## INTRODUCTION

This document explains how to install Furse Electronic Systems Protectors for Photovoltaic (PV) systems:

**ESP DC550/12.5/PV, ESP DC1000/12.5/PV**

**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.

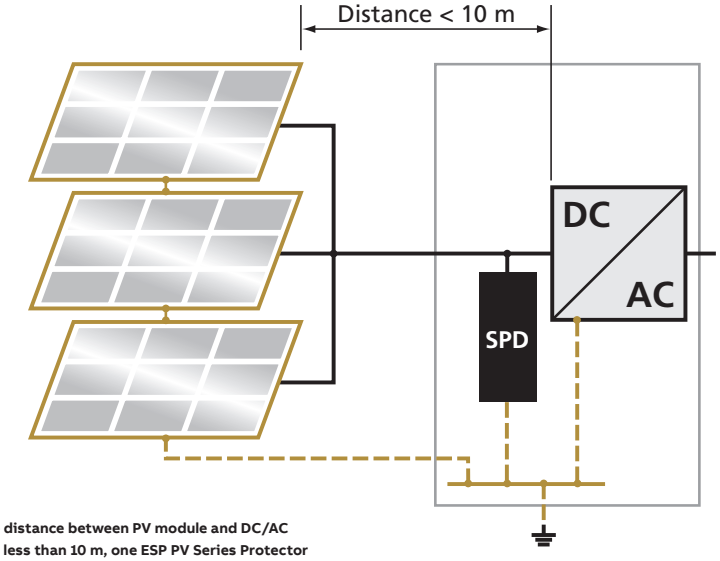


**Figure 1:**
**Where the distance between PV module and DC/AC inverter is less than 10 m, one ESP PV Series Protector suffices, installed close to the DC/AC inverter.**

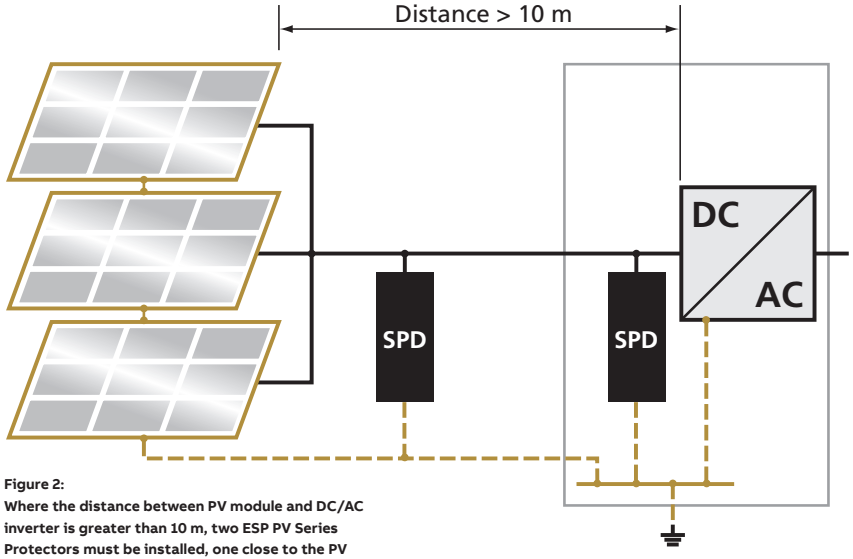


**Figure 2:**
**Where the distance between PV module and DC/AC inverter is greater than 10 m, two ESP PV Series Protectors must be installed, one close to the PV module and the other close to the DC/AC inverter.**

**2. Application**

**2.1** Furse ESP PV Series Combined Type 1 and 2 Protectors are suitable for use on the DC side of Photovoltaic (PV) solar panel systems.

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

Combined Type 1 and Type 2 protection enables the ESP PV Series Protector to meet the requirements for protecting PV solar panel systems in line with DD CLC/TS 50539-12:2010, section 4.6.2.1.

Note: Additional ESP mains power Protectors should be installed on the AC side of the photovoltaic 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.

**3. Before installation**

**3.1** Ensure that the ESP Protector's maximum DC voltage is suitable for the installation.

| | Maximum DC Voltage |
|---|---|
| ESP DC550/12.5/PV | 550 V |
| ESP DC1000/12.5/PV | 1000 V |

**4. Installation**

**4.1 Location**

The ESP Protector 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 ESP Protector 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 ESP Protectors must be installed, one close to the inverter and the other close to the PV module (see Figures 1 & 2).

**4.2 Enclose the ESP Protector**

The ESP Protector has exposed terminals and therefore, for electrical safety, must be installed within an enclosure.

Suitable enclosures (such as the WBX D4) are available from Furse.

Use cable glands to retain the enclosure's IP rating.

ESP Protectors should always be installed in a dry environment.

**4.3 Parallel connection**

The ESP Protector 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 ESP Protector need to be kept short in order to minimise additive inductive voltages. The total lead length between the live conductors, the ESP Protector 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.

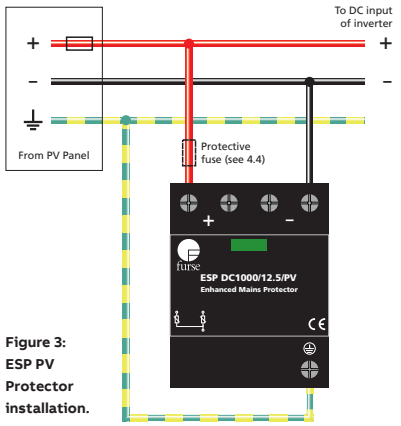


**Figure 3:**
**ESP PV Protector installation.**

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 ESP Protector.**

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

A means of isolation should therefore be installed in the connection to the ESP Protector. Where it is also necessary to fuse the connection to the ESP Protector, this can be achieved through use of a switchfuse, MCCB or type 'C' MCB.

**4.4 Fuse connecting leads**

It is recommended that the connecting lead to the + terminal of the ESP Protector is fused. This is to protect the connecting lead in the event of a short circuit.

... continued overleaf

Fuses specifically designed for use on PV systems are recommended.

To determine the most appropriate fuse required, make assessment of the nominal current of the photovoltaic module and the open circuit voltage of the PV array.

1. Multiply the nominal current of the photovoltaic module by a factor of 1.4 and select the closest, higher value fuse to the calculated figure.

2. Multiply the open circuit voltage of the PV array by a factor of 1.2 & ensure that the selected fuse has a higher voltage withstand than the calculated figure.

**4.5 Size of connecting leads**

The size (cross-sectional area) of the connecting leads between the terminals of the ESP Protector and the power supply is dependent on the installation.

Where one ESP Protector only is installed close to the DC/AC inverter, a minimum size of 6 mm2 multi-stranded conductor (copper) can be used.

Where two ESP Protectors are installed, one close to the PV module and the other close to the DC/AC inverter, 16 mm² multi-stranded conductor (copper) must be used.

Note: the size of the connecting leads to the ESP Protector(s) must not be less than the size of leads of the associated system.

If required, the terminals on the ESP Protector 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 ESP Protector's terminals.

The ESP Protector 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 ESP Protector) the greater the voltage let-through the ESP Protector. 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. Protector operation/status indication**

**5.1** The ESP Protector 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 clear. Should a fault occur, the supervision device disconnects the ESP Protector from the mains supply and displays a red indicator in the status window.

**Note: After the supervision device has disconnected surge protection, the ESP Protector 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 ESP Protector to a building management system.

A volt free contact on the ESP Protector allows a remote alarm to be tripped if a fault develops within the ESP Protector.

When a fault occurs terminals 11-14 (14 is NC) break contact and terminals 11-12 (12 is NO) make contact.

Note: Unless further specific surge protection is in place the signalling wires for the remote alarm contact should only be routed inside the building, otherwise the overall surge protection may be affected.

**6.2** The terminal for the volt free contact accepts 1.5 mm2 cable and is located on the bottom of the ESP Protector. The ESP Protector's remote indication is rated at 0.5 Amp, 250 V AC.

**7. Maintenance**

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

(i) Status indication window (clear = ok, red = fault/disconnected)

(ii) Condition of connecting leads and terminations

**8. Application notes**

**8.1 ESP coordination**

ESP PV Series Protectors are designed to operate on the DC side of the DC/AC inverter of PV power systems. Additional Type 1 or Type 2 ESP Protectors 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 PV Series Protectors fully coordinate with ESP Type 1+2 units (such as ESP 415/XXX) on the same installation.

Always ensure ESP Protectors are used on the same installation to ensure coordination.

Mixing ESP Protectors 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 ESP Protector should be fully disconnected from the circuit before testing. Otherwise the ESP Protector 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.

## Notes


ESP PV Series

# for photovoltaic protectors

INSTALLATION INSTRUCTIONS


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