

Focus on IFA's work

Edition 2/2013

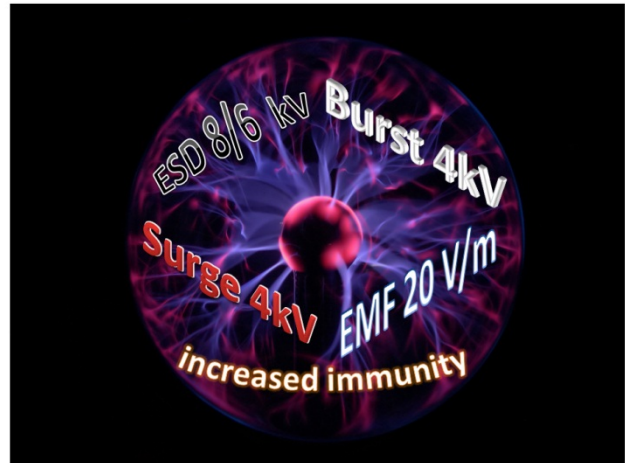
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Electromagnetic fields and functional safety

Problem

In recent years, electronic and programmable electronic systems have increasingly replaced the traditional safety devices, generally employing contacts, on plant and machinery. Worker protection systems employing wireless transmission technology (radio frequency identification (RFID)) are increasingly being used. They have the advantage of greater flexibility for adaptation to changing tasks; at the same time, however, they are more sensitive to electromagnetic disturbances. Disturbances are caused for example by switching transients in industrial plant, lighting strikes, mobile phones, and discharges of static electricity from persons coming into contact with a component.

In the absence of supplementary measures, noise voltage impulses on lines or magnetic or electromagnetic fields may interfere with the function of these systems. In a worst-case scenario, the safety function may be impaired by electromagnetic disturbance. The resulting hazards must be taken into consideration at an early stage during development, testing and assessment. Safety devices employing electronic and programmable electronic systems must continue to fulfil their safety-related functions even under unusual electromagnetic conditions. A proposal had therefore to be drawn up for an enhanced immunity level for safety devices.



Enhanced disturbance level

Activities

In the German Electrotechnical Committee within DIN and VDE, a joint proposal was drawn up by representatives of German industry, the Deutsche Bahn (DB) and the IFA for an enhanced immunity level for industrial devices with safety functions. This proposal has been discussed at international level by the International Electrotechnical Commission (IEC) and was published in January 2008 in the form of the IEC 61326-3-1 standard. The IFA is involved in current standards projects for EMC relating to functional safety (IEC 61000-6-7, IEC 61000-1-2, EN 13309-2, ISO 13766-2).

Results and Application

On the basis of IEC 61508 Part 2, a higher immunity to disturbance for safety devices is required, in the form of a higher disturbance level, than that set out in the EMC generic standard (DIN EN 61000-6-2). Only the safety-related functionality need be retained at these higher levels, however, or a safe status assumed. Depending upon the disturbance phenomenon, the immunity of the safety function should be higher than the proof levels set out in the generic EMC standard by one level of severity, and/or the number of interference pulses/the duration of exposure should be increased. Concessions in the enhanced immunity are permitted in consideration of the field of application and the local environment. The enhanced immunity need thus be assured only for: electromagnetic fields at frequencies at which high field strengths may also occur (ISM frequency band, mobile telephone frequencies, etc.); electrostatic discharges in areas which are generally accessible (for built-in appliances, only outside the switchgear cabinet); for fast transient disturbances on power-supply and signal terminals; for high-power impulse voltages on power-supply and signal terminals.

Area of Application

Manufacturers of machinery, safety devices and control systems; staff on standards committees and in test institutes

Additional Information

- DIN EN 61000-6-2: Elektromagnetische Verträglichkeit (EMV) – Teil 6-2: Fachgrundnormen – Störfestigkeit für Industriebereich (03.06). Beuth, Berlin 2006
- DIN EN 61508-2: Funktionale Sicherheit sicherheitsbezogener elektrischer/elektronischer/programmierbarer elektronischer Systeme –

Teil 2: Anforderungen an sicherheitsbezogene elektrische/elektronische/programmierbare elektronische Systeme (02.11).

- DIN EN 61326-3-1: Elektrische Mess-, Steuer-, Regel- und Laborgeräte – EMV-Anforderungen – Teil 3-1: Störfestigkeitsanforderungen für sicherheitsbezogene Systeme und für Geräte, die für sicherheitsbezogene Funktionen vorgesehen sind (Funktionale Sicherheit) – Allgemeine industrielle Anwendungen (11.08).
- IEC/TS 61000-1-2: Electromagnetic Compatibility (EMC) – Part 1-2: General – Methodology for the achievement of functional safety of electrical and electronic systems including equipment with regard to electromagnetic phenomena (04.09).
- IEC 61000-2-5: Electromagnetic compatibility (EMC) – Part 2: Environment – Section 5: Classification of electromagnetic environments (05.11).
- IEC 61000-6-7 : Electromagnetic compatibility (EMC) – Part 6-7: Generic standards – Immunity requirements for systems, equipment and products intended to perform functions in a safety-related system (functional safety) in industrial environments (06.12).
- Apfeld, R.; Grommes, W.: EMC and functional safety for power drive systems with integrated safety functions
www.dguv.de/ifa, Webcode [e95371](http://www.dguv.de/ifa)

Expert Assistance

IFA, Division 5: Accident prevention, Product safety

Literature Requests

IFA, Central Division