Data Sheet CODESYS Safety (for EtherCAT Safety Modules) SL

CODESYS extension for EtherCAT based safety solutions with TwinSAFE logic modules EL6900, EL6910 and EK1960 from Beckhoff under a CODESYS controller with CODESYS EtherCAT Master stack.

Product description

The TÜV certified product allows to extend any CODESYS project with an EtherCAT controller with CODESYS EtherCAT Master stack for the development of safety functions with TÜV certified safety logic modules by Beckhoff and digital FSoE I/O modules and analog TSC input modules in the EtherCAT network. The extension with safety-specific editors and configurators is integrated seamlessly into the CODESYS Development System and the CODESYS EtherCAT configurator. It enables cost effective and scalable realization of simple safety applications with zero sytem integration or adaptation effort and low acceptance expenditure. The product is aimed at users and at device manufacturers who do not intend to develop their own safety controller and require only limited safety functionality.

- **Safety level** up to PL-e according to DIN EN ISO 13849 and up to SIL3 according to IEC 62061/61508, depending on input and output devices and programmed logic.
- **Simplified acceptance** by Limited Variability Programming (LVL) according to ISO 13849 and IEC 62061.
- **Logic modules**: EL6900 or EL6910 as EtherCAT camp (TwinSAFE-Logic), or EK1960 as EtherCAT coupler (TwinSAFE-Compact Controller) by Beckhoff.
- **Digital SIL3 I/O-modules**: FSoE modules (Failsafe over EtherCAT) by any manufacturer installed from EtherCAT description files.
- **Analog SIL2 input modules**: 10 TSC modules (TwinSAFE SingleChannel) by Beckhoff: EL3124-0090, EL3174-0090 (differential), EL3214-0090 (for resistance sensors), EL3314-0090 (for thermal element), EL3356-0090 (for weight cell/resistance bridge); and encoders/givers EL5001-0090 (SSI), EL5021-0090 (Sin/Cos), EL5032-0090 (EnDat2.2), EL5101-0090 (incremental differential RS422), EL5151-0090 (incremental)

Operation functions and fieldbus configuration on the standarc controller can be changed without impact on the safety functions of the safety logic module.

- **Standard signals** can be exchanged with the EtherCAT controller: standard input signals for comparison with TSC values, signals from/to the standard application.
- **Multiple** safety logic modules within an EtherCAT network are possible.
- **Groups**: Monitoring of multiple safety areas by one safety logic module supported by dividing the safety application into "groups" of I/O modules with related logic in an IEC 61131-3 POU in FBD language. Each group is started, stopped, diagnosed and error acknowledged separately by the standard application.
- **Optional devices**: If a safety area is not present in the machine, EL6910 and EK1960 allow to deactivate the corresponding group by online command without chaning the application (permanently, temporarily, passivated).
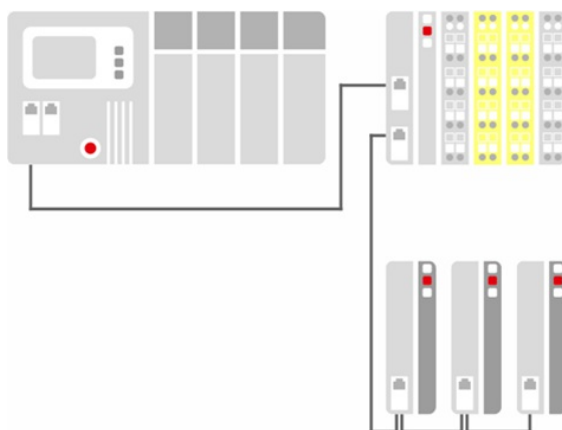
Picture 1: System structure with CODESYS EtherCAT controller (top left), EtherCAT Safety logic and I/O modules (top right), other EtherCAT modules (bottom right)

Configuration and programming directly in CODESYS

- Devices: Safety logic modules and safety I/O modules (FSoE and TSC) are added in the EtherCAT device tree
- Exchange: Variables exchanged between safety and standard are defined in special list objects
- Groups: Each safety POU together with the used I/O modules represents a group; group status flags mappable to exchanged variables; defining the allowed group deactivation methods (EL6910/EK1960 only)
- Safe versioning: version identifications and CRCs for safety application and each POU and device shown in application editor ("pinning")
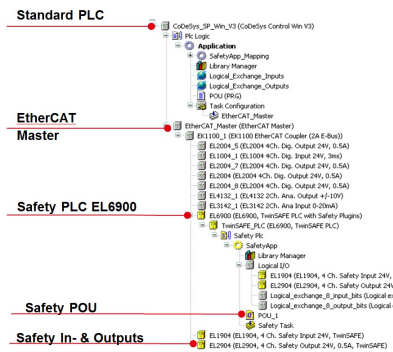

Safety Configurator for I/O Modules

- FSoE parameters
- Application-related module parameters
- Symbolic mapping of I/O points

Safety FBD Editor for Group Logic

- Restricted IEC 61131-3 Function Block Diagram (FBD)
- Interconnection of predefined certified safety-related function blocks (see further below), physical inputs and outputs, and variables exchanged with the EtherCAT controller
- High-lighting of safety-related data flows
- EL6910/EK1906: Definition of replacement values for the case the group gets deactivated
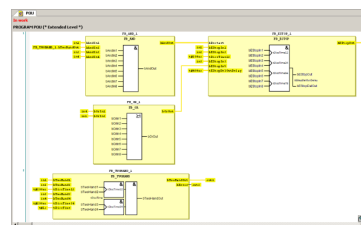
Online

- Online monitoring in the safety FBD editor
- Status of groups in the CODESYS project navigator
- Diagnostic messages from the safety logic module
- Configuration of the on-board user management
- Activation status and deactivation of groups
- Module replacement supported: replaced logic module loads safety application from standard controller
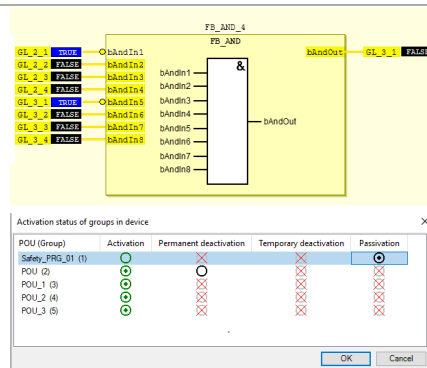
Predefined Safety Function Blocks

CODESYS libraries describe the certified safety function blocks for factory safety which are predefined in the safety logic modules for using them in the FBD editor.

safety monitoring functions		other functions	
FB_ESTOP, FB_TWOHAND, FB_MODE, FB_MON	monitoring safety controls: emergency stop button, two hand control, operation mode selector, safety door	FB_AND, FB_OR, FB_TON, FB_TOF, FB_RS, FB_SR	standard function blocks I (digital)
FB_MUTING	monitoring a muting sequence	FB_CS	deactivate connection to FSoE module (connection shutdown)
FB_EDM	monitoring a safety switch		
additional function blocks only in EL6910 and EK1960:			
FB_SLI, FB_ENVELOPE, FB_LOADSENSING	monitoring a position: against deviation range; against envelope; against stepped area	FB_ADD, FB_SUB, FB_MUL, FB_DIV, FB_COUNTER	standard function blocks II (analog)
FB_CAMMONITOR	monitoring a cam		
			Comparison of a TSC value with

safety monitoring functions		other functions	
		FB_COMPARE	1 to 4 standard values for SIL2
FB_LIMIT, FB_VIOLATIONCNT	Detect limit violations; weighted error counter	FB_SCALING, FB_SPEED	use; scaling of an analog value; speed from position

General information

Vendor:

CODESYS GmbH
Memminger Strasse 151
87439 Kempten
Germany

Support:

https://support.codesys.com

Item:
CODESYS Safety (for EtherCAT Safety Modules) SL
Item number:
2306000000
Sales:

CODESYS Store
https://store.codesys.com

Included in delivery:
Package for the CODESYS Development System including
- device descriptions for EL6900, EL6910, EK1960, 10 TSC modules
- library of predefined safety function blocks
- library for the standard controller for I/O routing
- safety FBD editor, configurator, etc.
- safety manual
License key

System requirements and restrictions

Programming System	CODESYS V3.5 SP15 Patch 4 (64 bit, 32 bit), or a version listed in column "Compatibility" under "All versions"
Programming Platform	Windows 10 (64 bit) The versions maintained by Microsoft are supported.
Runtime System	CODESYS Control V3.5 SP4 (or higher)
Additional Requirements	License for CODESYS EtherCAT Master on the controller
Supported Devices	• 3 logic modules: EL6900, EL6910, EK1960 (Beckhoff TwinSAFE-Logic, TwinSAFE-Compact Controller) • FSoE I/O-modules (without SRA-parameters, or preconfigured) • 10 analog TSC input modules: EL3124-0090, EL3174-0090, EL3214-0090, EL3314-0090, EL3356-0090, EL5001-0090, EL5021-0090, EL5032-0090, EL5101-0090, EL5151-0090 (Beckhoff TwinSAFE SingleChannel) Note: Use the project "Device Reader" to find out the supported features of your device. "Device Reader" is available for free in the CODESYS Store.
Restrictions	No configuration of SRA-parameters; no installation of further TSC modules from description files; no PROFIsafe support
Licensing	This product is subject to license conditions. Without valid license, the product is executable as a demo for two hours at a time. SAFE STATE WILL BE ENTERED AFTER EXPIRY OF TWO HOURS! The license is activated by CODESYS Key (hardware dongle) or by Soft Key (software license container).
Required Accessories	Optional: CODESYS Key

Note: Not all CODESYS features are available in all territories. For more information on geographic restrictions, please contact sales@codesys.com.

Note: Technical specifications are subject to change. Errors and omissions excepted. The content of the current online version of this document applies.