

*Title:* **Methods of Early Short-Circuit Detection for Low-Voltage Systems**

*Authors:* Timo Mützel<sup>1)</sup>, Frank Berger<sup>1)</sup>, Michael Anheuser<sup>2)</sup>

*Affiliations:* 1) TU Ilmenau, Department of Electrical Apparatus and Switchgear, 98693 Ilmenau, Germany

2) Siemens AG, Automation & Drives, 92224 Amberg, Germany

*Author's address:* TU Ilmenau  
Department of Electrical Apparatus and Switchgear  
Timo Mützel  
P.O. Box 10 05 65  
98684 Ilmenau, Germany

E-mail: [timo.muettel@tu-ilmenau.de](mailto:timo.muettel@tu-ilmenau.de)

Phone: +49 3677 / 69-1461

Fax: +49 3677 / 69-1686

*Abstract:*

Short-circuits in electrical networks imply extreme mechanical and thermal stresses to loads, systems, and protection devices. The paper discusses new approaches for low-voltage system protection.

The three-dimensional locus curves criterion will be pointed out as one opportunity for short-circuit detection. Regression analysis, used to predict the amplitude of a sinusoidal function and therefore the prospective short-circuit current, provides another possible detection algorithm. Also a method based on combined three-phase quantities, e.g. phase currents, has been studied for network failure identification. Other possible techniques are the analysis of short-circuit depend voltage drops in the network or wavelet methods interpreting the network currents via dyadic filter banks of a Multiresolution Analysis.

A comparison and benchmark of the presented algorithms for utilization in low-voltage networks has been worked out. Therefore, disturbances of typical loads have to be considered carefully to avoid nuisance tripping in addition to the aspired rapid failure detection.