

## Student & Young Professionals Forum Talk 3



### **From Basic Electrical Circuits to Functional Safety - An Entry Point for Automation Engineer**

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Functional safety is becoming more and more important. Much has technically changed in recent years. Whereas in the past, functional safety engineering methods were predominantly branch specific, today many methods are used across branches. One of the reasons for this is the progressive harmonization of standards; another one is the safety related semiconductors that are increasingly being used – if appropriate – across industries.

The lecture session is aimed at engineers from the field of automation and motion control to provide an introduction to the topic of functional safety. Many other approaches explain the methods of functional safety top-down, starting from the relevant standards. In the opposite case, however, the methods are explained in the course of the lecture. The methods are presented on the basis of basic electrical circuits. This makes the entry much easier.

Practical examples illustrate how reliable components, redundancy and diagnostic functionality can be used to create functional safe components. Particular emphasis is placed on safe fieldbus systems and lockstep processors.

Due to the increasing number of devices and the high innovation rate of semiconductor manufacturers, functional safe microcontrollers will cost less and thus will be used in more and more applications. The fast-growing market for cooperation robots is an example of where cost-effective functional safety methods are in a high demand.

**Jens Onno Kra** studied electrical engineering at the Bergische Universität Wuppertal and received his doctorate in 1993 from Prof. Joachim Holtz in the field of electric machine and drive research. Until February 2004 he was Technical Director responsible for the development of Kollmorgen Servo Drives.

Since 2004 Prof. Kra has been teaching control engineering, motion control, FPGA-based digital signal processing and functional safety at the TH Köln. The research focus is on the development of robust, safety-related and energy-efficient inverter control with programmable hardware.