

If CAN is duty, functional safety is freestyle

At the Conexpo tradeshow in Las Vegas (USA), most of the manufacturers of industrial joysticks exhibited their products. Many of these joysticks provide CAN connectivity; some of them also feature functional safety.

FUNCTIONAL SAFETY IS NOT JUST A TOPIC in the European construction machine industry. At Conexpo, it was one of the most discussed themes. Danfoss (Denmark) already launched its CAN-connectable joystick supporting Plus+1 functional safety protocol at the Bauma exhibition in Munich (Germany) last year. The next company providing a functional safe joystick is Elobau (Germany). Of course, the joystick comes with a CAN interface. Which safety protocol will be supported, has not yet been decided. The J4 joystick provides redundancy and is already approved for SIL-2 (PL-d) applications. It comes in an IP67-rated housing. In addition, the J4 single axis joystick is redundant or semi-redundant, but not yet SIL-approved.

When using CANopen as the higher-layer protocol, the step to CANopen Safety is obvious. It is mature (invented in 2000) and internationally standardized in EN 50325-5. For J1939-based networks no functional safety protocol has been standardized yet. The related SAE working group is still in the process of selecting one. Candidates are the CANopen Safety approach and the Plus+1 protocol by Danfoss. Another option is the functional safety solution proposed for the Isobus (ISO 11783 series), which complies with the J1939 application layer.



Conexpo is the gathering place for the construction industries, with a focus on construction, aggregates, and ready mixed concrete (Photo: Conexpo)

Increasing functionality

Most of the shown joysticks support the J1939 protocol; some of them also provide CANopen as an option. There is also a trend to integrate more pushbuttons into the joysticks. For example Penny + Giles (UK) has introduced a version with eleven switches. This means, the related CiA 401 specification needs to be updated as well as the related PGNs for J1939.

Most of the joysticks used in construction and mining machines as well as in other mobile machines are customized. Of course, the handle should be ergonomically designed, in particular of those joysticks, which provide multiple functions. A typical example is the product range from J.R. Merritt Controls (USA). The company offers handles with balls, caps, pushbuttons, and mechanical interlocks as well as waterproofed versions, rotary cam switches and bang/bang modules. The ESS408 CAN interface can be configured to CANopen and J1939 as well as proprietary CAN solutions. It features analog inputs for up to four axes of proportional control, eight digital inputs for pushbuttons, and two digital outputs for lights or alarms.

P-Q Controls (USA) also manufactures customized joysticks using its patented inductively couples system. The multi-axes feature level attitude sensors, which eliminate the wiping contacts of potentiometers. In some products, the company uses the Hall effect technology. The product range also includes foot-pedals. Optionally, the devices come with a CAN interface.