**INTRODUCTION**

This document explains how to install the Fuse Electronic Systems Protector for DC systems:

ESP DC05D1, ESP DC12D1, ESP DC24D1

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1. **Safety note:**

   Warning! Installation by person with electrotechnical expertise only.

   Warning! 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 Fuse ESP DCD1 series Combined Type 1, 2 & 3 Protectors are suitable for use on direct current (d.c.) power distribution systems primarily to protect connected electronic equipment from transient overvoltages on the power supply.

   Note: Additional ESP mains power Protectors should be installed on AC power supplies to offer a coordinated Total Solution protection concept to the installation.

3. **Before installation**

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

<table>
<thead>
<tr>
<th>Maximum voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESP DC05D1</td>
</tr>
<tr>
<td>ESP DC12D1</td>
</tr>
<tr>
<td>ESP DC24D1</td>
</tr>
</tbody>
</table>

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4. **Installation**

   4.1 **Location**

   The ESP DCD1 series Protector need to be installed very close to the power supply to be protected.

   Usually the ESP Protector will be installed at a power distribution panel either inside it or right next to it.

   4.2 **Enclose the ESP Protector**

   The ESP Protector has exposed terminals. For electrical safety, the ESP Protector must be installed within a panel or enclosure.

   Where possible, install the ESP Protector within the power distribution panel behind a suitable viewing window.

   When mounting the ESP Protector in an existing metal panel or enclosure, ensure that the enclosure is securely bonded to the earth bar to which the ESP Protector will be connected.

   Position the ESP Protector at the preferred location on the DIN rail and press the ESP Protector back to release the springs.

   The ESP Protector locks into place (see Figure 2).

   4.3 **DIN installation**

   ESP DCD1 series Protectors have been designed with an innovative DIN foot for connection to standard 35 mm DIN rails.

   This DIN foot, comprising spring loaded steel DIN mounts, enables rapid positioning of the ESP Protector on to the rail.

   The spring loaded steel DIN mounts pull down and out to lock into place ready for siting the ESP Protector (see Figure 1).

   If it is not possible to install the ESP Protector within the distribution panel it should be mounted in a separate enclosure as close as possible to the distribution panel (see Sections 4.8 & 4.9 - Length of connecting leads).

   Gland the enclosure on to the power distribution panel.

   Suitable enclosures are available from Fuse.

   ESP Protectors should always be installed in a dry environment.

   4.4 **Parallel connection**

   The ESP Protector can be connected in parallel with the supply to be protected (see Figure 3), or connected in-line (series), for power supplies ≤ 125 A (see Figure 4).

   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 Sections 4.8 & 4.9 - Length of connecting leads).

   Connections should be made to each supply conductor including earth.

   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.

   4.5 **Series connection**

   The twin terminal design of the ESP DCD1 Protector enables installation in-line (series) with the power supply (for power supplies ≤ 125 A).

   The connecting leads (see Sections 4.8 & 4.9 - Length of connecting leads).

   Protectors should be installed on AC power supplies to offer a coordinated Total Solution protection concept to the installation.

   The terminals of the ESP Protector can receive up to 25 mm² stranded cable.

   Any type of protector installed in parallel (shunt) with the supply will have additive inductive voltage on the connecting leads.

   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 (see Section 4.6).

   4.6 **Fuse connecting leads**

   The connecting lead to the + terminal of the ESP Protector should be fused.

   This is to protect the connecting lead in the event of a short circuit.

   The fuse to the ESP Protector (F_{SPD}) should be lower than the upstream supply fuse F_{S} by a sufficient enough factor to ensure fuse discrimination.

   As a general guide a factor of at least 2 could be used (F_{SPD} ≤ 0.5 F_{S}), where the maximum fuse to the ESP Protector required is 125 Amps (if the supply fuse is 250 Amps or greater).

   Refer to the fuse manufacturer’s operating characteristics to ensure discrimination, particularly where an installation includes a mixture of types of fuse, or of fuses and circuit breakers.
4.7 Size of connecting leads
For parallel connection, the connecting leads between the terminals of the ESP Protector and the power supply should be 10 mm² multi stranded conductor (copper). For series connection, the supply cables should be suitably rated for the specific load current.

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

4.8 Length of connecting leads - parallel connection
For ESP Protectors installed in parallel, 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.

ESP Protectors can be mounted upside down or on their side if this facilitates shorter connecting leads.

4.10 Bind connecting leads - parallel connection
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.

5.0 Protector operation/status indication
5.1 The ESP Protector gives a continuous visual display of its status. It includes a two colour indicator light, for both positive and negative:

- Green only = Full protection, power on.
- Green + Red = WARNING. Reduced protection, replace unit as soon as possible.
- Red only = NO PROTECTION. Replace ESP Protector immediately.
- No lights = No power connection or system fault. Check external fuses and connections.

The normally closed (NC) contact is closed when the ESP Protector is healthy and power is present.

As well as providing warning of the reduced protection state, the normally closed volt free contact can also be used to signal power loss, eliminating the need for special relays (see Figure 5).

The ESP Protector’s remote indication is rated at 1 Amp, 250 V AC. Note: For reliable contact operation, the minimum permissible load is 10 mA, 5 V DC.

<table>
<thead>
<tr>
<th>Supply Rated Voltage (Vrms)</th>
<th>Unit Voltage Range (Vrms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO</td>
<td>NC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power Present</th>
<th>OPEN</th>
<th>CLOSED</th>
<th>CLOSED</th>
<th>OPEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Absent</td>
<td>CLOSED</td>
<td>OPEN</td>
<td>CLOSED</td>
<td>OPEN</td>
</tr>
</tbody>
</table>

Figure 5 - Operation of normally closed (NC) and normally open (NO) volt free contact.

6. Remote indication
6.1 A remote indication of the reduced protection state is provided for linking the ESP protector to a building management system, remote telemetry, PLC or directly to the equipment to be protected, damage will result.

The ESP Protector has both a normally open and a normally closed volt free contact, powered by an ‘active’ relay.

6.2 The terminal for the volt free contact accepts 1.5 mm² cable (solid or stranded conductor) and is located on the top of the ESP Protector.

It has three terminals, marked:

- 11 = NO = Normally Open
- 12 = NC = Normally Closed
- 14 = C = Common

The normally open (NO) contact is open when the ESP Protector is healthy and power is present.

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

- Visual status indication lights (see 6. Status indication for interpretation)
- Condition of connecting leads and terminations

8. Application notes
8.1 ESP coordination
ESP DCD1 series Protectors fully coordinate with AC mains power ESP Type 1+2 Protectors (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.

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!

Recycled. Therefore, contact ABB for disposal of this device contains valuable raw materials which can be recycled. Therefore, contact ABB for disposal of this equipment.

Notes

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