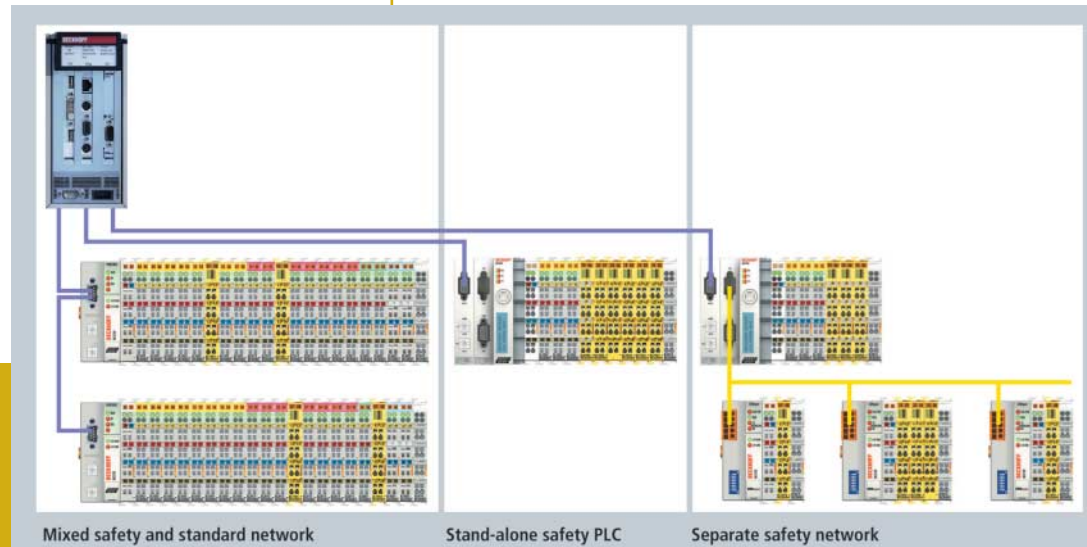


Concept and practical benefits of the integrated TwinSAFE safety system

Complete system safety

- Advanced electronic safety technology offers a wide range of benefits in terms of flexibility, handling, diagnostics and, of course, wiring effort. However, genuine added value only comes from an integrated system that offers optimum synergy between standard automation and safety technology. TwinSAFE, the safety solution from Beckhoff, integrates safety functionalities into the existing control architecture.





Conventionally, automation and safety technologies are often implemented separately. TwinSAFE from Beckhoff provides a consistent hardware and software technology for achieving integrated and simplified utilization, ranging from safe input and output terminals and safe miniature controllers for the Bus Terminal system to the AX5000 Servo Drives. On the software side, TwinSAFE technology is fully integrated with TwinCAT automation software, enabling convenient configuration of safety functionality. Together with the Beckhoff TwinSAFE protocol (see text in box), holistic and very flexible integrated solutions (SIL3) can be implemented.

Fieldbus-independent communication

The Beckhoff philosophy of open control technology also applies to safety integration: The TwinSAFE protocol enables transfer of safety-relevant data via any medium. Since the bus system used does not contribute to safety aspects, all fieldbus systems such as PROFIBUS, CANopen, Lightbus, Ethernet TCP/IP or EtherCAT can be used.

The TwinSAFE concept integrates seamlessly with the Bus Terminal system. The safety Bus Terminals extend the tried and tested I/O system with safety functions and all the wiring for the safety circuit is handled via the existing fieldbus network. Safe signals can be mixed with standard signals without restriction. This saves considerable design effort, installation and material. Maintenance is simplified significantly through faster diagnosis and simple replacement of only a few components. The TwinSAFE Bus Terminals include three basic functionalities: digital input (KL19xx), digital output (KL29xx), and a Logic Terminal (KL6904). For a large number of applications, the complete safety-relevant sensor and actuator technology can be wired on these Bus Terminals. The required logical link of the inputs and the outputs is handled by the KL6904 TwinSAFE logic. For small configurations, the tasks of a fail-safe PLC can thus be handled within the Bus Terminal system.

The TwinSAFE Logic Bus Terminal is the link unit between the TwinSAFE input and output terminals. It enables the configuration of a simple, flexible and cost-effective decentralized safety control system.

With TwinSAFE, there are no built-in safety requirements for the higher-level controllers. The typical safety functions required for the automation of machines, such as emergency off, safety door, two-hand etc. are already permanently included in the KL6904. The user can configure the terminal according to the safety requirements of the application.

Flexible structure

The TwinSAFE concept enables a wide range of safety tasks to be realized. Structures with mixed standard and safety-relevant signals are possible. Configuration of separate networks is also possible. Alternatively, the TwinSAFE system can be operated as a stand-alone solution or as a decentralized pre-processing system with safe communication between a higher-level safety controller (see fig. ahead).

In a mixed system, distributed standard and safety terminals use a common fieldbus. The standard fieldbus is used for the communication. As a further option, all safety-relevant signals can be integrated into one station, thereby creating a local "safety island." A further option is a pure safety network using standard Bus Couplers but only safety-relevant signals for the bus communication. In effect, this would be similar to a special safety bus. In the two latter variants, system components can be separated if necessary with status information being exchanged via a standard channel in the form of a fieldbus. The Beckhoff system offers the additional advantage of being able to switch to the "mixed control world" at any time since the same Bus Couplers are used for standard automation and safety functions.

Safe system networking

A further significant system benefit is the fact that inter-system communication can be achieved with little effort. In conventional systems consisting of several individual machines, the transfer of safety-relevant signals between different sections is very complex. With TwinSAFE the system communication is generally based on standard signals and shared by the Beckhoff system for safety-relevant data. This is made possible by the KL6904 Logic Terminal, which can communicate not only with safe inputs and outputs, but also with other safety and logic units.

Networking of individual TwinSAFE Logic Terminals enables simple and cost-effective safety-relevant networking of machines via bus systems. The TwinSAFE system facilitates encapsulation and decoupling of individual production or manufacturing cells. System extensions or changeovers can be implemented quickly and without wiring effort. All fieldbus systems including real-time Ethernet or EtherCAT are suitable for this type of machine-to-machine (M2M) communication. Communication is monitored as follows: Each logic and I/O terminal has a watchdog timer that handles query timing and local monitoring. As the central

