



SAFETY

INTEGRATED SAFETY SYSTEM SOLUTION

EN



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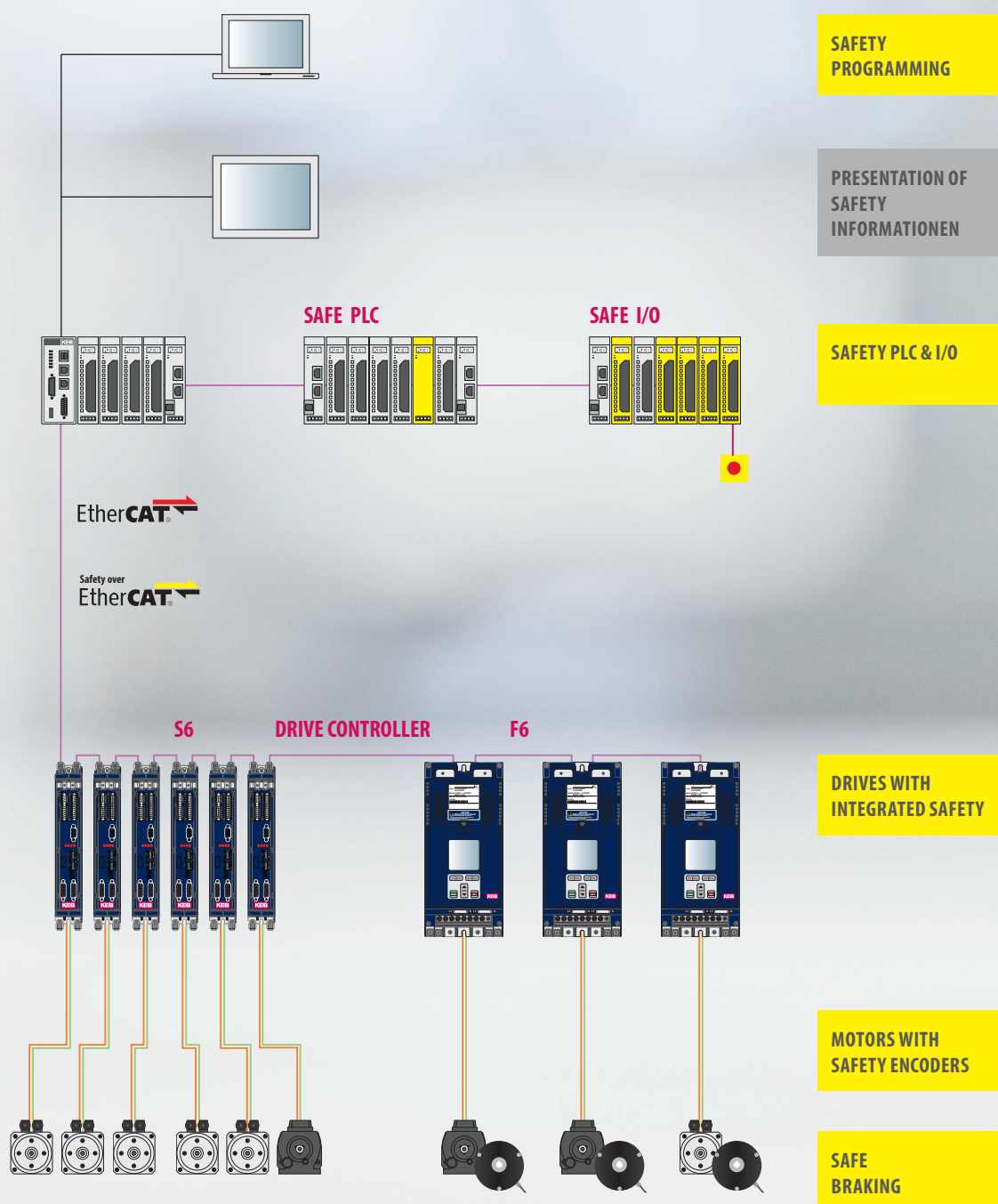
INTEGRATED SAFETY SYSTEM

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.

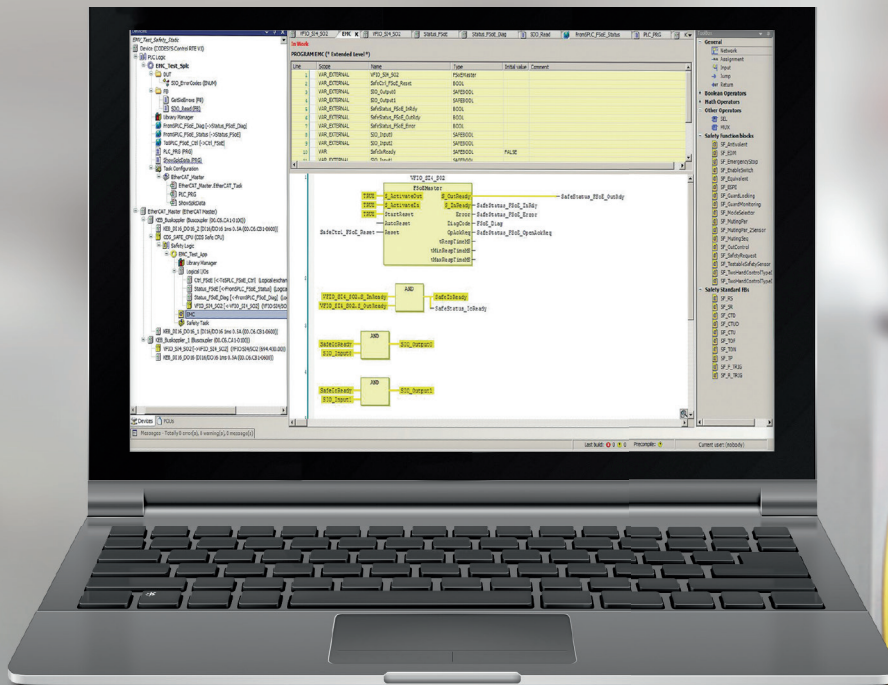
Integrated into the EtherCAT-based control and remote I/O system, the Safety PLC and the Safety I/O module take over all safety relevant tasks of the control level.

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 SIL3 and ISO/EN 13849 PL e for their safety PLC application. COMBIVIS studio 6 safety uses a TÜV certified CODESYS plug-in 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.

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.

PROGRAMMING OF SAFETY APPLICATIONS

The safety controller is programmed based of 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.

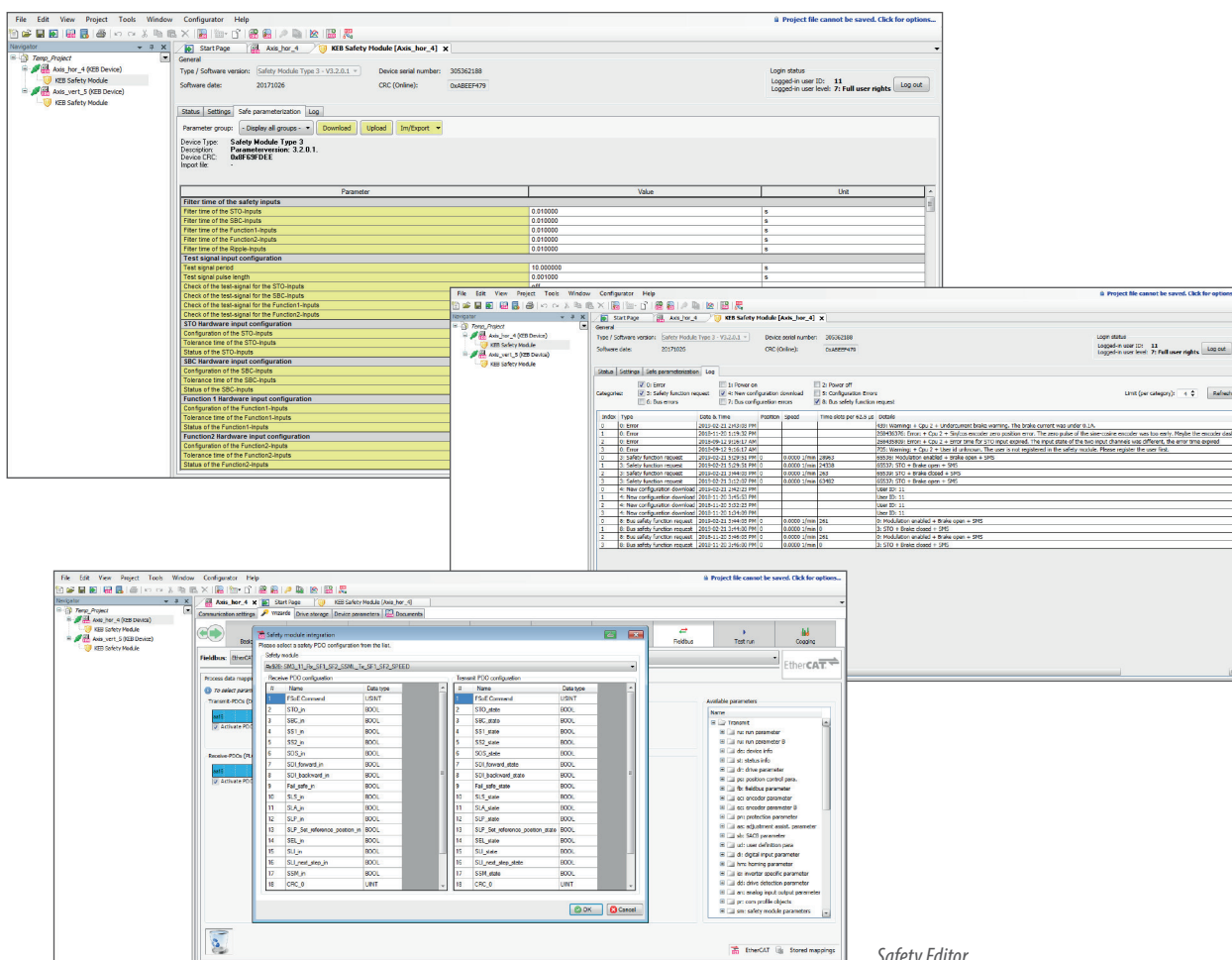
This reduces the time required for the development, verification and acceptance of the safety application for the user.

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

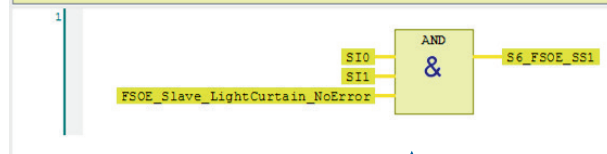
HARDWARE

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).

PROGRAM POU (* Basic Level *)

Line	Scope	Name	Type	Initial va...	Comment
1	VAR_EXTERNAL	Input0	SAFEBOOL		
2	VAR_EXTERNAL	Input0_1	SAFEBOOL		
3	VAR_EXTERNAL	Input0_0	SAFEBOOL		
4	VAR_EXTERNAL	Input1_1	SAFEBOOL		
5	VAR_EXTERNAL	Output0_1	SAFEBOOL		
6	VAR_EXTERNAL	Output1_1	SAFEBOOL		
7	VAR_EXTERNAL	SI0	SAFEBOOL		
8	VAR_EXTERNAL	SI1	SAFEBOOL		
9	VAR_EXTERNAL	FSoE_...oError	SAFEBOOL		
10	VAR_EXTERNAL	S6_FSoE_SS1	SAFEBOOL		



Freely programmable
via function block diagram



Safety PLC

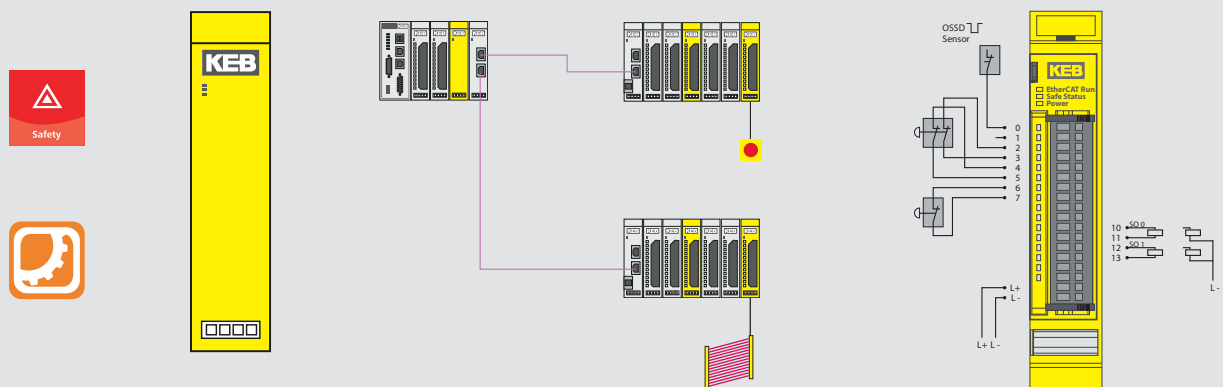


Safety I/O

EtherCAT®

Safety over
EtherCAT®

DECENTRALIZED SAFETY CONCEPT



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).



Drive controllers COMBIVERT F6 and S6 provide integrated safety functions

EtherCAT®

Safety over
EtherCAT®



HIGHLIGHTS

- Scalable safety concept up to PL e (ISO 13849-1) and SIL3 (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

SAFETY FUNCTIONS IN THE DRIVE

BASIS FOR SAFETY

COMPACT

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

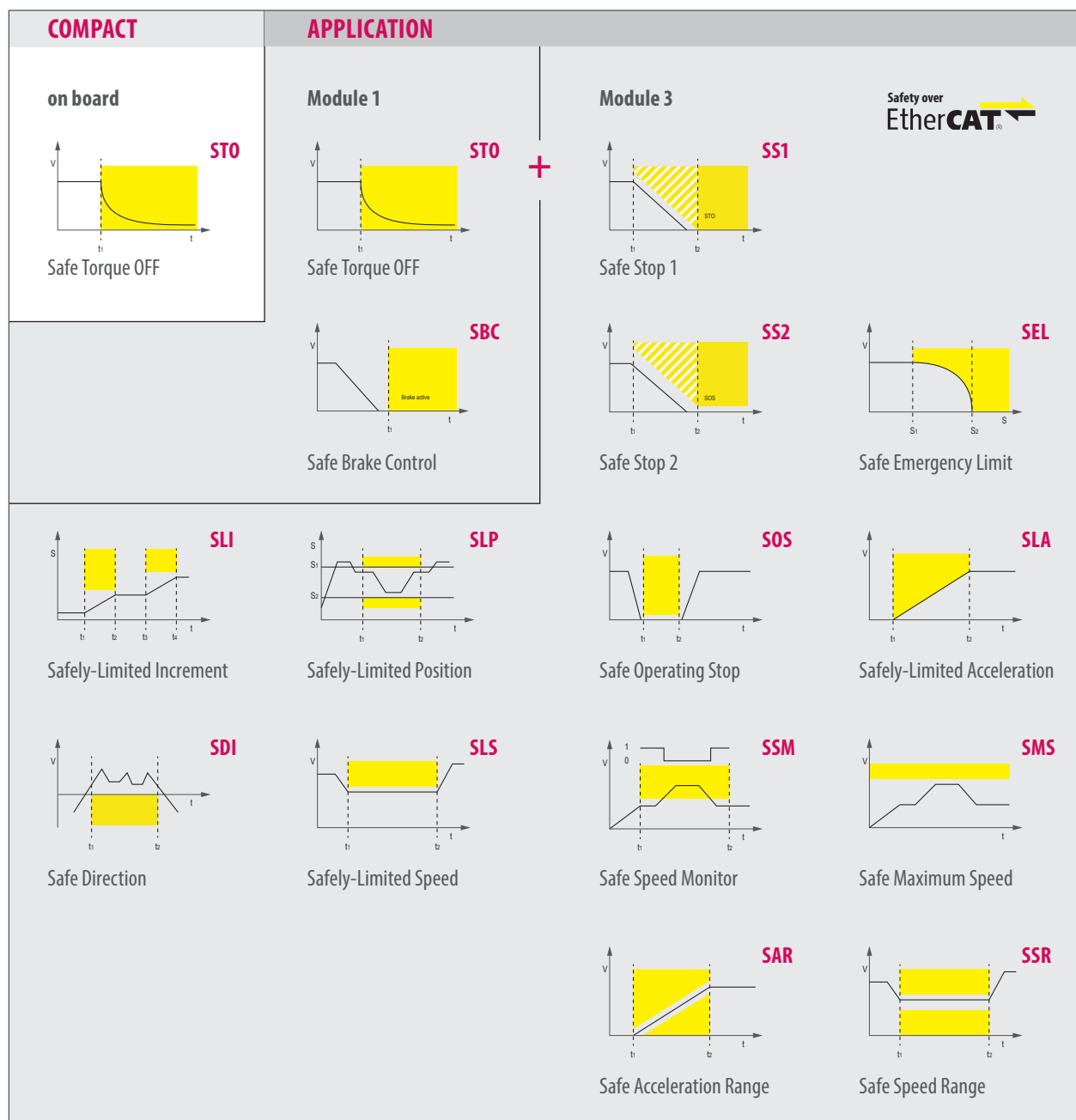
SAFETY FUNCTIONS WITH SPEED AND POSITION MONITORING

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).



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).

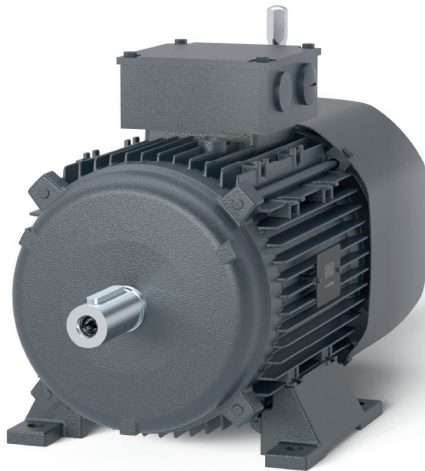


WHY USE DRIVE-BASED SAFETY (SAFE MOTION)?

- 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.

KEB-DRIVE 2019

Choice | Text | Dimensions | Motor

ZG32 Helical gear unit **TA53** Servo motor 400V

30 Nm, 4500 1/min

1/min	Nm	cG	i	T2dyn[Nm]
0 - 218	620-320	0.80	20.61	570

Foot mounted version

Output shaft with key Ø48x110

Breather valve

Lubricant: CLP VG220 Mineraloil

Brake BF04, 36Nm, 24VDC

EN06 - Absolute encoder, singleturn, 12bit/rev + 128ppr SinCos, HiPerface

TW - PTC thermistor sensor

FS02 - Encoder HiPerface SIL2/PLd

Forced ventilation

Motor connection: Plug connector radial, position 0A

Paint: normal, RAL9005 black

Mounting position: M1

condensation drain hole

Dust- and water protection IP65

Paint: normal, RAL9005 black

Mounting position: M1, 0°, inclined to M2

KEB-DRIVE 2019

Choice | Text | Dimensions | Motor

Nominal current I0/I1/Imax: 29.0/14.9/58A

Insulation class: 155

Protection standard: IP54

Spring applied brake BF04, 36Nm, 24VDC

EN06 - Absolute encoder, singleturn, 12bit/rev + 128ppr SinCos, HiPerface

Supply voltage 5VDC

Motor protection: PTC thermistor sensor

functional safety: FS02 - Encoder HiPerface SIL2/PLd

Forced ventilation 3x400VAC, Plug connector HAN3A, position 90D

With counterplug

Motor connection: Plug connector radial, position 0A

Paint: normal, RAL9005 black

Mounting position: M1

Weight: ~49 kg

M0/M1/Imax=30/15.5/60Nm

I0/I1/Imax=29.0/14.9/58A

nn=4500 1/min

Pm=7.3kW Jm=28.15kgcm² Jb=1.4kgcm²

T2dyn=570Nm T2notaus=820Nm

Jg=0.627 kgcm² i=6699/325 cg=24 Nm/

HS-Code: 85015220

KEB-DRIVE 2019

Choice | Text | Dimensions | Motor

Mn=15.5Nm - Nominal torque

Mmax=60Nm - Maximum torque

I0=29.0A - Current at stall torque

I1=14.9A - Current at nominal torque

Imax=58A - Current at maximum torque

η=94.5% - Efficiency

Ru-v,20=0.364Ω - Winding resistance 20°C

Ru-v=0.513Ω - Winding resistance warm

Lq=2.5551mH - Winding inductance

Ld=2.839mH - Winding inductance

Kepk,20=10.52V*min/1000 - Voltage constant Peak value 20°C

Kepk=93.84V*min/1000 - Voltage constant Peak value warm

Jm=28.15kgcm² - Inertia

Jb=1.4kgcm² - Inertia

M[Nm]

100

90

80

70

60

50

40

30

20

10

0

500

1000

1500

2000

2500

3000

3500

4000

4500

5000

5500

6000

6500

7000

n[1/min]

Motor: TA53 V40

① M S1-105K

② Mmax motor

③ nmax 400V

④ nmax 360V

⑤ nmax 460V

Parameter set F5

Parameter set F6

KEB-DRIVE 2019

Choice | Text | Dimensions | Motor

822

284

538

110

118.5

21

138

150

192

5

100

14

51.5

Ø17.5

205

245

M16

Ø48x110

ZG32 TA53 V40 BF04 EN06 TW FS02 F

KEB-DRIVE 30.04.2019

STEP

RTF

Text

KEB

CE

ZG32 TA53 V40 BF04 EN06 TW FS02 F 3~BDC Motor

(serial-no) 49kg

Pm=7.3kW IP54 Tn C1 155

U0=400V In=14.9A Mn=15.5Nm

nn=4500 1/min fn=225Hz M0=30Nm Mmax=60Nm

Kepk=93.84V*min R=0.513Ω L=2.84mH

BF04=36Nm 24VDC F 3~400V 50Hz 0.19A

ZG32: i=20.61 T2n=320Nm M1 n1eff=1500 1/min

CLP VG220 0.55l

SERVOMOTORS



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



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



Automation with Drive

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