

OSM/IN DECISION

Standard: EN 50539-11:2013	Sub clause: - 6.2.5.2 - 7.2.1 - 7.4.7.2 - 7.4.7.3	Sheet N°: OSM/IN 270
Subject: Correct sample preparation and application of the overload behaviour test	Key words: - overload behaviour - sample preparation	Meeting N°: -- Item: -- Enquiry dates: 2014-03-03 / 2014-04-25

Question/Problem:

How to correctly prepare the test samples and to perform and apply the “overload behaviour test”, depending on SPD-configuration, modes of protection and current branches?

Decision:

The following principle procedure and options are either complementary or corrective to some of the standard requirements to remove inconsistencies:

Important definitions:

3.1.6

modes of protection

intended current path between terminals, that contains one or more protective components, for which the manufacturer declares a protection level, e.g. + to -, + to earth, - to earth

Note 1 to entry: Additional terminals may be included within this current path.

3.1.7

current branch of an SPD

intended current path, between two nodes that contains one or more protective components

Note 1 to entry: A current branch of an SPD may be identical with a mode of protection of a SPD.

Note 2 to entry: This intended current path does not include additional terminals.

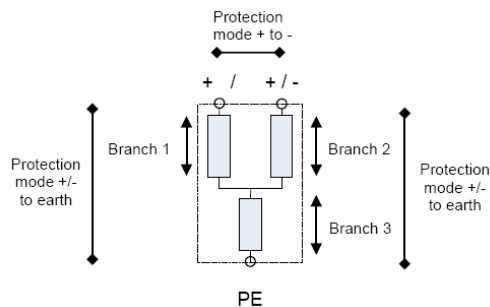


Figure 1 □ **Current branches vs. modes of protection of an SPD**

To be continued

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Configurations, sample preparations and testing alternatives

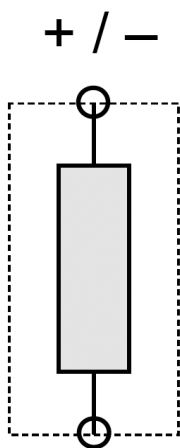
This test is **not applied to modes of protection which have voltage switching components only.**

The test shall be performed on each mode of protection declared by the manufacturer, however, if some modes of protection have identical circuitry, the test can be performed on the mode of protection which presents the most vulnerable configuration.

For SPDs in Y-configuration and for single mode SPDs to be connected in Y configuration according to the manufacturer's information, testing shall be performed on each mode of protection of the complete SPD or SPD set in Y configuration, except if modes of protection are identical and their construction is completely symmetrical.

All the series connected **voltage-switching components** of the test sample **shall be replaced by appropriate copper blocks (dummies)**, ensuring that the internal connections and their cross-section area and surrounding material (e.g. resins) and packaging are not changed.

5.9.1 I-configuration



There are two choices how to apply the test:

- 1) Preferred procedure:
 Replace all voltage limiting components with components of the same nature, but with a voltage U_{1mA} being equal to 50-60% of the U_{1mA} value of the original components.
 Perform the test with the required prospective current settings either at a voltage of $U_{CPV}/1,2$ or at a higher voltage as required by the manufacturer.
- 2) Alternate procedure:
 The voltage limiting components remain unchanged.
 Perform the test with the required prospective current settings either at a voltage of 2 times $U_{CPV}/1,2$ or at a higher voltage as required by the manufacturer.

In both cases:
 For SPDs not satisfying the time criteria of acceptance the test may be repeated, but the test voltage is increased. If the time criteria of acceptance is again not satisfied this procedure may be repeated.

+ / - / PE

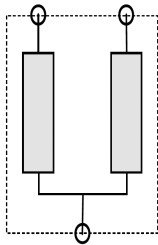
To be continued

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5.9.2 U-configuration

+/- +/-

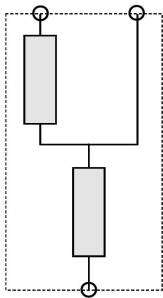


Each of the two modes of protection + to PE and – to PE shall be tested as described above for the I-configuration

PE

5.9.3 L-configuration

+/- +/-

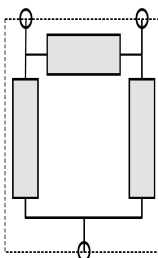


Each of the two modes of protection + to – and – to PE shall be tested as described above for the I-configuration

PE

5.9.4 Δ-configuration

+/- +/-



Each of the three modes of protection + to – and + to PE and – to PE shall be tested as described above for the I-configuration

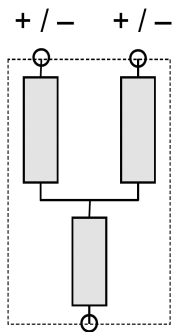
PE

To be continued

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5.9.5 Y-configuration AND 5.9.6 Single mode SPDs, to be connected in Y-configuration



PE

There are three choices how to apply the test:

- 1) Preferred procedure 1 (general):
 Replace all voltage limiting components in both current branches of the relevant mode of protection to be tested with components of the same nature, but with a voltage U_{1mA} being equal to 50-60% of the U_{1mA} value of the original components. Perform the test with the required prospective current settings either at a voltage of $U_{CPV}/1,2$ or at a higher voltage as required by the manufacturer.
- 2) Preferred procedure 2 (only if the two current branches within the relevant mode of protection to be tested are identical):
 Replace all voltage limiting components of one current branch by appropriate copper blocks (dummies), the voltage limiting components in the other current branch remain unchanged. Perform the test with the required prospective current settings either at a voltage of $U_{CPV}/1,2$ or at a higher voltage as required by the manufacturer.
- 3) Alternate procedure:
 The voltage limiting components remain unchanged. Perform the test with the required prospective current settings either at a voltage of 2 times $U_{CPV}/1,2$ or at a higher voltage as required by the manufacturer.

Note : Procedure 1 and procedure 2 are equivalent and may be chosen by the manufacturer, as far as applicable.

In all three cases:

For SPDs not satisfying the time criteria of acceptance the test may be repeated, but the test voltage is increased. If the time criteria of acceptance is again not satisfied this procedure may be repeated.

To be continued

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Explanatory Notes:

To follow the decision for future standard improvement, taken at the CLC TC37A WG1 meeting on 5th February 2014 in Paris.

Extract from the minutes:

Inconsistency within EN 50539-11

Inconsistencies related to **SPD overload behavior test in 50539-11:**

The WG1 agreed the following interpretations of EN 50539-11 parts in relation to overload behaviour testing for laboratories:

- 7.4.7.2.2 : For Y, allow to modify in the branch connected to PE using the 50% modified MOV like in the other branches.
- Too many different ways on stressing the sample (modified or not) leading in too many different results depending on the selected testing options.
Applying 2 times the $U_{cpv}/1,2$ on sample shall be avoided due to possible overstress on the disconnecter(s) except with the permission of the manufacturer
- In 6.2.5.2 SPD overload behavior, Disregard the following three sentences for product testing:
*“This test is also not applied to SPD’s mode(s) of protection that contains one current branch having voltage switching components only.
If one current branch of the SPD contains voltage switching components only, and if this current branch is connected to earth, the SPD cannot be used in earthed PV systems. In that case, even if they are not tested, the corresponding mode(s) of protection can be declared.”*
All modes of protection connected to PE and containing at least one limiting component shall be prepared and tested similar to an I configuration.
- To ensure comparable test results, at least a 6 pulse rectifier bridge shall be used for power supply of the overload behaviour test. This is to ensure a limit for the maximum ripple under full load condition.

These inconsistencies are reduced by these above WG1 decisions.