

INTRODUCTION
 This document explains how to install Furse ESP surge protective devices SPDs for DC power applications such as Photovoltaic (PV) systems.

ESP DC1100T1/12.5, ESP DC1500T1/12.5



- 1. Safety note:**
 Warning! Installation by person with electrotechnical expertise only.
 Warnung! Installation nur durch elektrotechnische Fachkraft.
 Avvertenza! Fare installare solo da un elettricista qualificato.
 Avertissement! Installation uniquement par des personnes qualifiées en électrotechnique.
 Advertencia! La instalación deberá ser realizada únicamente por electricistas especializados.

2. Application
2.1 Furse ESP DC T1 Series SPDs are combined Type 1 and 2 SPDs. They are suitable for use on DC applications such as the DC side of Photovoltaic (PV) solar panel systems.

They are suitable for equipotential bonding to protect a DC system (e.g. PV) against damage from flashover as a result of lightning.

Combined Type 1+2 protection enables the ESP DCT1 SPDs to meet the requirements for protecting PV solar panel systems in line with IEC 61643-32.

Note: Additional ESP mains power SPDs should be installed on the AC side of the PV system in order to protect against transients on the 230 V AC line from DC/AC inverter to the local sub-distribution board - see Furse Application Note AN014

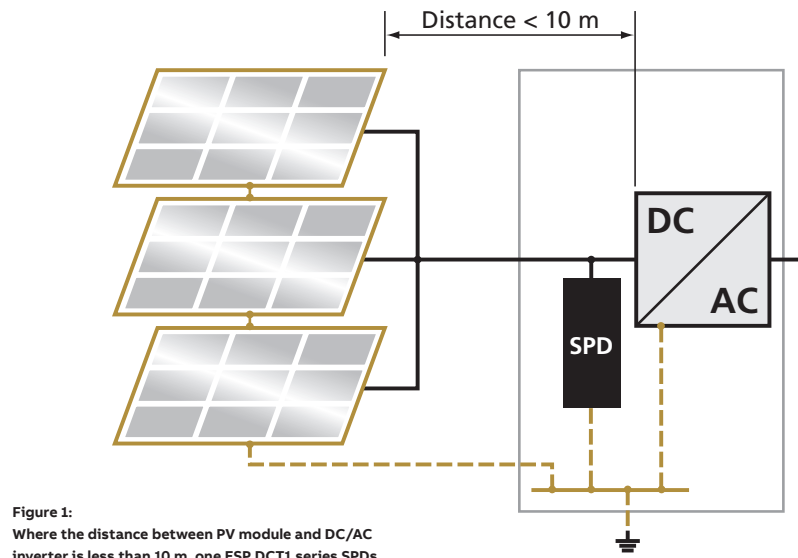


Figure 1: Where the distance between PV module and DC/AC inverter is less than 10 m, one ESP DCT1 series SPDs suffices, installed close to the DC/AC inverter.

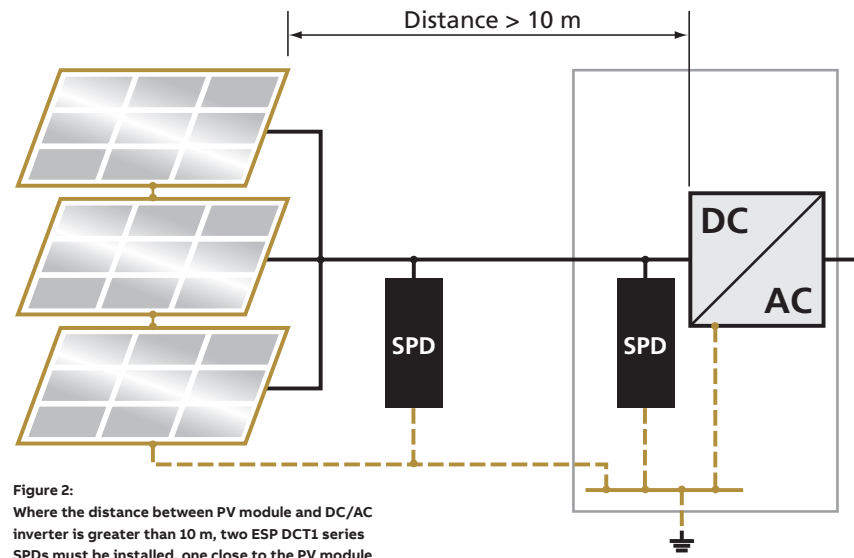


Figure 2: Where the distance between PV module and DC/AC inverter is greater than 10 m, two ESP DCT1 series SPDs must be installed, one close to the PV module and the other close to the DC/AC inverter.

3. Before installation
3.1 Ensure that the SPD's maximum DC voltage is suitable for the installation.

	Maximum DC Voltage
ESP DC1100T1/12.5	1100 V
ESP DC1500T1/12.5	1500 V

4. Installation
4.1 Location
 The SPD should be installed very close to the DC/AC inverter to be protected. Where the distance between the PV module and the DC/AC inverter is less than 10 m, a single SPD close to the inverter will suffice. However, where the distance between the PV module and the DC/AC inverter is greater than 10 m, then two SPDs must be installed, one close to the inverter and the other close to the PV module (see Figures 1 & 2).

4.2 Enclose the SPD
 The SPD has exposed terminals and therefore, for electrical safety, must be installed within an enclosure. Suitable enclosures (such as the WBX D4 and MBX D4) are available from Furse.

Use cable glands to retain the enclosure's IP rating. SPDs should always be installed in a dry environment.

4.3 Parallel connection
 The SPD should be connected in parallel with the supply to be protected (see Figure 3). The connecting leads do not carry the load current of the supply, only the current associated with suppressing the transient overvoltage.

Connecting leads to the SPD need to be kept short in order to minimise additive inductive voltages. The total lead length between the live conductors, the SPD and the earth conductor should ideally be no more than 0.5 m (see Section 4.6 - Length of connecting leads).

Connections should be made to each supply conductor including earth.

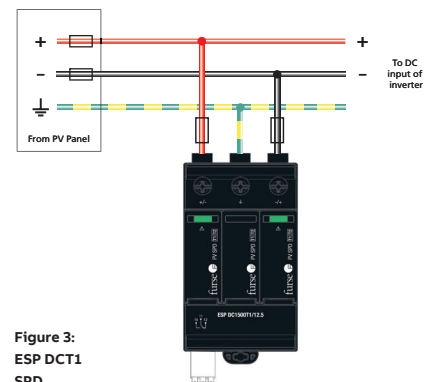


Figure 3: ESP DCT1 SPD installation.

Maximum torque is 4.5 Nm power terminals, with cable stripping length 11 mm. The torque rating for the volt-free contacts is 0,25 Nm and cable stripping length 7 mm.

Note: Hand tighten connections only. Do NOT use power driven screwdrivers to make connections to the SPD.

It is good practice to be able to isolate or disconnect the SPD from the supply.

A means of isolation should therefore be installed in the connection to the SPD. Where it is also necessary to fuse the connection to the SPD, Fuses specifically designed for use on PV systems are recommended.

4.4 Fuse connecting leads
 It is recommended that all live connecting leads are fused. This is to protect the connecting leads in the event of a short circuit.

If the I_{SCMAX} rating delivered by the PV array is greater than I_{SCPV} rating of the SPD then external fusing must be fitted. ABB Furse always recommends the use of external PV fusing in all installations as it is good electrical practice.

The following fuse guidance from IEC 60364-7-712 applies:

- Use gPV fuses in accordance with IEC 60269-6
- The rated operating voltage U_e shall be greater or equal to U_{OCMAX} of the PV array.

To determine a suitable value for the gPV fuse, the following guidance is offered:

- Determine I_{SCMAX} that can be delivered by the PV array at that point in the installation
- Divide this value by 10 (equivalent to low irradiation value), divide this by 1.25
- Install gPV fuse value closest to this calculated value.
- Example: if $I_{SCMAX} = 3000A$, then a suitable fuse would be 240A gPV

4.5 Size of connecting leads

The size (cross-sectional area) of the connecting leads between the terminals of the SPD must be at least 16mm² multi-stranded conductor (copper) for a Type 1 PV SPD.

Note: the size of the connecting leads to the SPDs must not be less than the size of leads of the associated system.

If required, the terminals on the SPD will accept connecting leads of up to 25 mm².

4.6 Length of connecting leads

The connecting leads should be kept as short as possible and ideally should not exceed 25 cm (10 inches) from the busbars to the SPD's terminals.

The SPD can be mounted upside down or on its side if this facilitates shorter connecting leads.

WARNING: The longer the connecting leads (between the cable or busbars and the terminals of the SPD) the greater the voltage let-through the SPD. If the resultant let-through voltage is higher than the withstand voltage level of the equipment to be protected, damage will result.

4.7 Bind connecting leads

Connecting leads should be tightly bound together using Ty-Raps®, tape or spiral wrap. This should be done for the entire length of the cable or as far as is possible.

5. SPD operation/status indication

5.1 The SPD includes an internal thermal supervision device which continually monitors its operation. Status is displayed via the front facing window.

During normal operation the status display is green. Should a fault occur, the supervision device disconnects the SPD from the mains supply and displays a red indicator in the status window.

Note: After the supervision device has disconnected surge protection, the SPD should be replaced to prevent the risk of flashover causing dangerous sparking and equipment damage.

6. Remote indication

6.1 A remote indication facility is provided for linking the SPD to a management system/remote alarm. A volt free contact on the SPD allows a remote alarm to be tripped if a fault develops within the SPD. When a fault occurs (or the protective module is removed) terminals 11-12 (12 is Normally Closed NC) break contact and terminals 11-14 (14 is Normally Open NO) make contact – see Figure 5.

Figure 5

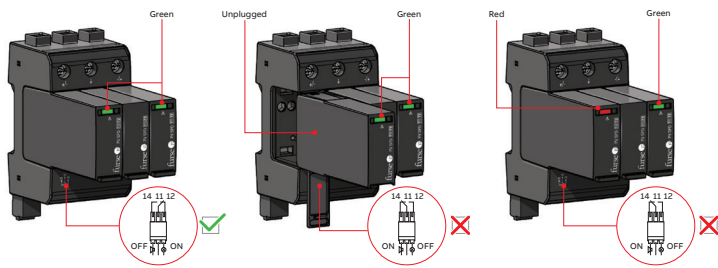
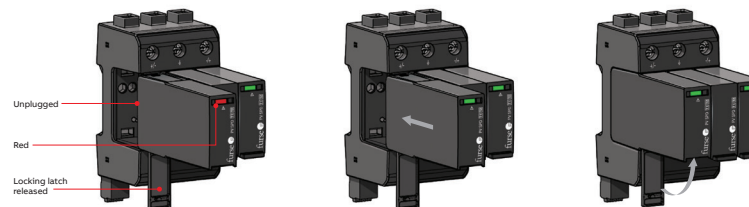


Figure 6



6.2 The fast-fit spring-type terminal for the volt free contact accepts solid cable from 0.25mm² up to 1.5 mm² and is located on the bottom of the SPD. The SPD's remote indication is rated at 1.0 Amp, 250 V AC. Note: For reliable contact operation, the minimum permissible load is 10 mA, 5 V DC.

7. Maintenance

7.1 Maintenance should be conducted at least once a year and also following lightning activity. Visually check:

- Status indication window (green= ok, red/not green = fault/disconnected)
- Condition of connecting leads and terminations

7.2 Figure 6 illustrates how to replace an SPD's protection module (spares available from ABB Furse). First disconnect the power to the SPD. To remove a protection module, its associated locking latch should first be released by pulling the latch tab down as shown.

The module can then be withdrawn. The replacement protection module can then be inserted until it is fully seated and the locking latch can be re-engaged to secure the protection module in place. Power to the SPD can then be reinstated.

8. Application notes

8.1 ESP coordination

ESP DCT1 series SPDs are designed to operate on the DC side of the DC/AC inverter of PV power systems. Additional Type 1 or Type 2 SPDs should be installed on the AC side of the system in order to provide full protection on the 230 V AC line from the DC/AC inverter to the local sub-distribution board.

See Furse Application Note AN014 for further information protection on the AC side of PV systems.

ESP DCT1 series SPDs fully coordinate with ESP DCT2 SPDs on the same installation.

Always ensure SPDs are used on the same installation to ensure coordination. Mixing SPDs with alternative manufacturers' units could result in damage to both protection units and connected equipment through poor coordination.

8.2 Insulation tests (flash testing)

The SPD should be fully disconnected from the circuit before testing. Otherwise the SPD will treat the insulation test as a transient overvoltage and control the voltage to a low level - thereby defeating the object of the test.

8.3 Use of powered screwdrivers

The use of powered screwdrivers is not recommended. Hand tighten connections only (maximum torque value is 4.5 Nm for these terminals).

Environment

Consider the protection of the environment! Used electrical and electronic equipment must NOT be disposed of with domestic waste. The device contains valuable raw materials which can be recycled. Therefore, contact ABB for disposal of this equipment.



For photovoltaic Surge Protective Devices (SPDs) ESP DCT1 (PV) Series
INSTALLATION INSTRUCTIONS



Contact us

ABB Furse
UK Office
Wilford Road
Nottingham NG2 1EB
Tel: +44 (0) 115 964 3700
Fax: +44 (0) 115 986 0071
National Sales Tel: +44 (0) 333 999 9900
National Sales Fax: +44 (0) 333 999 9901
E-Mail: enquiry@furse.com

www.furse.com