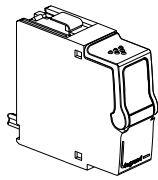

**4 141 55/56**

**4 141 85/86**
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**1. DESCRIPTION, INSTALLATION**
**■ 1.1 Description**

Type 2 SPDs for photovoltaic (PV) installations with voltages which may reach a maximum voltage ( $U_{ocmax}$ ) of 1200 VDC (irrespective of the local environmental, temperature, sunlight conditions, etc).

Specifically designed to protect the DC part of PV installations (PV panels and inverters)

- based on the use of non-polarised panels (panels which do not require their active conductors to be earthed)\*
- without an energy storage system (e.g. batteries, etc)

Equipped with replacement plug-in modules with LED indicators (red LED: modules need to be replaced).

\* equipped with status feedback

**■ 1.2 Installation**

SPDs must not be installed in locations where there is a risk of fire or explosion without special precautions. They must be disconnected before checking the installation insulation resistance.

Connections as per section 4.5 and 4.6: SPD connected to the mains supply and to the protective conductor (PE) using as short a connection as possible (< 50 cm).

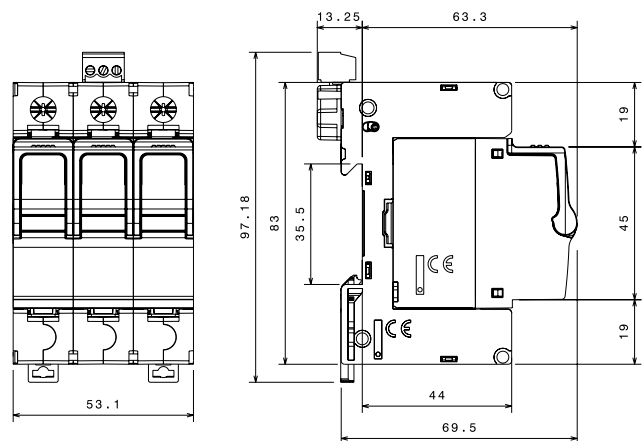
Electromagnetic compatibility rules: avoid loops, fix the cables firmly against the exposed metal conductive parts.

Compulsory connection of the earth terminal on the SPD to the protective conductor (PE) in the distribution board.

Equipotentiality rules: interconnection of the exposed conductive parts of the equipment and the protective conductor (PE) in the distribution board, which is itself connected to the earth terminal of the SPD (see 4.6).

**2. RANGE**

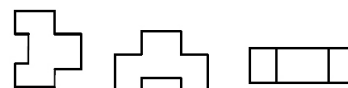
Cat. No.	Description	Reference voltage
4 141 55	Base + Cartridges (4 141 85 x3)	600 VDC
4 141 56	Base + Cartridges (4 141 86 x3)	1000 VDC
4 141 85	Replacement cartridge	600 VDC
4 141 86	Replacement cartridge	1000 VDC

**3. DIMENSIONS**

**4. POSITIONING, CONNECTION**
**■ 4.1 Fixing**

. On EN 60715 or DIN 35 symmetrical rail

**■ 4.2 Operating position**

. Vertical      Horizontal      Side


**■ 4.3 Power supply**

. 4 141 55/56: via the top

**4. POSITIONING, CONNECTION (continued)**

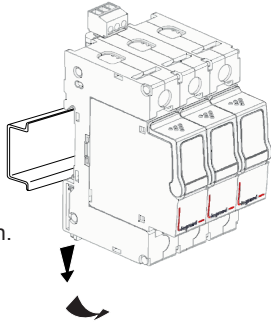
**4.4 Maintenance**

**Checking the installation insulation resistance**

Disconnect the SPDs (remove the cassettes) before checking the installation insulation resistance.

**Module maintenance**

A modular SPD can be replaced without disconnecting the other products.



Put the latch clip in the unlocking position. Tilt the device forward and release the upper hook from the rail

**Associated protection device**

No external associated protection is necessary for currents below 125 A (4 141 56) and 50 A (4 141 55).

**Installing cascaded SPDs**

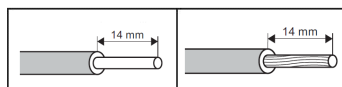
When panels are more than 10 m away from the inverter (from the DC enclosure incorporating the DC SPD protecting the inverter), a DC SPD is also recommended close to the panels (see section 4.5 and 4.6).

**Connection**

- . IP20 protected terminals, with wired device
- . Cage terminals with quick release captive screws
- . Terminals fitted with flaps preventing a cable being placed under the terminal, with the terminal partly open or closed
- . Terminal depth: 14 mm

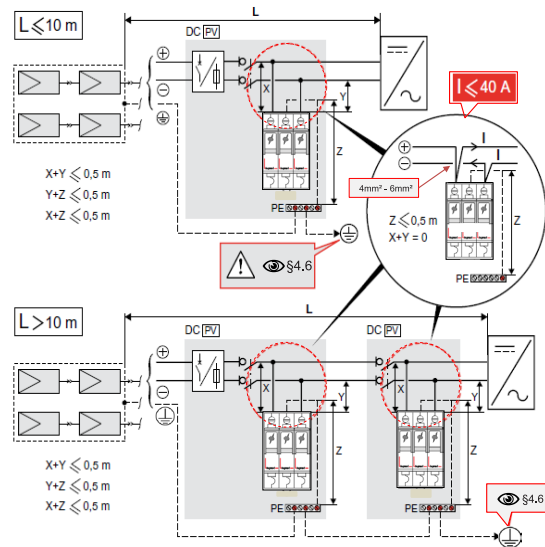
**Connection cross-sections and lengths to be stripped**

Permitted conductors	
- Flexible	4 to 25 mm <sup>2</sup>
- Rigid	6 to 35 mm <sup>2</sup>
Tools required	
- Flat screwdriver	Ø4 to 6.5 mm
- PZ Phillips screwdriver	PZ2
Tightening torque	
- min.	2.5 Nm
- max.	3.0 Nm
- recommended	2.7 Nm



**4. POSITIONING, CONNECTION (continued)**

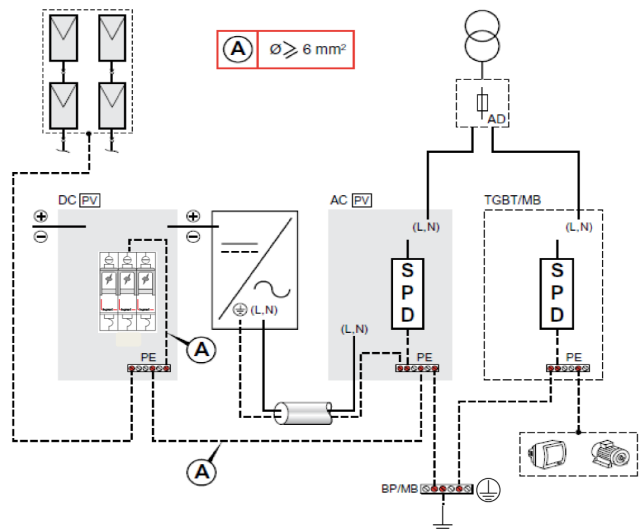
**4.5 Connecting the PV SPD**



**4.6 Earth connections and equipotentiality in the PV installation**

Equipotentiality of all the earths is essential to ensure correct voltage surge protection of the whole PV electrical installation and the consumption part.

Check that the earth connection to which exposed conductive parts in the installation are connected complies with standard NF C 15-100 (IEC 60364).

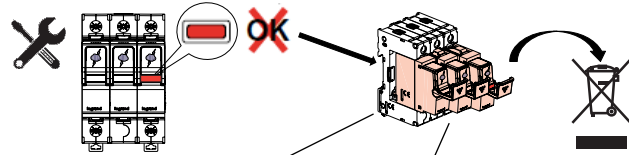


**4. POSITIONING, CONNECTION (continued)**

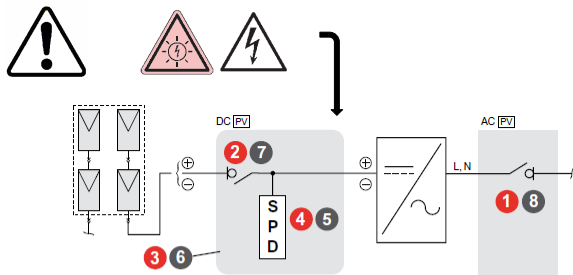
**4.7 Replacing plug-in modules**

Recommendation:

The installation must not be switched back on (DC/AC) without the plug-in modules fitted.



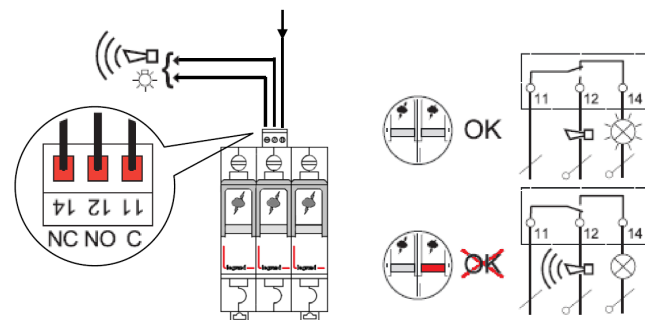
4 141 55	4 141 56
4 141 85 x 3 (+/- ⊥)	4 141 86 x 3 (+/- ⊥)



1	OFF	8	ON
2	OFF	7	ON
3		6	
4		5	

**4.8 Status feedback**

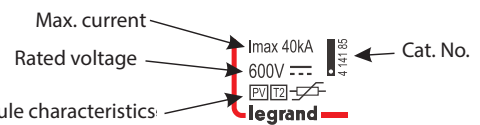
A signalling accessory is included for feedback of the SPD status.



**5. GENERAL CHARACTERISTICS**

**Marking on the front (plug-in modules)**

. By indelible pad printing



**Marking on the front (base) and markings on the side (base and plug-in modules)**

. By laser

**Characteristics**

Cat. Nos.	4 141 55 4 141 85	4 141 56 4 141 86
Reference voltage (Uocstc)	600 V(DC)	1000 V(DC)
Max. voltage (Ucpv)	720 V(DC)	1200 V(DC)
SPD type	Type 2	
Number of protected poles	2	
Protection mode	Y <sup>(1)</sup>	
Nominal current (In: 8/20 wave)	20 kA	
Max. discharge capacity (Imax: 8/20 wave)	40 kA	
Protection level (Up) at In (20 kA)	2.5 kV	4 kV
Protection level (Up) at In (5 kA)	1.9 kV	3.2 kV
Max. operating current (Iscpv)	50 A <sup>(2)</sup>	125 A <sup>(2)</sup>
Max. line current (I <sub>l</sub> )	40 A	
Residual current at Ucpv (Ipe)	< 1 mA	
Response time	25 ns	
Max. terminal capacity (flexible wire with cable ends/rigid wire)	25/35 mm <sup>2</sup>	
Number of ports	1	
Location category	Indoor	
Installation method	Permanent	
Number of modules	3	
Protection index	IP 20/IK 04	
Pollution level	2	
Operating temperature	-25°C to +60°C	
Storage temperature	-25°C to +60°C	

<sup>(1)</sup> Y protection mode: +/- protection, +/-earth and -/earth.

<sup>(2)</sup> Maximum current that the PV SPD can withstand in the event of end of life due to a short-circuit without adding any external protection, irrespective of the local environmental, temperature, sunlight conditions, etc. This value must always be greater than the max. short-circuit current of the PV generator (1.25 I<sub>scstc</sub>).

**Materials**

. Base:

- Fibreglass reinforced (10%) polycarbonate (PC)
- Self-extinguishing: 850°/30 s
- Colour: RAL 7035 light grey

. Plug-in module:

- Fibreglass reinforced (30%) polybutylene terephthalate (PBT)
- Self-extinguishing: 960°/30 s
- Colour: RAL 7035 light grey

**5. GENERAL CHARACTERISTICS (continued)**

**Packaged volume**

	4 141 55	4 141 56	4 141 85	4 141 83
Packaging	per unit		per unit	
Volume (dm <sup>3</sup> )	0.5		0.2	
Weight (g)	340		340	

**6. LEGRAND RECOMMENDATIONS**

**■ 6.1 Protection of the DC part of the PV installation**

To provide correct voltage surge protection of the DC part of the PV installation, a PV SPD is recommended:

- On each inverter input <sup>(1)</sup> (in DC enclosures in accordance with guide UTE C 15-712-1, SPD compulsory according to the type and location of the installation to be protected, see UTE C 15-712-1)
- Close to the panels (in group junction boxes according to guide UTE C 15-712-1) when they are more than 10 m away from the inverter or the DC enclosure <sup>(2)</sup>

<sup>(1)</sup> For multi-input or multi-MPPT inverters, it is advisable to use an SPD on each input

<sup>(2)</sup> PV generators with a Uocmax voltage of less than 600 V: According to guide UTE C 15-712-1, this protection is only necessary if Legrand 600 V SPDs are installed close to the inverters. This protection is nonetheless recommended for widespread PV installations with very long lines.

**■ 6.2 Protection of the AC part of the PV installation**

Likewise, for correct protection of the AC part of the PV installation, it is advisable to group the inverters together in the same equipment room as the main panel (main LV distribution board) connecting the PV installation to the LV grid. Thus a single AC SPD <sup>(1)</sup> is all that is needed to protect the main LV distribution board (SPD compulsory according to the type and location of the installation to be protected, see UTE C 15-712-1).

If the inverters are not installed in the equipment room in which the main LV distribution board is located (or are installed outdoors) an AC SPD is also necessary close to each inverter.

Recommended types of AC SPD:

PV installation power	Main LV board protection Installations with lightning conductors <sup>(3)</sup>	Main LV board protection Installations without a lightning conductor	Protection close to inverters <sup>(2)</sup>
P < 36 kWc	Type 1 (Iimp 12.5 kA)	SPD protected	SPD protected
P < 100 kWc	Type 1 (Iimp 25 kA)	Type 2 (I <sub>max</sub> 70 kA)	Type 2 (I <sub>max</sub> 15 kA)
P > 100 kWc	Type 1 (Iimp 25 kA)	Type 1 (Iimp 25 kA)	Type 2 (I <sub>max</sub> 40 kA)

<sup>(1)</sup> An additional AC SPD is also necessary close to each inverter that is more than 10 m away from the main LV distribution board. This SPD must be the same type as those used close to the inverters (see above table).

<sup>(2)</sup> AC SPDs needed close to each inverter that is  
 - more than 10 m away from the main LV distribution board  
 - installed outdoors or outside the equipment room in which the main LV distribution board is installed

<sup>(3)</sup> When a PV installation is protected by lightning conductors, it is advisable to create an isolated lightning protection system (isolated LPS) as described in standard NF EN 62305, maintaining adequate separation distances between the metal structures of the panels and the LPS (lightning conductors and downcomers).

**6. LEGRAND RECOMMENDATIONS (continued)**

**■ 6.3 Protection of the AC part of the existing installation (consumption part)**

To ensure correct voltage surge protection of the whole installation (PV installation and installation on the consumption side), it is advisable to protect the AC installation on the consumption side so as to avoid any possible risk resulting from voltage surges on the PV installation or voltage surges from the grid.

Since both electrical installations usually have a common earthing system, SPDs are recommended on both installations to avoid any possible problem of equipotentiality or feedback from earth.

The SPDs must be the same type as the AC SPDs recommended for AC protection of the PV installation (see section 6.2). SPDs for the secondary enclosures must be the same type as those recommended for protection close to the inverters (table above in section 6.2). See also the technical data sheets for T1 and T2 SPDs for 230/400 V~ systems.

**■ 6.4 Guide UTE C 15-712-1**

According to this guide, the use of PV SPDs for protection on the DC side is compulsory:

- if lightning conductors are present
- depending on the lightning risk analysis\* (according to the distance between panels and inverter and the local lightning strike density) (see article 13)

The use of AC SPDs is compulsory on the AC side:

- if lightning conductors are present
- if the local lightning strike density is greater than 2.5 (see NF C 15-100 article 443)

Note: The use of SPDs is usually also compulsory if a lightning risk analysis has been carried out according to standard NF EN 62305 (IEC 62305). In this case, refer to section 6.2 and the previous table, considering an installation equipped with lightning conductors and incorporating all the necessary protection close to the equipment.

\*Given the expense of panels and inverters, we strongly recommend that SPDs are always installed.

**7. CONFORMITY**

Complies with standard NF EN 50539-11 and drafts PR NF EN 61643-31 and future standard IEC 61643-31. Used to comply with the installation requirements and recommendations in guides UTE C 15-712-1, TS 50539-12 and also standards IEC 60364-7-712 and IEC 61643-32.

Conforms to Directive: 2014/35/EU

**8. ACCESSORY**

**Replacement plug-in modules:**

Plug-in module Cat. No.	Voltage	Associated base
4 141 85	600 VDC	4 141 55
4 141 86	1000 VDC	4 141 56

With LED indicator:

- Green: SPD operational
- Red: plug-in module needs to be replaced

Replacing plug-in modules: see section 4.7