SAFETY

INTEGRATED SAFETY SYSTEM SOLUTION

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INTEGRATED SAFETY SYSTEM

KEB’s system solutions span from control through automation to mechanical interface. Parallel to the certified software tool KEB offers a complete portfolio of powerful hardware for the machine and plant automation.

Integrated into the EtherCAT-based control and remote I/O system, the Safety PLC and the Safety I/O module take over all safety relevant tasks of the control level. The safety-oriented Safety over EtherCAT communication (FSoE) creates a flexible interface in the drive level where modular safety solutions provide various safety functions.

Synchronous/asynchronous motors and gear motors described as FS = “Safety Ready” are fitted with encoder feedbacks for safety tasks.
SOFTWARE

SINGLE POINT OF ENGINEERING

DEVELOPMENT ENVIRONMENT (IDE)

With COMBIVIS studio 6 safety, machine designers can meet compliance with IEC 61508 SIL 3 and ISO/EN 13849 PL e for their safety PLC application. COMBIVIS studio 6 safety uses a TÜV certified CODESYS plugin which is fully integrated in COMBIVIS studio 6 development environment. This means the machine and safety program can be developed in one unified software platform. The safety controller programs as a sub-node of the main machine controller and the application, tasks, global variable lists, POEs and logic I/Os are also integrated.

PROGRAMMING OF SAFETY APPLICATIONS

The safety controller is programmed based on a Function Block Diagram (FBD) via Safety Editor in IEC 61131-3. The FBD Safety Editor contains certified safe modules according to PLCopen Safety. The safety modules facilitate the programming of common machine elements like for example e-stop circuits, light curtains, and two-handed control.

This reduces the time required for the development, verification and acceptance of the safety application for the user.

SAFE PROJECT MANAGEMENT

COMBIVIS studio 6 safety also offers additional functionality for managing the project. This includes change tracking, safe signal flow, safe versioning (pinning), and the separation of safe mode and debug mode.
**CONFIGURATION OF INTEGRATED SAFETY ON THE DRIVES**

The configuration of the KEB Safety Drives is done with the certified Safety Editor, which is integrated in the KEB parameterization environment COMBIVIS 6. This is where the safety functionality and limits can be configured. These safety-related settings can be saved and downloaded to other drives via COMBIVIS or via the controller. Current parameters and the error history can be used for system diagnosis. The export function makes it easy to create the required documentation.

COMBIVIS 6 is available free of charge for every user.

**HIGHLIGHTS**

- User administration
- Creation and adaptation of the configuration
- Diagnosis
- Data backup
- Documentation of the settings
- Change history
- Creating the MDP file for Safety over EtherCAT
SAFETY PLC & I/O

The freely programmable Safety PLC and the Safety I/O modules form an innovative safety solution. Communication takes place via the existing EtherCAT bus with the certified Safety over EtherCAT (FSoE) safety protocol. Any FSoE slaves can be addressed via the Safety PLC (FSoE master).

HIGHLIGHTS

**Safety PLC**
- Safety over EtherCAT Master
- Free programmable Safety PLC
- IEC 61508 SIL3 and EN ISO 13849-1 CAT.4/PL e
- Cross communication between PLC and Safety PLC on common bus

**Safety I/O**
- Safety over EtherCAT Slave
- Safe I/O module with safe inputs and outputs
- IEC 61508 SIL3 and EN ISO 13849-1 CAT.3/PL e
- Four safe inputs (with dedicated test pulse outputs)
- Two safe outputs (max = 2 Amps)
FUNCTIONAL SAFETY (FS) DRIVES

The sixth generation of KEB drives offers scalable safety functions directly in the drive controller. The device variants are Compact, Application and Pro for the COMBIVERT F6 and S6 enabling selectable functions according to the requirements.

COMPACT
In the Compact device variant, Safe-Torque-Off (STO) is integrated as the basic function.

APPLICATION
The Application device variant is available for speed and position-dependent safety functions with encoders. Flexible adaptation of the safety functions and limit values is possible via digital I/Os and/or Safety over EtherCAT (FSoE).

PRO
The Pro device variant offers possibilities for implementation in the area of encoderless safety. For example, safe solutions can be implemented in applications where encoder mounting is not possible. This also results in a reduction in costs. Here, too, the safety functions and limit values can be flexibly adapted via digital I/Os and/or Safety over EtherCAT (FSoE).

HIGHLIGHTS

- Scalable safety concept up to PL e (ISO 13849-1) and SIL 3 (IEC 61508 and IEC 62061)
- Advanced safe motion functions according to IEC 61800-5-2
- Safety over EtherCAT (FSoE) Slave Option
- OSSD outputs (detection of wire breakage, shorts, etc.)
- Safe parameterization through COMBIVIS 6
- Safe speed measurement without encoder
- Dual channel ripple interface for cascading safety chain
- Up to 8 different configurations stored
### BASIS FOR SAFETY

**COMPACT**

In the Compact version, the COMBIVERT F6 and S6 drive controllers are equipped with Safe-Torque-Off (STO).

### SAFETY FUNCTIONS WITH SPEED AND POSITION MONITORING

**APPLICATION**

The device variant Application is available in two versions. In addition to STO, Module 1 adds safe brake control (SBC) which provides a safe 24 V supply for the brakes. Module 3 offers safe motion functionality according to IEC 61800-5-2 through speed and position detection using encoders. The error reaction time is shortened and costs are reduced by reducing the number of separate protective devices. Module 3 also offers the option of controlling all available safety functions and limit values via Safety over EtherCAT (FSoE).

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<th>COMPACT</th>
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<tr>
<td>on board</td>
<td>Module 1</td>
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<table>
<thead>
<tr>
<th>Function</th>
<th>Graph</th>
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<tr>
<td>Safe Torque OFF</td>
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<tr>
<td>Safe Brake Control</td>
<td>SBC</td>
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<tr>
<td>Safe Stop 1</td>
<td>SS1</td>
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<tr>
<td>Safe Stop 2</td>
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<tr>
<td>Safe Emergency Limit</td>
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<tr>
<td>Safely-Limited Increment</td>
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<td>Safely-Limited Acceleration</td>
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<td>Safe Direction</td>
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<td>Safely-Limited Speed</td>
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<tr>
<td>Safe Speed Monitor</td>
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<td>Safe Maximum Speed</td>
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<td>Safe Acceleration Range</td>
<td>SAR</td>
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<tr>
<td>Safe Speed Range</td>
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**SENSORLESS SAFETY FUNCTIONS**

**PRO**
The Pro device variant of the COMBIVERT F6 and S6 drive controllers offers advanced safety functions without having to use a safety encoder. The device determines the safe velocity parameters from the pulse width modulation (PWM) of the motor supply.

In addition to STO, Module 5 is equipped with a safe brake control (SBC), which provides a safe 24 V supply for braking operation as well as a monitoring of the switching status of the brake via microswitch evaluation.

Module 5 also offers the option of controlling all available safety functions via Safety over EtherCAT (FSoE).

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**WHY USE DRIVE-BASED SAFETY (SAFE MOTION)?**

- Less wiring - remove contactors and other traditional safety components
- Fast reaction - direct handling inside the drive
- Easy to operate - up to 8 different safety setups per function
- Cost savings compared to traditional safety solution
MOTORS & GEARS

THREE-PHASE ASYNCHRONOUS MOTORS

KEB DRIVE

The fast configuration for motors and gears is done with the software KEB DRIVE.
SERVOMOTORS

**HIGHLIGHTS**

**Servomotors DL3 & TA series**
- Powerful, compact design, up to 82Nm nominal torque
- Option with KEB spring-applied brake
- Quick connect power and feedback connectors
- Safe encoder option: Hiperface, Resolver

**Gear motors**
- Induction or servo motor (up to 45kW)
- Spring-applied brake option with micro switch
- SIL2 and SIL3 encoder

**SPRING-APPLIED BRAKES**

- Holding brakes from 0.3 Nm ... 1,500 Nm
- Options such as protection class IP 65
- Double brake design possible for theatres, elevators and lifts
- Optional microswitch to increase the diagnostic coverage level

COMBISTOP for servomotors

COMBISTOP for three-phase motors