

# CANopen Safety with Codesys Safety for SIL 2

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The CANopen Safety protocol developed by CAN in Automation (CiA), international users' and manufacturers group, was published in 2010 as a European standard EN 50325-5. The protocol allows for safety-relevant data transmission via CAN networks according to the IEC 61508 standard. The German TÜV Rheinland has approved the protocol for use in systems requiring Safety Integrity Level 3 (SIL 3).

With Codesys Safety SIL2 from 3S-Smart Software Solutions, the first integration of the CANopen Safety protocol into an IEC-61131-3 development environment is available. The software tool consists of two parts. These are the Codesys Control runtime system certified according to the IEC 61508 and the Codesys Development System, which is an IEC-61131-3 programming system.

Using the tool the development and integration of the safety-relevant applications into the existing CANopen-based controller networks is possible. This combination is well suited for mobile machines e.g. in the construction industry where Codesys is already broadly applied in control systems.

Implementing CANopen Safety functionality based on Codesys Safety SIL2 allows integration of a number of already certified I/O devices from diverse manufacturers into customer's functionally-safe machine.

The CANopen Safety protocol stack was developed in accordance to the EN 50325-5 standard. It is based on the company's CANopen stack, which offers the CANopen NMT (network management) slave functionality (compliant with the CiA 301 specification) for communication with other CANopen devices in the network. With regard to the architecture, the CANopen Safety stack is attached on top of the standard CANopen stack and uses the latter to

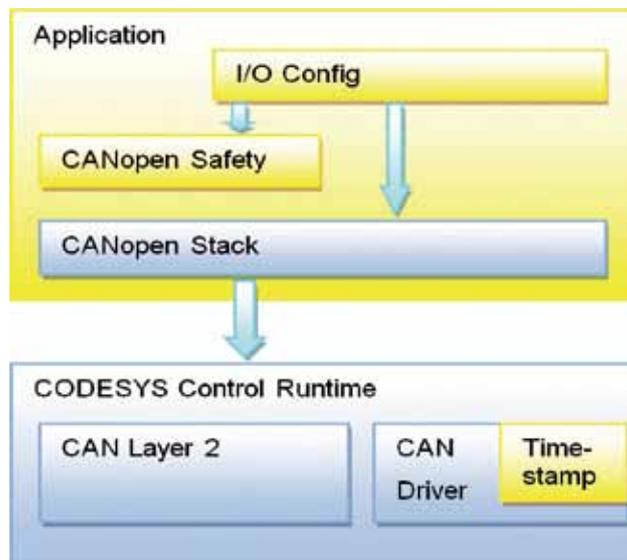


Figure 1: Architecture of the Codesys CANopen Safety stack

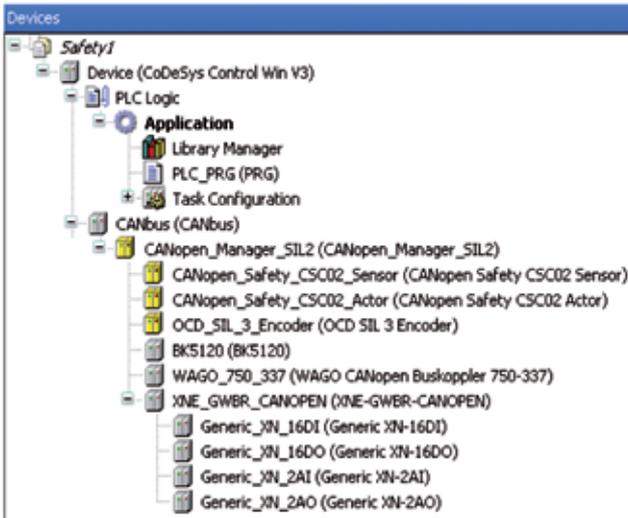


Figure 2: Mixed usage of standard and safety-relevant CANopen NMT slaves in a Codesys project

receive and to transmit PDOs (process data objects). The implementation of the CANopen Safety stack is independent from the hardware, which means that it can be used

with potentially any available CAN chip. For connection, a miniature CAN driver is required, which is already available for most of the CAN chips. For realization of a safety-

relevant solution, the complete CAN communication channel is regarded as not safe. The CANopen Safety stack handles all possible failure scenarios. The only safe software parts are the CANopen Safety stack and a small part of the CAN driver.

By means of this TÜV-certified solution it is possible to use safety-relevant CANopen devices and standard CANopen NMT slaves in the same network. Compliance with both kinds of CANopen devices was considered in the development phase.

As the first manufacturer, Sensor-Technik Wiedemann (Germany) ported the Codesys Safety SIL2 to one of its mobile controllers. Starting from fall 2013, the ESX-3XL will be available on the

market with the implemented Codesys CANopen Safety stack. Already in summer 2013, the controller will be available with a proprietary CANopen Safety solution. We will show the controller solution at the Bauma 2013 trade fair in Munich on the joint-stand from CAN in Automation (CiA).



The Moba Operand is programmable with the Codesys software and provides CANopen connectivity

Codesys, the IEC 61131-3 compliant runtime system, has been used in very different applications. Besides typical industrial machine control systems and in factory automation, it has also been implemented in mobile machines and other unusual applications including train control systems.

A typical application is the photovoltaic solar-panel production line that uses automation equipment by Berghof (Germany). The EC1000 programmable logic controller (PLC) running Codesys controls the RStep motion controllers via CANopen. It also communicates via Ethercat with the ET1000 human machine interfaces (HMI), which also features the Codesys runtime and program-

## Soft-PLC in applications

ming system. The stepper motors are configurable by means of the Codesys motion function block library.

Another example is the Chimæra Lu750 PLC with integrated HMI functionality jointly developed by Biavator and Lüscher (both Switzerland). The IPC (industrial personal computer) is programmable using the Codesys environment. It controls Lüscher's CTP (computer to plate) devices used in modern printing processes. The panel controller manufactured by Biavator provides CANopen connectivity.

Sigloch (Germany) specialized in machines for binding books and brochures use the XC200 controller by Eaton (Germany) featuring Codesys. The PLC's CANopen interface is used to connect drives and other peripherals.

In mobile automation, Moba (Germany) uses Codesys, for example, for its MDS-2000 drilling system, its HBM MPC-210 grader control systems, and its software for aerial work platforms. Janz Tec (Germany) has implemented Codesys in its CANopen-connectable PC-based controllers, which are applied in the Tourmix mobile feed mixing plant by

Buschhoff (Germany) and in the aircraft tractor by Trepel (Germany).

In order to give customers access to ready-made solutions, 3S-Smart Software Solutions (Germany) has opened the Codesys store on the Internet. The products offered include free-of-charge sample projects, device description files, utilities, tested application libraries, additional visualization elements, and tool plug-ins. Beside the products offered directly by 3S, the store also offers third-party products from device manufacturers, system partners or other independent providers. From Codesys V3.5 ServicePack 2 on, the store will also be integrated in the Codesys programming system. This enables users to look for suitable software add-ons when working in the IEC 61131-3 tool. All selected packages can be installed, licensed and rated directly in Codesys, without intermediate storage. Moreover, users will be informed about available updates for installed software add-ons. Unfortunately, there is up to now no CANopen additional function available in the store.

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<http://store.codesys.com>