



KEB



COMBIVIS studio 6 SAFETY

To complete the automation concept, KEB offers a fully integrated safety solution based on the development environment CODESYS SAFETY in the COMBIVIS studio 6 automation platform. This total solution allows freely programmable development for applications with safety standards IEC 61508 SIL3 and DIN EN ISO 13849-1 PL_e.

To allow maximum flexibility, based on existing EtherCAT® topology and without additional wiring, KEB offers the safety protocol Fail Safe over EtherCAT® (FSoE).

COMBIVIS studio 6 SAFETY



FUNCTIONAL SAFETY (FS)

Functional safety is one of the key topics of automation technology. As a result of the Machinery Directive and the Product liability law, the machine and plant construction industry is facing a new situation.

In general, functional safety must be taken into account in automation from the control system, at KEB this has led to development of whole system solutions in which safety functions are extensively integrated.

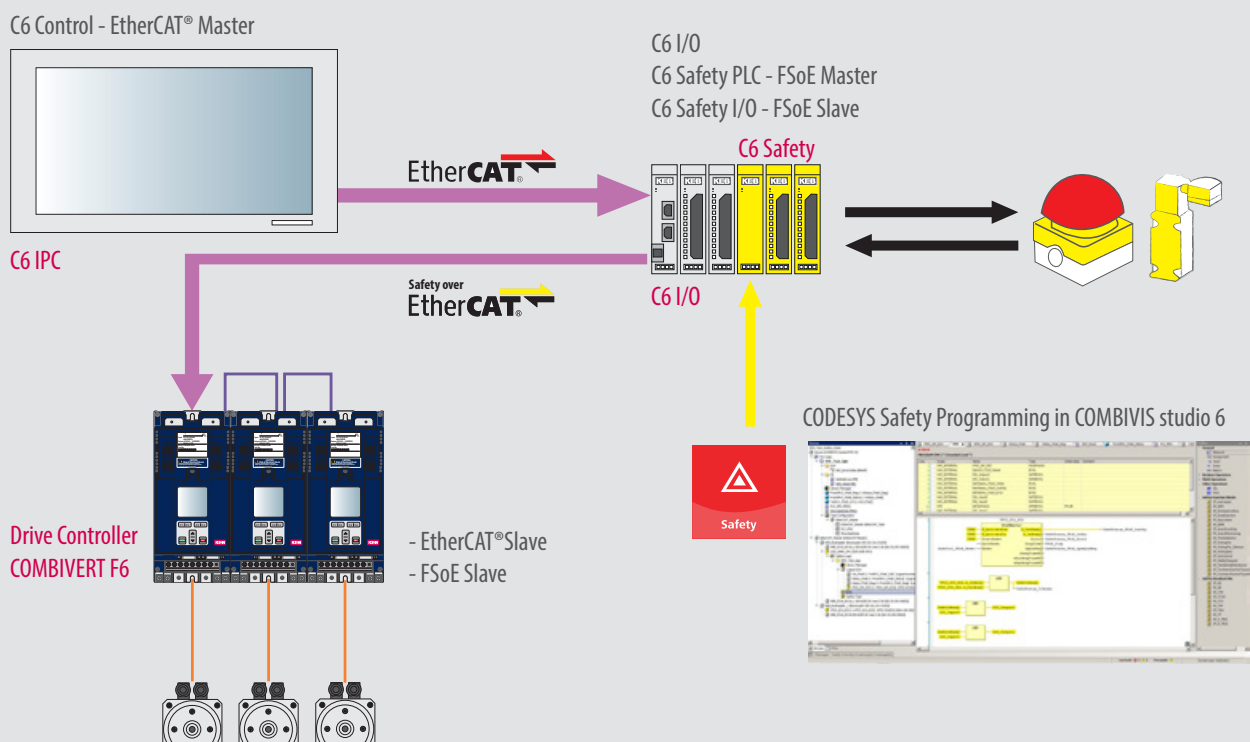
One consequence is that safety plays a key role in all components of a modern machine. In order to ensure that safety is not achieved at the cost of handling, suitable operating concepts are required to ensure that safe machines also remain competitive.



HIGHLIGHTS

- Integrated modular safety concept
- Safety over EtherCAT® (FSoE)
- Cross communication between PLC and safety PLC
- On-line monitoring of secure and insecure data
- SIL3 to IEC 61508
- PLe to DIN EN ISO 13849

SAFETY CONCEPT

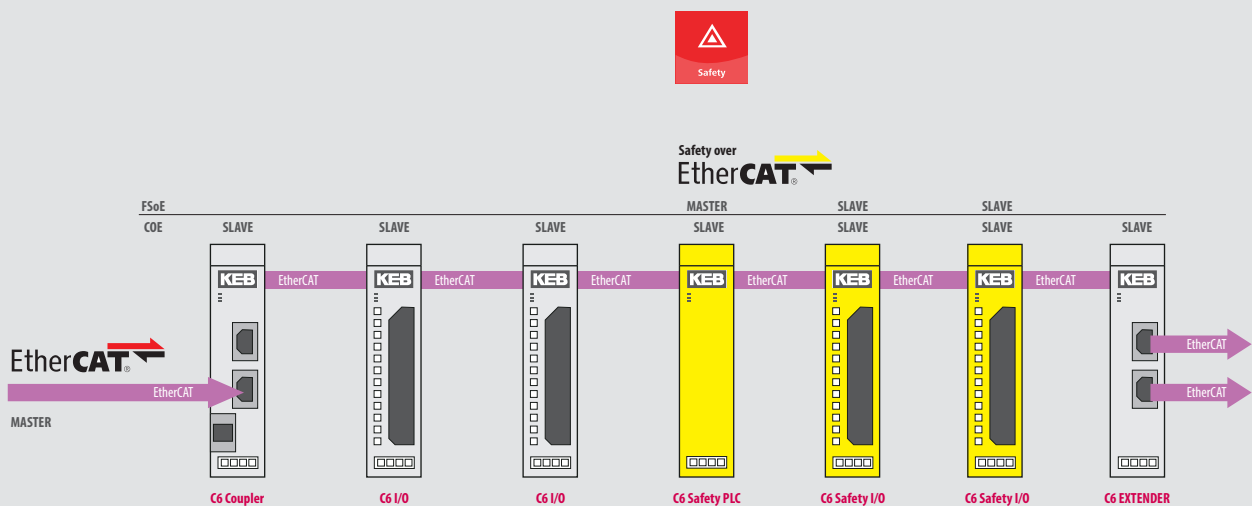


KEB SAFETY SYSTEM

We have expanded the C6 I/O module system. Thanks to safe inputs and outputs, the KEB automation platform can now be used for motion control applications with sophisticated safety requirements. Another notable point is that separate wiring of safety circuits is no longer required thanks to the integrated safety I/Os. Safe signals are transmitted together with the standard signals to the C6 Safety control system in the EtherCAT® protocol. This integration is based on the TÜV-certified safety protocol FSoE (Fail Safe over EtherCAT®). The KEB Safety System fulfills SIL 3 of IEC 61508.

FSoE: SAFETY OVER ETHERCAT

In parallel with the EtherCAT® development, a special protocol for functional safety has also been produced. The protocol and implementation of Safety over EtherCAT® (FSoE) are TÜV-certified and comply with Safety Integrity Level 3 (SIL3) to IEC 61508. Safety over EtherCAT® has been standardised internationally in IEC 61784-3-12 since 2010. Safety over EtherCAT® does not impose any restriction on transmission speed and cycle time, since EtherCAT® is used as a single-channel communication medium. The transport medium is regarded as the “Black Channel” and not included in the safety consideration.





SAFETY PLC: CONTROL SYSTEM TECHNOLOGY WITH INTEGRATED SAFETY

Thanks to the flexible software architecture in which safety functions are an integral part of the user software, different safety functions can be freely programmed in the Safety PLC of KEB using the standardised languages of IEC 61131-3 (Codesys). The architecture of the Safety PLC is prepared for certification to the highest safety standards (SIL 3 to IEC 61508, PL e to DIN EN ISO 13849).

By design, the safety controller is adapted to the real-time environment of EtherCAT® and can be expanded universally in conjunction with KEB's modular I/O system. The decentralised structure is designed for direct installation in machines and plants without additional wiring complexity - and at the same time with little space requirement and rapid installation.

For the user, the Safety PLC meets all the conditions for implementing a safety concept without further certification expense. This includes the possibility of equipping existing plants with modern safety functions in a short time.

SAFETY I/O: CREATES MORE POSSIBILITIES

With the Safety I/O modules, KEB lays the foundations for extending the safety chain and integrating more tasks in the automation environment.

Modular terminal systems as inputs and outputs form the interfaces for signals or process parameters. Within the FSoE safety protocol, a Safety I/O module is now available which integrates safety chain tasks in the existing modular top-hat rail terminal system.

Safety I/Os fulfill SIL 3 to DIN EN ISO 61508, or Performance Level e (PL e) of DIN EN ISO 13849. In combination with the Safety PLC, the module can be used for the following safety functions:

- 4 x emergency off switch
- 4 x contact emitter
- 2 x light grid
- 2 x one-hand operation
- 2 x independent output functions



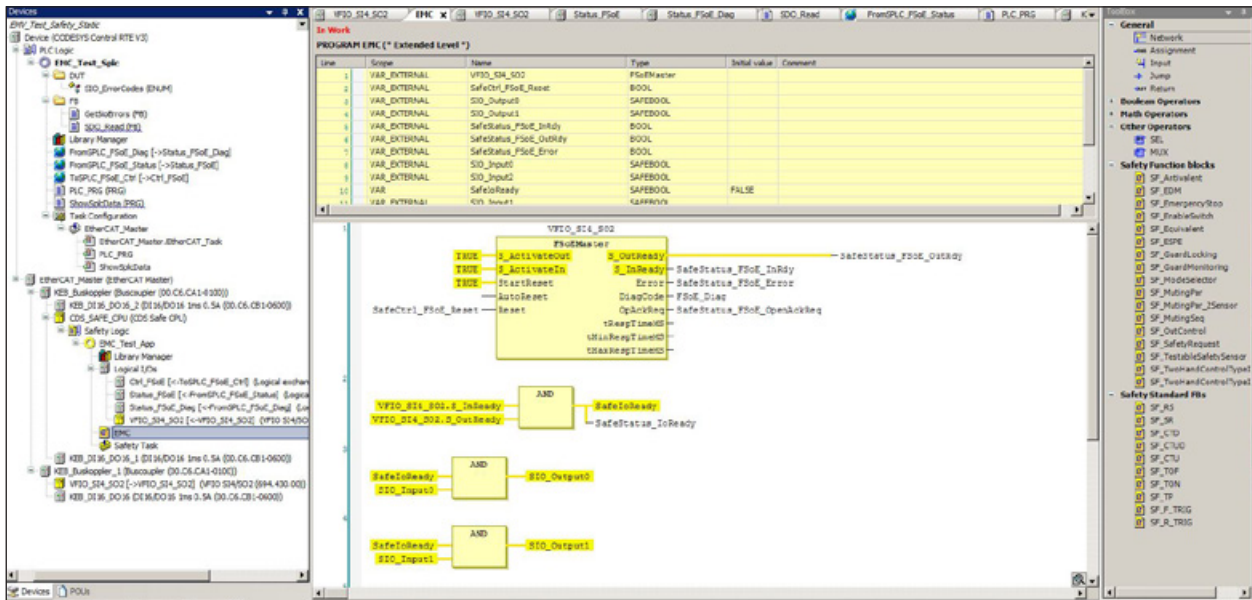
STANDARD PROGRAMMING WITH CODESYS SAFETY

The C6 Safety PLC is programmed with a certified plug-in which is fully integrated in the KEB COMBIVIS studio 6 development environment. The safety controller constitutes a sub-node of the standard controller.

This includes the application, task and global variable lists, POEs and logic I/Os. The entire system is programmed with the FBD Safety Editor in IEC61131-3 and certified modules to PLC Open Safety.

The software also offers additional functions for securing the safety function. These include change tracking, safe signal flow, safe versioning (pinning), separation of safe mode and debug mode.

Developers can use an extensive library in CODESYS Safety. Prepared function modules make work easier and engineering faster - and hence more economic.



Safety-Editor



HIGHLIGHTS

- Integrated Safety-FBD Editor for programming
- Library for internal Safety Software modules such as emergency off, protected door monitoring, two-hand control etc.
- Configurator for Safety over EtherCAT® (FSOE)
- Data exchange with standard control
- Safe Download function with automated diverse compile checking



EDITOR FOR THE KEB DRIVE SAFETY MODULE

With the safety module editor, KEB offers users in the COMBIVIS 6 engineering environment a tool for configuration and analysis of the safety modules. The functions and values necessary for an application can be set off-line in order to be transmitted to the module on completion in just a few clicks. A useful feature for series applications or in service, is that the parameter lists produced with the safety module editor can be called at any time and transmitted again to further modules. A checksum ensures that the data has been correctly received. The data access itself can be freely configured and secured with password-dependent user rights.

- Part of the COMBIVIS 6 development environment
- Safe transfer of configuration data
- Rapid parameter list download for series machine construction
- Scalable user rights with six different password levels
- Status and error messages:
 - global status
 - status of safety functions
 - error status
 - status of inputs and outputs
 - current rotation speed
 - current position
 - system time and date

The screenshot shows the 'KEB Sicherheitsmodul' configuration window. It includes a user management section, a parameter list table, and a dropdown menu for 'Im/Export'.

Parameter	Wert	Einheit
Filterzeiten der Sicherheitseingänge		
Filterzeit der STO-Eingänge	0.100000	s
Filterzeit der SBC-Eingänge	0.100000	s
Filterzeit der Funktion1-Eingänge	0.100000	s
Filterzeit der Funktion2-Eingänge	0.100000	s
Filterzeit der Ripple-Eingänge	0.100000	s
Taktsignal Eingangskonfiguration		
Testsignal-Periodendauer	10.000000	s
Testpulslänge	0.001000	s
Auswertung des Testsignals für die STO-Eingänge	aus	
Auswertung des Testsignals für die SBC-Eingänge	aus	
Auswertung des Testsignals für die Funktion1-Eingänge	aus	
Auswertung des Testsignals für die Funktion2-Eingänge	aus	
STO Eingangskonfiguration		
Toleranzzeit der STO-Eingänge	0.100000	s
Status der STO-Eingänge	äquivalent	
SBC Eingangskonfiguration		
Toleranzzeit der SBC-Eingänge		
Status der SBC-Eingänge		
Funktion1 Eingangskonfiguration		
Belegung der Funktion1-Eingänge		
Toleranzzeit der Funktion1-Eingänge		
Status der Funktion1-Eingänge		
Funktion2 Eingangskonfiguration		
Belegung der Funktion2-Eingänge		
Toleranzzeit der Funktion2-Eingänge		
Status der Funktion2-Eingänge		

The 'Im/Export' dropdown menu contains the following options:

- Sichere Konfigurationsdaten exportieren
- Sichere Konfigurationsdaten importieren
- Parameterliste für Download erzeugen
- Sichere Konfigurationsdaten aus Parameterliste importieren
- Default-Werte laden

Safe parameterisation

Produce parameter list

The screenshot displays the KEB software interface for a safety module. The top window shows the 'Sichere Parametrierung' (Safe Parameterization) tab, which includes sections for 'Sicherheitsmodul Status' (Safety Module Status) and 'Steuerkarten Parameter' (Control Card Parameters). The status section shows 'Allg. Sicherheitsstatus: 264706: Sicherheitsoperation freigegeben + Konfiguration Ok + Hochstarten des Sicherheit...' and 'Fehlerstatus: Kein Fehler'. The parameter section lists various safety-related parameters like 'de41: safety type' and 'de42: safety software version'.

The bottom window shows the 'Protokoll' (Protocol) tab, which displays a list of events. The 'Kategorien' (Categories) section includes 'Fehler' (Error), 'Sicherheitsfkt.' (Safety Function), 'Neue Konfig.' (New Config.), 'Konfig. Fehler' (Config. Error), 'Einschalten' (Turn On), 'Ausschalten' (Turn Off), and 'Aktualisieren' (Update). The main table lists events with columns for 'Index', 'Typ', 'Datum & Zeit', and 'Details'. The events include various error messages such as 'Fehler: + Cpu 2 + Die Fehlerzeit für den Funktion2 Eingang ist abgelaufen' and 'Warnung: + Cpu 2 + STO Eingang gesetzt. Das Runterladen der neuen Konfig...'.

Status of safety module

Safety module protocol



HIGHLIGHTS

- Part of COMBIVIS 6
- Safe transfer of configuration data
- Setting for series cases by parameter list download
- User rights with six different password levels