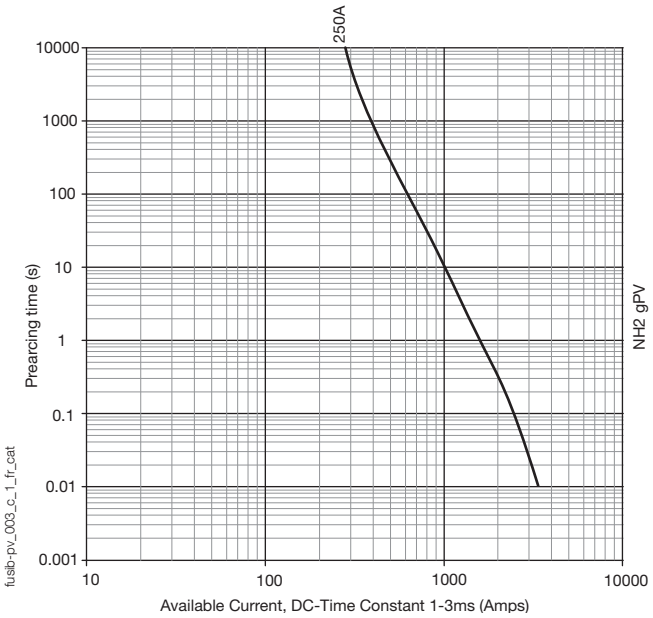
## Time/current operational characteristics

### Rated voltage 1000 VDC

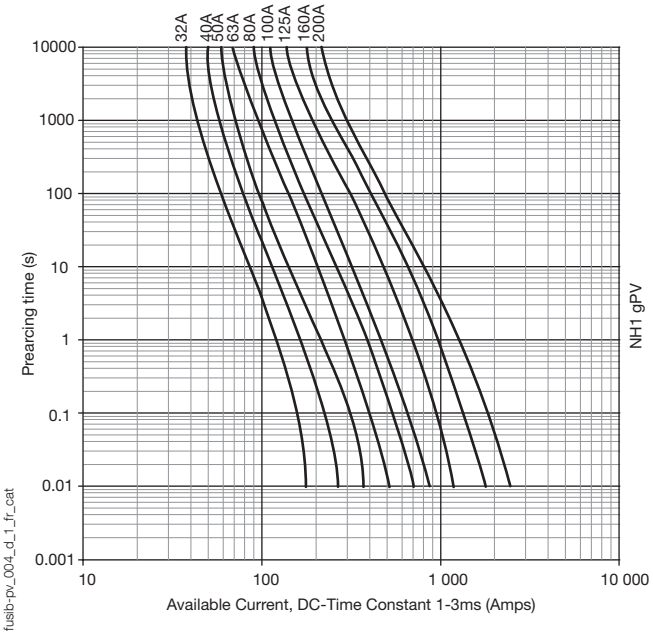
**gPV cylindrical fuses 10x38**



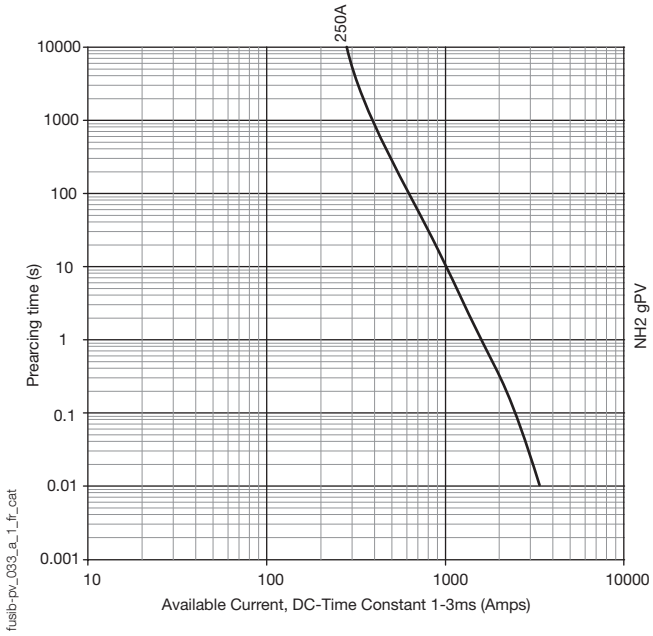

**gPV cylindrical fuses 14x51**




**gPV NH1 knife blade fuses**

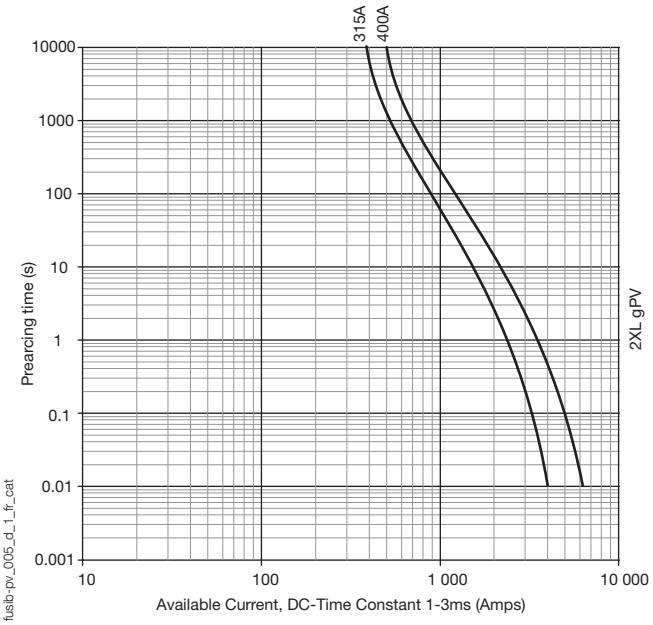



**gPV NH2 knife blade fuses**



## Rated voltage 1000 VDC (continued)

### gPV NH3 knife blade fuses




### gPV 3L knife blade fuses