

Focus on IFA's work

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Use of tablet PCs and smartphones for machine control

Problem

Tablet PCs and smartphones are now ubiquitous, and their use for communication, navigation and similar purposes is taken as a given. Increasing digitalization and networking in production, logistics and transport, not least in the context of Industry 4.0, has led to the desire for such products also to be used for controlling machinery. A professional can program the app needed for this purpose very quickly.

When experts are asked whether control in this way from a tablet PC or similar device is also sufficiently safe, their response is however generally negative: many requirements which for example are satisfied by safe wireless remote controls cannot be implemented directly by control from a tablet PC.

Activities

In response to several consultations with institutions for accident insurance on the subject of using tablet PCs and similar devices for control purposes, the IFA has conducted a concept study with the aim on the one hand of considering the functional aspects and the interests of industry, and on the other of identifying how machinery could be operated safely by means of a tablet PC.

The concept study demonstrates, by way of example, the implementation of the two safety functions of enabling and emergency-stop. In accordance with the future EN 60204-1 standard, the enabling function enables machine operation



Demonstration model of the IFA PC tablet frame

to be initiated when the enabling device is actuated with a separate start control, which in this case is implemented through the tablet PC. The new edition of the standard also makes provision for the first time for emergency stop devices on portable wireless control devices.

A demonstration model was produced as part of the concept study. CAD software was used to design a frame into which a tablet PC can be inserted. This frame was produced by a 3D printing process.

In order to demonstrate the mode of operation, conventional emergency stop and enabling push-buttons were integrated into the frame together with electronics for processing the safety-oriented signals (see image).

Correct execution of the two safety functions must be assured by the frame independently of the tablet PC. The tablet serves only as a medium for transferring the safety information generated by the electronics in the frame to the machine control system. Experts term this a "black channel" approach, which is now common for the transmission of safety-related messages.

The electronics built into the frame record the states of the enabling and emergency stop devices, and generate a secure data message from them. This data message is transmitted over a wireless link, for example by Bluetooth, to the machine control app on the tablet PC. The app then transmits this secure and unmodifiable data together with its own data to the machine control system, for example by WLAN. The machine control system thus receives both the data from the machine app and the secure data message from the frame.

Since proper execution of the safety functions is ensured by the electronics built into the frame and by the machine control system, replacement of the tablet or a change in the operating interface (machine app) has no influence upon execution of the safety functions, i.e. upon the functional safety. The concept does not yet take account of any measures required by EN ISO 13850 to prevent confusion between active and non-active emergency stop devices or security measures required for wireless data transmission.

Results and use

A demonstration model of a tablet PC frame was produced suitable for use in lectures at professional conferences and in meetings of working groups at the German Social Accident Insurance Institutions. The intention is for the concept also to be presented to interested manufacturers and operators.

User group

Manufacturers and operators of machinery; prevention departments of the German Social Accident Insurance Institutions

Further information

- Principle of testing [GS-ET-07](#) of DGUV Test: Principles of testing and certification of wireless control equipment for machinery safety requirements
- Prüfgrundsatz GS-VL-36 des DGUV Test: Grundsätze für die Prüfung und Zertifizierung von kabellosen Steuerungen für Fahrzeugaufbauten und Maschinen auf Nutzfahrzeugen
- EN 60204-1:2018: Safety of machinery – Electrical equipment of machines – Part 1: General requirements; Beuth Verlag, Berlin (in preparation)

Technical enquiries

IFA, Division 5: Accident Prevention – Product Safety

Literature enquiries

IFA, Central Division