

FORM 2

THE PATENTS ACT, 1970
(39 of 1970)
AND
THE PATENTS RULES, 2003

**COMPLETE
SPECIFICATION**

(See Section 10; rule 13)

TITLE OF THE INVENTION

“METHOD AND APPARATUS FOR DETECTING AN ARC IN A DC CIRCUIT”

APPLICANT

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The following specification particularly describes
the invention and the manner in which
it is to be performed

Claims

1. A method for detecting an arc in a DC circuit, comprising the following steps of:
 - 5 - measuring and analyzing an AC component (I_{AC}) of a current (I) flowing in the DC circuit and determining at least one parameter of the AC component (I_{AC});
 - 10 - varying the level of the DC component (I_{DC}) of the current (I);
 - determining a degree of correlation between the level of the DC component (I_{DC}) of the current (I) flowing in the DC circuit and the at least one parameter of the AC component (I_{AC}), and
 - 15 - detecting and signaling an arc dependent on the degree of correlation determined.
2. The method as claimed in claim 1, in which a signal strength ($|I_{AC}|$) of the measured AC component (I_{AC}) is considered as the parameter.
- 20 3. The method as claimed in either of claims 1 and 2, in which an arc is detected and signaled when the degree of correlation determined is greater than a predefined degree of correlation.
- 25 4. The method as claimed in claim 2 or 3, in which the degree of correlation determined increases if the signal strength ($|I_{AC}|$) falls with increasing level of the DC component (I_{DC}) of the current (I).
- 30 5. The method as claimed in one of claims 1 to 4, in which the level of the DC component (I_{DC}) of the current (I) is varied by means of periodic modulation.
- 35 6. The method as claimed in claim 5, in which the modulation is effected in sinusoidal or square-wave form or in the form of a wavelet.

7. The method as claimed in claim 5 or 6, in which the modulation is dependent on identification parameters of an apparatus carrying out the method.
8. The method as claimed in one of claims 1 to 7, in which an inverter (5) is arranged in the circuit and in which the variation or modulation of the level of the DC component (I_{DC}) of the current (I) is caused by the inverter (5).
9. The method as claimed in claim 8, in which the variation or modulation is caused by switching operations of semiconductor power switches of the inverter (5) during voltage conversion.
10. The method as claimed in claim 9, in which the variation or modulation is caused by the inverter (5) carrying out an MPP tracking method.
11. The method as claimed in one of claims 1 to 10, in which the level of the DC component (I_{DC}) of the current (I) is varied if the parameter of the AC component (I_{AC}) exceeds a threshold value (I^* , $|I^*|$).
12. The method as claimed in claim 11, in which the threshold value (I^* , $|I^*|$) is determined with the aid of low-pass filtering from the parameter of the AC component (I_{AC}).
13. The method as claimed in one of claims 1 to 12, comprising the following further steps after an arc has been detected:
- reducing the level of the DC component (I_{DC}) of the current (I) to zero or almost zero;

- performing a further measurement of the AC component (I_{AC}) of the current (I);
 - determining whether an AC signal is still present in the further measurement, and
 - 5 - signaling the presence of a parallel arc (8) if an AC signal is present, or signaling that a series arc (7) has occurred if an AC signal is not present.
- 10 14. An apparatus (10) for detecting an arc in a circuit, comprising:
- means for varying a current (I) flowing in the circuit;
 - an evaluation unit for analyzing a measured AC
 - 15 component (I_{AC}) of the current (I) and for determining at least one parameter of the AC component (I_{AC});
 - a correlation unit for determining a degree of correlation between the level of a DC component
 - 20 (I_{DC}) of the current (I) flowing in the circuit and the at least one parameter of the AC component (I_{AC}), and
 - a signaling output (16) at which the presence of an arc is signaled dependent on the degree
 - 25 of correlation determined.
15. An inverter (5) comprising an apparatus (10) as claimed in claim 14.
- 30 16. The inverter (5) as claimed in claim 15, designed as an inverter for a photovoltaic installation (1).

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