df Electric

# PHOTOVOLTAIC

FUSE LINKS & FUSE HOLDERS FOR PHOTOVOLTAIC APPLICATIONS

HORUS PHOTOVOLTAIC PROTECTION

# gPV CYLINDRICAL

## fuse links

CYL 10x38


10x38 14x51 10x85 10/14x85 22x65

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# gPV CYLINDRICAL
fuse links

10x38

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10x38

**RATED VOLTAGE**
1000V DC

**RATED CURRENT**
1A...20A

**BREAKING CAPACITY**
30kA

**STANDARDS**
IEC/EN 60269-1
IEC/EN 60269-6
UL248-1
UL248-19


## Cylindrical fuse links for photovoltaic applications

gPV 10x38 cylindrical fuse links from DF Electric have been developed to offer a compact, safety and economic protection of photovoltaic modules (string protection) with voltages up to 1.000V DC.

The range comprises the following fuse links:

→ **Size 10x38 1000V DC 1A to 20A**

They provide protection against overloads as well as short-circuit (gPV class according to the requirements of IEC60269-6 and UL248-19 Standards).

Made with ceramic tube with high withstand to internal pressure and thermal shock, that allows a high breaking capacity in a reduced physical space.

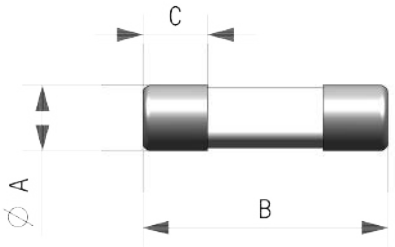
Contacts are made in silver plated copper and melting elements are made in pure silver in order to avoid the aging and thus keep unalterable the electric characteristics.

For these fuse links we recommend the utilization of **10x38 PMX-PV fuse holders**.

UL Listed (File E355019).

RoHS COMPLIANT

# Dimensions




| A | B | C |
|---|---|---|
| 10,3 | 38 | 10 |

**Weight** 8gr

# Range

| In (A) | REFERENCE | PACKING Uni /BOX |
|---|---|---|
| 1 | **491601** | 10/100 |
| 2 | **491602** | 10/100 |
| 3 | **491604** | 10/100 |
| 4 | **491605** | 10/100 |
| 5 | **491606** | 10/100 |
| 6 | **491610** | 10/100 |
| 8 | **491615** | 10/100 |
| 10 | **491620** | 10/100 |
| 12 | **491625** | 10/100 |
| 15 | **491629** | 10/100 |
| 16 | **491630** | 10/100 |
| 20 | **491635** | 10/100 |


# gPV CYLINDRICAL
fuse links

10x38

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## Technical data

| | |
|---|---|
| **Rated voltage** | 1000V DC |
| **Rated current** | 1A...20A |
| **Rated breaking capacity** | 30kA |
| **Utilization category** | gPV |
| **Minimum interrupt rating** | 1A → 1,45·In<br>2A...20A → 1,35·In |
| **Non fusing current** | 1,13·In |
| **Storage temperature** | -40°C ... 90°C |
| **Operating temperature *** | -40°C ... 80°C |

* For ambient temperatures higher than 25ºC it is necessary to apply a derating in maximum current.

## Standards

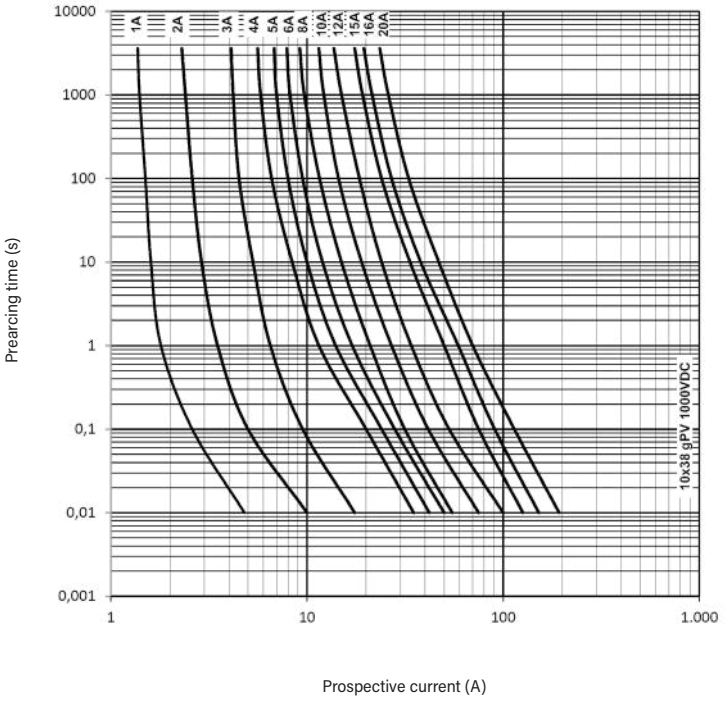
**IEC/EN 60269-1**
**IEC/EN 60269-6**
**UL248-1**
**UL248-19**
**RoHS Compliant**

## Certifications

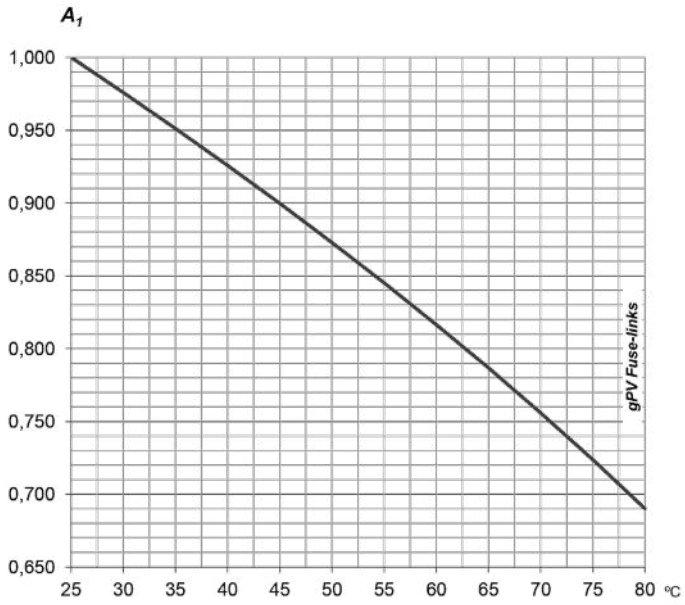
## Power dissipation

| $I_n$ | PREARCING $I^2t$ | OPERATING $I^2t$ | POWER DISSIPATION $0.7 \cdot I_n$ | POWER DISSIPATION $I_n$ |
|---|---|---|---|---|
| (A) | ($A^2S$) | ($A^2S$) | (W) | (W) |
| **1** | 0,35 | 1,2 | 0,31 | 0,76 |
| **2** | 0,62 | 1,0 | 0,78 | 1,45 |
| **3** | 1,9 | 3,1 | 0,66 | 1,66 |
| **4** | 6,9 | 11 | 0,64 | 1,57 |
| **5** | 14 | 22 | 0,60 | 1,65 |
| **6** | 24 | 38 | 0,77 | 1,84 |
| **8** | 7 | 17 | 0,82 | 2,00 |
| **10** | 15 | 38 | 0,94 | 2,20 |
| **12** | 27 | 68 | 0,98 | 2,40 |
| **15** | 62 | 115 | 1,05 | 2,65 |
| **16** | 89 | 165 | 1,10 | 2,70 |
| **20** | 158 | 294 | 1,33 | 3,20 |

## t-I characteristics




# Ambient temperature derating factor




| $t_a$ (ºC) | $A_1$ |
|---|---|
| 25 | 1,00 |
| 30 | 0,98 |
| 35 | 0,95 |
| 40 | 0,93 |
| 45 | 0,90 |
| 50 | 0,87 |
| 55 | 0,84 |
| 60 | 0,82 |
| 65 | 0,79 |
| 70 | 0,76 |
| 75 | 0,72 |
| 80 | 0,69 |

# Selection and applications guide

In photovoltaic plants, there are a special installation and working conditions that must be considered to select the appropriate fuse links.

These fuses are usually placed inside plastic watertight boxes, where high ambient temperatures are reached. This condition force to reduce the maximum current that can circulate through the fuse links, otherwise it would be have premature aging. To avoid nondesired operation of fuse links it is necessary to apply a derating when select the appropriate rated current.

On the other hand, the day/night cycles as well as the pass of clouds cause a constant current changes that generates continuous heating and cooling, and this cause a thermal stress in fuselinks materials, especially in the melting elements. To avoid premature aging another derating must be applied (DF Electric recommend a value of 0,80 for this application).

With these considerations it is possible to select the suitable fuse.

To verify that the rated voltage of fuse link is sufficient, the following points must be taken into account:

· Open circuit voltage $V_{OC\ STC}$ of PV modules.
· Numbers of modules connected in series (M).
· Safety factor (20%) to take into account the rise of open circuit voltage at very low temperatures.

According to this, rated voltage in DC of fuse links must be:

$$V_{DC}(\text{fuse link}) \geq V_{OC}(STC) \cdot M \cdot 1{,}2$$

Open circuit voltage $V_{OC\ STC}$ of PV modules is the maximum voltage that a Photovoltaic module can deliver when is working without load, measured under standard test conditions (STC).

This information is given by the manufacturer of PV modules.

To choose rated current of fuse links, points to be taken into account are the following:

· Short circuit current of PV modules $I_{SC\ STC}$.
· Derating factor for ambient temperature ($A_1$).
· Derating factor for current variation ($A_2$).

Short circuit current of PV modules $I_{SC\ STC}$ is the maximum current that one module can deliver measured under standard test conditions (STC). This data is also given by the manufacturer of PV modules.

Recommended derating factor for current variation ($A_2$): 0,80.

Ambient temperature inside boxes where are placed protections can reach easily 40ºC or 45ºC (for tropical countries it is necessary to consider higher values).

It should be applied a derating factor ($A_1$) as function of ambient temperature.

With previous considerations, rated current of fuse-link should be:

$$I_N(\text{fuse link}) \geq \frac{I_{SC\ STC}}{A_1 \cdot A_2}$$

For example, if we consider a maximum ambient temperature of 45ºC, the rating to use would be:

$$I_N(\text{fuse link}) \geq \frac{I_{SC\ STC}}{0{,}90 \cdot 0{,}80} \geq I_{SC\ STC} \cdot 1{,}4$$

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The data reflected in this technical record are subject to the correct installation of the product in accordance with manufacturer's instructions, relevant installation standards and professional practices, maintained and used in applications for which they were made.

DF ELECTRIC retains the right to change the dimensions, specifications, materials or design of its products at any time with or without notice.



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